Total No. of Questions :4]

SEAT No. :

**P599**

[Total No. of Pages :3

# [5115] - 401

## T.Y.B.Sc.

## MATHEMATICS

## MT-341: Complex Analysis (Paper - I)

## (2013 Pattern) (New Course) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any Five of the following: **[10]**

a) Using properties of conjugate and modulus establish

$$\left|(2\overline{z}+5)\left(\sqrt{2}-i\right)\right|=\sqrt{3}\left|2z+5\right|.$$

b) Solve the equation $z^2+2z+(1-i)=0$.

c) Show that $f'(z)$ does not exist at any point if $f(z)=\exp(\overline{z})$.

d) Find the principal value of $(1-i)^{4i}$.

e) Evaluate the integral $\int_1^2\left(\frac{1}{t}-i\right)^2 dt$.

f) Find a representation of the function $f(z)=\frac{1}{1+z}$ in negative powers of $z$ that is valid when $|<|z|<\infty$.

g) Write the principal part of the function $\frac{\sinh z}{z^4}$ at the isolated singular point $z_0$=0.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Suppose that $f(z) = u(x, y) + i\, v(x, y)$ and that $f'(z)$ exists at a point $z_0 = x_0 + iy_0$. Then show that the first order partial derivatives of *u* and *v* must exist at $(x_0 + y_0)$ and they must satisfy the Cauchy Riemann equaitons $u_x = v_y, u_y = -v_x$ there and $f'(z_0) = u_x + iv_x$.

b) If a function $f(z) = u(x, y) + iv(x, y)$ is analytic in a domain D then show that *v* is harmonic conjugate of *u* in D.

c) Find all the roots of $\left(-8 - 8\sqrt{3}i\right)^{\frac{1}{4}}$ in rectangular coordinates, exhibit them as vertices of certain squares and point out which is the principal root.

***Q3)*** Attempt any two of the following: **[10]**

a) Let f be analytic everywhere inside and on a simple closed contour C taken in positive sense. If $z_0$ is any point interior to C, then show that $f(z_0) = \dfrac{1}{2\pi i}\int_C \dfrac{f(z)dz}{z - z_0}$.

b) Suppose that a function $f(z)$ is continuous on a domain D and has antiderivative F(z) in D. Then show that the integral of $f(z)$ along contours lying entirely in D and extending from any fixed point $z_1$ to any fixed point $z_2$ all have the same value.

c) Evaluate $\int_C f(z)dz$ where $f(z) = \pi \exp(\pi \bar{z})$ and C is the boundary of the square with vertices at the points 0,1, 1 +*i* and *i*, the orientation of C being in the counterclockwise direction.

***Q4)*** Attempt any one of the following: **[10]**

a) i) State and prove the Cauchy's residue theorem.

ii) Find all roots of the equation $\sin z = \cosh 4$.

b) i) Suppose that a function $f(z) = u(x, y) + iv(x, y)$ and its conjugate $\overline{f(z)} = u(x, y) - iv(x, y)$ are both analytic in a domain D. Show that $f(z)$ must be constant throughout D.

ii) Find the Taylor series for $f(z) = \frac{1}{z}$ about $z_0$ =2. Then, by differentiating term by term, show that

$$\frac{1}{z^2} = \frac{1}{4}\sum_{n=0}^{\infty}(-1)^n(n+1)\left(\frac{z-2}{2}\right)^n \quad (|z-2|<2).$$

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**Total No. of Questions :4]**

**SEAT No. :** ____

**P600**

**[Total No. of Pages :3**

# [5115] - 402

## T.Y.B.Sc.

## MATHEMATICS

## MT-342: Real Analysis - II (Paper - II)

## (2013 Pattern) (Semester - IV)

***Time : 2 Hours]*** ***[Max. Marks :40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any five of the following: **[10]**

a) Define: set of measure zero. Is every set of measure zero countable? Justify.

b) For each $n \in I$, let $\sigma_n$ be the subdivision $\left\{0, \frac{1}{n}, \frac{2}{n}, ..., \frac{n}{n}\right\}$ of [0,1] and $f(x) = x \ \ (0 \le x \le 1)$. Compute $\lim_{n\to\infty} U[f;\sigma_n]$.

c) True or false? If $f \in R[a,b]$, and if $f(x) = g(x)$ except for a countable number of points $x \in [a,b]$, then $g \in R[a,b]$. Justify your answer.

d) If $f_n(x) = x^n \ \ (0 \le x \le 1)$, then find $\lim_{n\to\infty} f_n(x) \ \ (0 \le x \le 1)$.

e) True or false? If a sequence of Riemann integrable functions converges to a Riemann integrable function, then that convergence is uniform. Justify your answer.

f) Show that $\int_1^\infty \frac{1}{x^2} dx$ is convergent.

g) Find C.P.V. of $\int_{-\infty}^{\infty} \frac{1}{1+x^2} dx$.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Let $f$ be a bounded function on the closed bounded interval $[a, b]$. Then prove that $f \in R[a,b]$ if and only if for each $\in > 0$, there exists a subdivision $\sigma$ of $[a, b]$ such that $U[f;\sigma] < L[f;\sigma] + \in$.

b) Discuss the uniform convergence of $\{f_n\}_{n=1}^{\infty}$, where $f_n(x) = nx(1-x^2)^n$ $(0 \le x \le 1)$.

c) Test the convergence of $\int_0^{\infty} \frac{1}{x^2 + \sqrt{x}} dx$.

***Q3)*** Attempt any two of the following: **[10]**

a) Let $J_1, J_2, ..., J_n$ be open intervals in $[a, b]$. Show that $\chi = \chi_{J_1 \cup J_2 \cup ... \cup J_n}$ in $R[a, b]$. Further show that $\chi(x) \le \chi_{J_1}(x) + \chi_{J_2}(x) + ... + \chi_{J_n}(x)$. Hence deduce that $\int_a^b \chi \le |J_1| + |J_2| + ... + |J_n|$.

b) Let $\{f_n\}_{n=1}^{\infty}$ be a sequence of real valued functions on a set E. Prove that $\{f_n\}_{n=1}^{\infty}$ is uniformly convergent on E if and only if for given $\in > 0$, there exists $N \in I$ such that $|f_m(x) - f_n(x)| < \in \quad (m, n \ge N; x \in E)$.

c) State and prove $\mu$-test for improper integral of second kind.

***Q4)*** Attempt any one of the following: **[10]**

a) i) If $u_1, u_2, ...$ are functions each of which has a derivative at every point of $[a, b]$, if $u_k'$ is continuous on $[a, b]$ for $k = 1, 2, ...$, if $\sum_{k=1}^{\infty} u_k$ converges to $f$ on $[a, b]$, and if $\sum_{k=1}^{\infty} u_k'$ converges uniformly on $[a, b]$, then prove that $f'(x) = \sum_{k=1}^{\infty} u_k'(x)$. **[5]**

ii) By examining $f(x) = \lim_{n\to\infty} f_n(x)$ for $0 \le x < \infty$, where $f_n(x) = \frac{1}{1+x^n}$, prove that $\{f_n\}_{n=1}^{\infty}$ does not converge uniformly on $[0,\infty)$. **[5]**

b) i) If $f$ is continuous on $[a,b]$, $f(x) > 0$ $(a \le x \le b)$ and $F(x) = \int_a^x f(t)dt$ $(a \le x \le b)$, then prove that $F'(x) = f(x)$, $a \le x \le b$. **[5]**

ii) Test the convergence of $\int_0^{\pi/4} \frac{1}{\sqrt{\tan x}} dx$. **[5]**

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Total No. of Questions : 4]

SEAT No. :

**P601**

[Total No. of Pages : 3

# [5115]-403
# T.Y.B.Sc.
# MATHEMATICS
## MT - 343: Problem Course Based on MT 341 and MT 342
## (2013 Pattern) (New Course) (Paper - III) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***The answer books of both sections together.***

## SECTION - I

(Complex Analysis)

***Q1)*** a) Attempt any three of the following: **[6]**

i) Find f'(z) when $f(z)=\frac{(1+z^2)^4}{z^2}$ $(z\neq 0)$.

ii) Evaluate $\int_C \text{Log}(z+2)\,dz$ where C is the simple closed contour $|z| = 1$ oriented in the positive sense.

iii) Find the residue at z = 0 for the function $\frac{z-\sin z}{z}$.

iv) Write the number $-1-i$ in exponential form.

b) Attempt any one of the following: **[4]**

i) Show that $|\text{Re}(2+\bar{z}+z^3)|\leq 4$ when $|z|\leq 1$.

ii) Locate all zeros and singularities of hyperbolic tangent function.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Show that the function $u(x,y) = 2x - x^3 + 3xy^2$ is harmonic in some domain and find it's harmonic conjugate $v(x,y)$.

b) Evaluate $\int_C f(z)dz$ where $f(z) = \dfrac{z+1}{z^2-2z}$ and C is the circle $|z| = 3$ in the positive sense.

c) Represent the function $f(z) = \dfrac{z+1}{z-1}$.

i) by its Maclaurin series and state where that representation is valid.

ii) by its Laurent series in the domain $1 < |z| < \infty$.

## SECTION - II

(Real Analysis - II)

***Q3)*** a) Attempt any three of the following: **[6]**

i) If A is not of measure zero, $B \subset A$ and B is of measure zero, then prove that A\B is not of measure zero.

ii) Let $f$ be the characteristic function on a set $E \subset [0,1]$ such that E and [0,1]\E are both dense in [0,1]. State whether $f \in R[0,1]$? Justify.

iii) Let $f_n(x) = \dfrac{x^n}{1+x^n}$ $(0 \le x \le 1)$. Show that $\{f_n\}_{n=1}^{\infty}$ converges pointwise on [0,1].

iv) Show that $\int_0^{\infty} e^{-x}dx$ is convergent.

b) Attempt any one of the following: **[4]**

i) Let $f(x) = 2x^2 - 3x + 5$ $(0 \le x \le 1)$. Show that $f \in R[0,1]$ and hence find $\int_0^1 f(x)dx$.

ii) Show that the series $\sum_{n=1}^{\infty} \dfrac{\text{Sin nx}}{n^2}$ converges uniformly on $(-\infty, \infty)$.

***Q4)*** Attempt any two of the following: **[10]**

a) If f $\in$ R[a,b], then prove that |f| $\in$ R[a,b].

b) Let $f_n(x) = \frac{1}{n} e^{-nx}$ $(0 \le x < \infty)$. Prove that $\{f_n\}_{n=1}^{\infty}$ converges uniformly to 0 on $[0, \infty)$

c) Prove that the improper integral $\int_{\pi}^{\infty} \frac{\text{Sin } x}{x} dx$ converges conditionally.

x x x

Total No. of Questions : 4]

SEAT No. :

**P602**

[Total No. of Pages : 2

# [5115]-404
# T.Y.B.Sc.
# MATHEMATICS
## MT - 344: Ring Theory
## (2013 Pattern) (Paper - IV) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any five of the following. **[10]**

a) Describe all ring homomorphisms of $\mathbb{Z}$ in to $\mathbb{Z}$.

b) Let (R,+) be an abelian group. Show that $(R,+,\cdot)$ is a ring if we define $a \cdot b = 0$ for all a,b $\in$ R.

c) Show that the characteristic of an integral domain D is either 0 or a prime p.

d) Describe all solutions of the congruence $2x \equiv 6 (\mathrm{mod}\, 4)$.

e) State the following statement is true or false with justification.

Let F be a field A nonconstant polynomial f($x$) $\in$ F[$x$] is reducible over F if and only if $f(x)$ has a zero in F.

f) Give an example to show that a factor ring of an integral domain may have divisors of 0.

g) Find all units of $\mathbb{Z}[i]$.

***Q2)*** Attempt any two of the following: **[10]**

a) Prove that every finite integral domain is a field.

b) Let $p \in \mathbb{Z}$ be a prime. Suppose $f(x) = a_0 + a_1 x + - - - - + a_n x^n$ is in $\mathbb{Z}$[x], and $a_n \not\equiv 0$ (modp), but $a_i \equiv 0$ (mod p) for all i<n, with $a_0 \not\equiv 0$ (mod $p^2$). Prove that $f(x)$ is irreducible over $\mathbb{Q}$.

c) Let $\phi : R \to R'$ be a ring homomorphism with kernel N. Then prove that the rings R/N and $\phi$ [R] are isomorphic.

***P.T.O.***

***Q3)*** Attempt any two of the following: **[10]**

a) Let R be a commutative ring with unity. If M is a maximal ideal of R, then prove that R/M is a field.

b) If F is a field, prove that every ideal in F[$x$] is principal.

c) Let D be a PID. Prove that every element that is neither 0 nor a unit in D is a product of irreducibles.

***Q4)*** Attempt any one of the following: **[10]**

a) i) Let D be a UFD and let F be a field of quotients of D. Let f(x) $\in$ D [x], where deg f(x) > 0. If f(x) is irreducible in D[x], then prove that f(x) is also an irreducible in F[x]. **[7]**

ii) In a PID, if an irreducible p divides ab, then prove that either p divides a or p divides b. **[3]**

b) i) Let D be a Euclidean domain with Euclidean norm $\nu$. prove that $\nu(1)$ is minimal among all $\nu$(a) for nonzero a $\in$ D. Also prove that u$\in$ D is a unit if and only if $\nu$(u) = $\nu$(1). **[5]**

ii) Prove that the integral domain $\mathbb{Z}(i) = \{a + bi / a, b \in \mathbb{Z}\}$ is a Euclidean domain. **[5]**

x x x

Total No. of Questions : 4]

SEAT No. :

**P603**

[Total No. of Pages : 2

# [5115]-405
# T.Y.B.Sc.
# MATHEMATICS
## MT - 345 : Partial Differential Equations
## (2013 Pattern) (Paper - V) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any five of the following. **[10]**

a) Find the integral curves of the equations $\frac{dx}{cy-bz}=\frac{dy}{az-cx}=\frac{dz}{bx-ay}$.

b) Show that the differential equation $(y^2+z^2)dx-xydy-xzdz=0$ is integrable.

c) Find the general integral of $z(xp-yq)=x^2-y^2$.

d) Obtain the partial differential equation by eliminating the arbitrary function $f$ from $z = x + y + f(xy)$.

e) Find a complete integral of Clairaut's partial differential equation $z\,pq=p^2q(x+q)+pq^2(y+p)$.

f) Solve the differential equation $2xdx+zdy+ydz=0$.

g) Find the direction ratios of tangent at the point $(x,y,z)$ to the conic $ax^2+by^2+cz^2=1,\ x+y+z=1$.

***Q2)*** Attempt any two of the following. **[10]**

a) Prove that necessary and sufficient condition that there exists a relation $F(u,v)=0$ which does not contain $x$ or $y$ explicitely between two functions $u(x,y)$ and $v(x,y)$ is that $\frac{\partial(u,v)}{\partial(x,y)}=0$.

***P.T.O.***

b) Solve the Pfaffian differential equation

$$x(y^2 - z^2)\,dx + y(z^2 - x^2)\,dy + z(x^2 - y^2)\,dz = 0$$

c) Show that the orthogonal trajectories on the hyperboloid $x^2 + y^2 - z^2 = 1$ of the conics in which it cut by the planes $x + y = c$ are its curves of intersection with the surface $(x - y)z = \text{k}$ where k is parameter.

***Q3)*** Attempt any two of the following: **[10]**

a) Explain Natani's method of solving Pfaffian differential equation P$dx$ + Q$dy$ + R$dz$ = 0.

b) Find the integral surface of the equation $(2xy - 1)p + (z - 2x^2)\,q = 2(x - yz)$ which passes through the line $x_0(s) = 1, y_0(s) = 0, z_0(s) = s.$

c) Find the general integral of $x(y - z)\,p + y(z - x)q = z(x - y)$.

***Q4)*** Attempt any one of the following: **[10]**

a) i) Explain Charpit's method for solving partial differential equation $f(x, y, z, p, q) = 0$.

ii) Solve by Jacobi's method. $z + 2u_z - (u_x + u_y)^2 = 0.$

b) i) Find a complete integral of the equation $zpq - p - q = 0.$

ii) Prove that a necessary and sufficient condition for the compatibility of $f(x, y, z, p, q) = 0$ and $g(x, y, z, p, q) = 0$ is

$$[f, g] = \frac{\partial(f, g)}{\partial(x, p)} + p\frac{\partial(f, g)}{\partial(z, p)} + \frac{\partial(f, g)}{\partial(y, q)} + q\frac{\partial(f, g)}{\partial(z, q)} = 0.$$

Total No. of Questions : 4]

SEAT No. :

**P604**

[Total No. of Pages : 3

# [5115]-406
# T.Y.B.Sc.
# MATHEMATICS
## MT - 346: Problem Course Based on MT - 344 and MT - 345
## (2013 Pattern) (Paper - VI) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Answer to the two sections should be written in separate answer books.***
4) ***Tie answer books of both sections together.***

## SECTION - I

(Ring Theory)

***Q1)*** a) Attempt any three of the following. **[6]**

i) Let R be a cummutative ring with unity of characteristic 4. Compute and simplify $(a + b)^4$ for all $a,b \in R$.

ii) Show that the polynomial $8x^3 + 6x^2 - 9x + 24$ is irreducible over Q.

iii) Show that the rings $\mathbb{R}$ and $\mathbb{C}$ are not isomorphic.

iv) Show that every field is a Euclidean domain.

b) Attempt any one of the following. **[4]**

i) Show that $\phi : \mathbb{C} \to M_2(\mathbb{R})$ given by $\phi(a+bi) = \begin{pmatrix} a & b \\ -b & a \end{pmatrix}$ for all $a,b \in \mathbb{R}$ is an isomorphism of $\mathbb{C}$ with the subring $\phi[\mathbb{C}]$.

ii) Show that the collection of all nilpotent elements in a commutative ring R is an ideal of R.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Show that a subset $\mathbb{Z}\times\{0\}$ of $\mathbb{Z}\times\mathbb{Z}$ is a prime ideal of $\mathbb{Z}\times\mathbb{Z}$ but it is not a maximal ideal of $\mathbb{Z}\times\mathbb{Z}$ .

b) Show that $\{a+xf(x)/a\in 2\mathbb{Z}, f(x)\in\mathbb{Z}[x]\}$ is an ideal in $\mathbb{Z}[x]$. Also show that $\mathbb{Z}[x]$ is not a PID.

c) Factor the Gaussian integer 4+3i into product of irreducibles in $\mathbb{Z}[i]$.

## SECTION - II

(Partial Differential Equations)

***Q3)*** a) Attempt any three of the following: **[6]**

i) Find the integral curves of $\frac{dx}{x}=\frac{dy}{y}=\frac{dz}{(x+y)z}$.

ii) Eliminating arbitrary constants a and b from $2z=(ax+y)^2+b$. Obtain the partial differential equations.

iii) Solve the differential equation $ydx+xdy+2zdz=0.$

iv) Find the general integral of $yzp+xzq=x+y$ .

b) Attempt any one of the following. **[4]**

i) Show that the differential equation $2xzdx+zdy-dz=0$ is integrable and find its primitive.

ii) Find the general integral of $z(xp-yq)=y^2-x^2.$

***Q4)*** Attempt any two of the following: **[10]**

a) Find a complete integral of the partial differential equation $x^2p^2 + y^2q^2 = 4$ by Charpit's method.

b) Solve the differential equation $xu_x + yu_y = u_z^2$ by Jacobi's method.

c) Show that the differential equations

$xp - yq = 0,\ z(xp + yq) = 2xy$ are compatible and find their solution.

x x x

Total No. of Questions : 4]

SEAT No. :

**P605**

[Total No. of Pages : 3

# [5115]-407
# T.Y. B.Sc.
# MATHEMATICS
## MT - 347(A) : Optimization Techniques
## (2013 Pattern) (Semester - IV) (Paper - VII)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any five of the following: **[10]**

a) Explain when the dummy activity is used in the construction of network.

b) State any two rules for construction of the project network.

c) Define an extreme point of a real valued function $f(x)$ of several variables. State the necessary condition for $x_0$ to be an extreme point of $f(x)$.

d) Define two person zero sum game and a fair game.

e) Write three types of replacement policies.

f) State any two assumptions of sequencing problem.

g) Explain the term saddle point.

***Q2)*** Attempt any two of the following: **[10]**

a) We have seven jobs each of which has to go through the Machines $M_1$ and $M_2$ in the order $M_1$-$M_2$. Processing time (in hours) are given as:

| Jobs: | $J_1$ | $J_2$ | $J_3$ | $J_4$ | $J_5$ | $J_6$ | $J_7$ |
|---|---|---|---|---|---|---|---|
| Machine $M_1$: | 3 | 12 | 15 | 6 | 10 | 11 | 9 |
| Machine $M_2$: | 8 | 10 | 10 | 6 | 12 | 1 | 3 |

Determine a sequence of these jobs that will minimize the total elapsed time.

Also find the idle time for Machine $M_2$.

***P.T.O.***

b) A Machine costs Rs. 60,000. Its running cost and resale values are given below:

| Year | : | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Running Cost (Rs.) | : | 10000 | 12000 | 14000 | 18000 | 23000 | 28000 |
| Resale value (Rs.) | : | 30000 | 15000 | 7500 | 3750 | 2000 | 2000 |

What is the optimum period of replacement?

c) Find the extreme points of the function

$f(x_1, x_2, x_3) = x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$.

***Q3)*** Attempt <u>any two</u> of the following: **[10]**

a) Solve the following game. The payoff is for Player A.

| | | B | | | |
|---|---|---|---|---|---|
| | | $B_1$ | $B_2$ | $B_3$ | $B_4$ |
| | $A_1$ | 25 | 27 | 35 | –2 |
| A | $A_2$ | 20 | 6 | 8 | 8 |
| | $A_3$ | 14 | 12 | 5 | 3 |

b) Solve the following game using the graphical method. The pay off is for Player A.

| | | B | |
|---|---|---|---|
| | | $B_1$ | $B_2$ |
| | $A_1$ | 1 | 2 |
| | $A_2$ | 5 | 4 |
| A | $A_3$ | –7 | 9 |
| | $A_4$ | –4 | –3 |
| | $A_5$ | 2 | 1 |

c) Construct the project network for the following project.

| Activity | : | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Predecessor(S) | : | - | A | A | C | C | C | D, E, F | G | H | H |

***Q4)*** Attempt any <u>one</u> of the following: **[10]**

a) The data for a PERT network is given in the following table.

| | Time Estimates | | |
|---|---|---|---|
| Activity | Optimistic | Most likely | Pessimistic |
| 1-2 | 5 | 8 | 10 |
| 1-3 | 18 | 20 | 22 |
| 1-4 | 26 | 33 | 40 |
| 2-5 | 16 | 18 | 20 |
| 2-6 | 15 | 20 | 25 |
| 3-6 | 6 | 9 | 12 |
| 4-7 | 7 | 10 | 12 |
| 5-7 | 7 | 8 | 9 |
| 6-7 | 3 | 4 | 5 |

i) Draw the project network.

ii) Determine the critical path and expected project completion time.

b) A project consists of 9 activities with following constraints.

A < D, A < E, B < F, D < F, C < G, C < H, F < I and G < I, where X < Y represents X is immediate predecessor of Y. The time in days for each activity is as follows:

| Activity: | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| Time: | 8 | 10 | 8 | 10 | 16 | 17 | 18 | 14 | 9 |

i) Draw the project network.

ii) Find the project completion time.

iii) Determine the total float and free float of each activity.

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Total No. of Questions : 4]

SEAT No. :

**P606**

[Total No. of Pages : 2

# [5115]-408
# T.Y. B.Sc.
# MATHEMATICS
## MT - 347(B) : Differential Geometry
## (New Course) (2013 Pattern) (Semester - IV) (Paper - VII)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any five of the following: **[10]**

a) Find the Cartesian equation of the curve $\gamma(t)=(e^t,t^2)$.

b) Show that the curve $\gamma(t)=\left(\frac{1+t^2}{t},t+1,\frac{1-t}{t}\right)$ is planar.

c) Define curvature of a curve in $\mathbb{R}^3$.

d) Show that $\gamma(t)=((1+2\cos t)\cos t,(1+2\cos t)\sin t)$ is not a simple closed curve.

e) State isoperimetric inequality.

f) Find the first fundamental form of the surface $\sigma(u,v)=(u,v,u^2+v^2)$.

g) Give an example of a conformal map that is not an isometry.

***Q2)*** Attempt any two of the following: **[10]**

a) Let $\gamma$ be a regular curve in $\mathbb{R}^3$ with nowhere Vanishing curvature. Prove that the image of $\gamma$ is contained in a plane if and only if torsion $\tau$ is zero at every point of the curve.

b) Find the torsion of the circular helix.

$\gamma(t)=(a\cos t,b\sin t,bt)$.

***P.T.O.***

c) If $\gamma(t)=(x(t), y(t))$ is a positively-oriented simple closed curve in $\mathbb{R}^2$ with period $a$, then show that $A(\text{int}(\gamma)) = \frac{1}{2}\int_0^a (x\dot{y} - y\dot{x})\,dt$. Also compute area of the interior of the ellipse $\gamma(t) = (a\cos t, b\sin t)$.

***Q3)*** Attempt any two of the following: **[10]**

a) Prove that the area of a surface patch is unchanged by reparametrisation.

b) Find the equation of the tangent plane of the surface patch $\sigma(r,\theta)=(r\cos h\theta, r\sin h\theta, r^2)$ at (1, 0, 1).

c) Determine the area of the part of the paraboloid $Z = x^2 + y^2$, $z \leq 1$.

***Q4)*** Attempt any one of the following: **[10]**

a) i) If $\gamma(t)=\sigma(u(t),v(t))$ is a unit-speed curve on a surface patch $\sigma$, then prove that its normal curvature is given $K_n = L\dot{U}^2 + 2M\dot{U}\dot{V} + N\dot{V}^2$, where $Ldu^2 + 2Mdudv + Ndv^2$ is the second fundamental form of $\sigma$.

ii) Show that the quadric $x^2 + 2y^2 + 6x - 4y + 3z = 7$ is a smooth surface with an atlas consisting of the single surface patch.

b) i) With usual notations, show that $\|\sigma_U \times \sigma_V\| = (EG - F^2)^{\frac{1}{2}}$.

ii) Show that translations and invertible linear transformations of $\mathbb{R}^3$ take smooth surfaces to smooth surfaces.

Total No. of Questions :4]

SEAT No. :

**P607**

[Total No. of Pages :2

# [5115] - 409
# T.Y.B.Sc.
# MATHEMATICS
# MT-347(C): C-Programming -II
# (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any Five of the following: **[10]**

a) Explain the meaning of the following declarations:

int n =5

int *p = &n;

b) Explain the use of keyword typedef.

c) Write a short note on getc( ) function.

d) Explain the use of EOF.

e) Explain the use of bitwise operator AND (&).

f) Write a macro ABS($x$) to find the absolute value of $x$.

g) Define a structure that contains two members; one floating point and another integer quantity, assume that there are 20 structure variables.

***Q2)*** Attempt any two of the following: **[10]**

a) Explain by giving an example the storage class static.

b) Write a short note on preprocessors in C.

c) Write a C program to implement bubble sort algorithm.

***P.T.O.***

***Q3)*** Attempt any two of the following: **[10]**

a) Write a short note on array of pointers.

b) Write a short note on dynamic memory allocation.

c) Write a C program to compute addition of two complex numbers using structures.

***Q4)*** Attempt any one of the following: **[10]**

a) i) Write a short note on fscanf( ).

ii) Write a C program to check whether a point ($x$, $y$, $z$) lies on the plane $2x+3y+4z+7=0$. Define a structure for point, accept 5 points from user.

b) i) Write a short note on pointers.

ii) Write a C program to copy a file to another file and display the contents of the copied file.

*EEE*

Total No. of Questions :4]

SEAT No. :

**P608**

[Total No. of Pages :3

# [5115] - 410
# T.Y.B.Sc.
# MATHEMATICS
## MT-347(D): Graph Theory
## (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

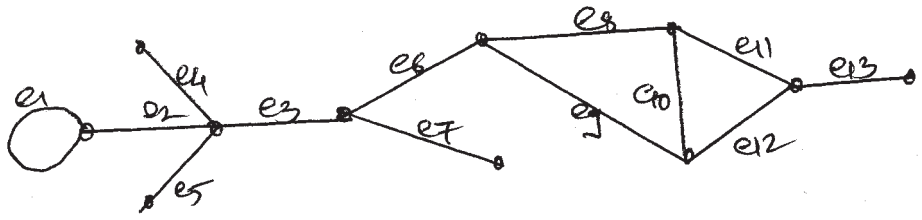
1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any five of the following: **[10]**

a) Draw all non-isomorphic complete bipartite graphs with atmost 4 vertices.

b) Give an example of a graph in which the length of longest cycle is 9 and the length of shortest cycle is 4.

c) Find all bridges in the following graph.




d) Let T be a tree with atleast $k$ edges $k \geq 2$. How many connected components are there in a subgraph of T obtained by deleting $k$ edges of T?

e) For which values of m, n does the complete bipartite graph $K_{m,n}$ is Eulerian as well as Hamiltonian.

f) Prove that the wheel $W_n$ is Hamiltonian for every $n \geq 4$.

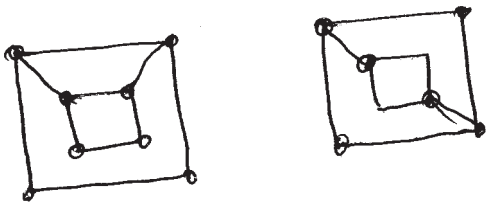
g) Give an example of 2 regular digraph with five vertices.

***P.T.O.***

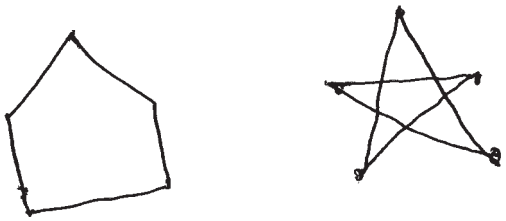
***Q2)*** Attempt any <u>two</u> of the following: **[10]**

a) Given any two vertices *u* and *v* of a graph G, prove that every *u-v* walk contains a *u-v* path.

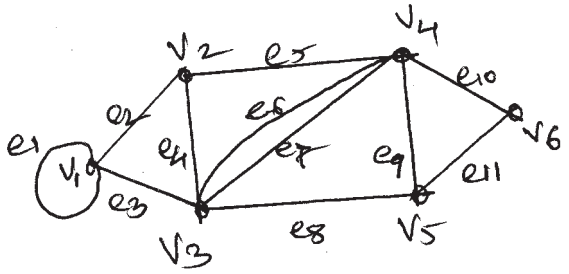
b) Show that following graphs are non-isomorphic.



Further show that following graphs are isomorphic.



c) Write down the adjacency matrix and the incidence matrix for the following graph.

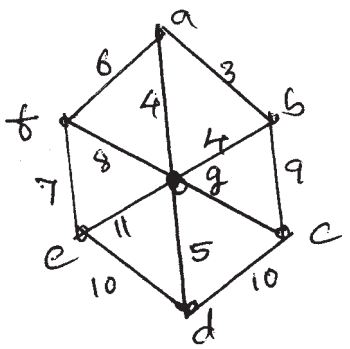



***Q3)*** Attempt any <u>two</u> of the following: **[10]**

a) Let T be a tree with atleast two vertices and let P = $u_0$ $u_1$ $u_2$ ----$u_n$ be a longest path in T. Prove that both $u_0$ and $u_n$ have degree 1.

b) Draw all spanning trees for a complete graph $K_4$ on 4 vertices. How many non isomorphic spanning trees are there?

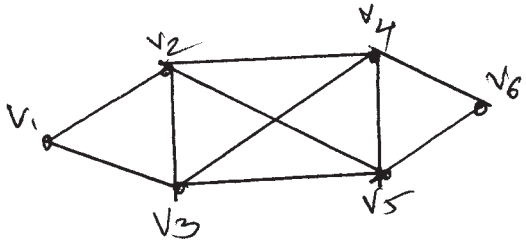
c) Find a minimal spanning tree for the following connected weighted graph using Kruskal's algorithm. Find also weight of the spanning tree.



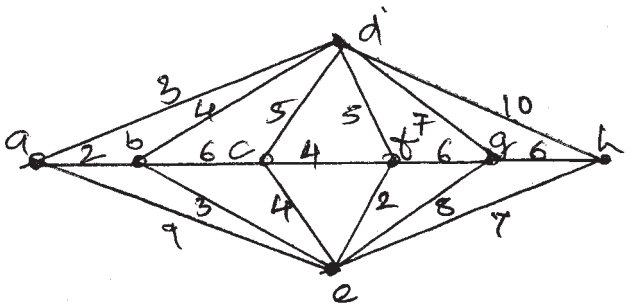

***Q4)*** Attempt any one of the following: **[10]**

a) i) Prove that a connected graph G is Euler if and only if degree of every vertex is even.

ii) Using the Hoperoft and Tarjan algorithm, find a strongly connected orientation for the following graph.




b) i) Solve the Chinese postman problem for the following graph.




ii) Prove that a simple graph G is Hamiltonian if and only if its closure C(G) is Hamiltonian.

EEE

Total No. of Questions :4]

SEAT No. :

**P609**

[Total No. of Pages :3

# [5115] - 411

## T.Y.B.Sc.

## MATHEMATICS

## MT-347(E): Lebesgue Integration (Paper - VII)

## (2013 Pattern) (New Course) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any five of the following: **[10]**

a) Let F be a closed subset of [*a*, *b*] and G be an open subset of [*a*, *b*] such that F $\subset$ G. Define | F | that is length of F. Show that this definition of | F | does not depend on which open set G is used.

b) Using the definition of a measurable function show that if $f(x) = 5\ (0 \le x \le 1)$ then *f* is measurable function on [0, 1].

c) If $E \subseteq [a,b]$ then prove that $\underline{m}\, E \le \bar{m}\, E$.

d) If $E_1$ and $E_2$ are measurable subsets of [0, 1] and if m $E_1$ =1, prove that $m(E_1 \cap E_2) = mE_2$.

e) Let *f* be a bounded function on [*a*, *b*]. Define Lebesgue upper integral and Lebesgue lower integral of *f* over [*a*, *b*].

f) Prove that every function f in R[*a*, *b*] is measurable.

g) Find $f^+, f^-$ if $f(x) = x^2 - 1\ \ (-2 \le x \le 2)$.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Prove that the subset E of $[a, b]$ is measurable if and only if given $\in > 0$ there exists open sets $G_1$ and $G_2$ such that $E \subset G_1, E' \subset G_2$ and $|G_1 \cap G_2| < \in$.

b) If $f$ and $g$ are measurable functions on $[a, b]$, then prove that $f + g$ is measurable.

c) If $E \subset [a,b]$ if $x \in E'$, and if $E \cup \{x\}$ is measurable, prove that E is measurable.

***Q3)*** Attempt any two of the following: **[10]**

a) If $E_1, E_2$, ..... are any subsets of $[a, b]$ then prove that

$$\bar{m}\left(\bigcup_{n=1}^{\infty} E_n\right) \leq \sum_{n=1}^{\infty} \bar{m}E_n .$$

b) If E is a measurable subset of $[a, b]$ and if $f$ is bounded function in $L[a, b]$ such that $f(x) \geq 0$ almost everywhere for $x \in E$ then prove that $\int_E f \geq 0$.

c) If $g \in L[a,b]$ if $f$ is a measurable function on $[a, b]$ such that $|f(x)| \leq |g(x)| \forall x \in [a,b]$, prove that $f \in L[a,b]$.

***Q4)*** Attempt any one of the following: **[10]**

a) i) Let $f \in L[a,b]$. Prove that given $\in > 0$ there exists s > 0 such that $\left|\int_E f\right| < \in$ whenever E is a measurable subset of $[a, b]$ with $m$E < $\delta$.

ii) Let $f(x) = \frac{1}{x^P} \quad 0 < x \leq 1$

$= 0 \quad x = 0$

Prove that $f \in L[0,1]$ if P < 1 and that $\int_0^1 f = \frac{1}{1-P}$.

b) i) If $f \in L[-\pi, \pi]$ and if $f(u + 2\pi) = f(u) \ \ (-\infty < u < \infty)$ show that for any real $x$, $\int_{-\pi+x}^{\pi+x} f(u)du = \int_{-\pi}^{\pi} f(u)du$.

ii) Find the Fourier series for $f(x) = x \ (-\pi \leq x \leq \pi)$.

$\mathcal{EEE}$

Total No. of Questions :4]

SEAT No. :

**P610**

[Total No. of Pages :3

# [5115] - 412

## T.Y.B.Sc.

## MATHEMATICS

## MT-347(F): Computational Geometry

## (2013 Pattern) (Semester - IV) (Elective)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator is allowed.***

***Q1)*** Attempt any five of the following: **[10]**

a) Find the angle through which the line $y = -x$ is rotated so that it is coincide with x-axis.

b) Write the transformation matrix to shear in Z-coordinate proportional to X-coordinate by a factor 2 and proportional to Y-coordinate by a factor 3.

c) Write the transformation matrix for a Cavalier projection, if the horizontal angle $\alpha = 30^{o}$.

d) What is parametric equation of ellipse

$$\frac{(x-1)^2}{4} + \frac{(y+2)^2}{9} = 1.$$

e) Write any two properties of Bezier curve.

f) Define dimetric projection. Find the angle $\theta$ of rotation about x-axis of $f_z = \frac{1}{2}$.

g) What is the effect of the Transformation matrix $\begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix}$ on a two dimensional point object.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Obtain the concatenated matrix for rotation about the point (–1, 2) by an angle $\pi^C$. Apply it on the ΔABC where A = (1, 1), B = (4, 1), C =(2, 4).

b) Obtain the concatened matrix for the following sequence of transformation in order.

i) Translation in X, Y, Z direction by –1, 2, 1 units respectively.

ii) Rotation about Z-axis by $90^o$.

iii) Reflection through Z= 0 plane.

c) Consider the triangle with vertices A(2, 2, –1), B(1, –1,4) and C(3, –1, 2). Find the perspective projection of ΔABC onto Z = 0 plane with center of projection at $Z_C = 20$ on Z-axis.

***Q3)*** Attempt any two of the following: **[10]**

a) Derive iterative formula to generate uniformly spaced n points on the circumference of a circle with center of origin and radius r.

b) If an object whose position vector matrix is [*x*] is reflected through the plane Z=3 then find the transformed object, where $[x] = \begin{bmatrix} 2 & 2 & 4 \\ 4 & -5 & 1 \end{bmatrix}$.

c) Suppose a 2×2 transformation matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ transform the line segment AB to the segment A*B*.

If slope of line AB is *m* then prove that slope of transformed line A*B* is $m^* = \dfrac{b + dm}{a + cm}$.

***Q4)*** Attempt any one of the following: **[10]**

a) i) Consider the Be'zier curve determined by the control points $B_0[4, 3]$, $B_1[0, 1]$, $B_2[2, -1]$. Find the first and second derivatives of the curve at t=0.3.

ii) Find the Cavalier and cabinet projections of the line segment joining A(1, 0, 1) and B(0, 1, 1) with a horizontal inclination angle $\alpha = 30^o$.

b) Generate uniformly spaced three points on the hyperbolic segment in the first quadrant for $4 \le x \le 8$ where equation of the hyperbola is $\frac{x^2}{4} - \frac{y^2}{16} = 1$.

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Total No. of Questions : 4]

SEAT No. :

P611

[Total No. of Pages : 2

# [5115]-413
# T.Y.B.Sc.
# PHYSICS
## PH-341 : Classical Electrodynamics
## (2013 Pattern) (Semester - IV) (Paper-I)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log table and calculator is allowed.***

***Q1)*** Attempt all of the following (One Mark each) : **[10]**

a) What do you mean by conservative field?

b) Write Laplace's equation in cartesian co-ordinate system.

c) Define the term an electrical image.

d) Write differential form of Gauss's law in dielectrics.

e) Define volume polarisation charge density. Give its S.I. unit.

f) Write the relation between $\vec{B}$, $\vec{H}$ and $\vec{M}$.

g) Define magnetic permeability.

h) What do you mean by remanence of the specimen?

i) State Lenz's law in electromagnetic induction.

j) Write microscopic equivalent of Ohm's law.

***Q2)*** Attempt Any Two of the following:

a) Define potential energy of a system of charges and obtain an expression for the potential energy of a system of charges. **[5]**

b) Obtain the relation between $\vec{D}$, $\vec{E}$ and $\vec{P}$ and hence explain the physical significance of three vectors. **[5]**

c) State Ampere's circuital law and show that $\vec{\nabla} \times \vec{B} = \mu 0 \vec{J}$. **[5]**

***P.T.O.***

***Q3)*** Attempt Any Two of the following:

a) Point charges +q and –2q are kept near an infinite grounded conducting plane at a perpendicular distance '2d' and 'd' respectively from it. Find the total force on the charge +q. **[5]**

b) A long conductor of length 20m lies along z direction with a current of 2 ampere in the $\hat{a}_z$ direction. Find the direction and magnitude of force on the conductor, if magnetic induction applied along x-axis is $\vec{B} = 0.05\,\hat{a}_x$ tesla. **[5]**

c) Find the magnetic field associated with $\overline{E} = E_0 \cos \beta_x \cos\omega t\ \hat{a}_z$. **[5]**

***Q4)*** a) Attempt any one of the following.

i) What is Poynting vector? State and explain Poynting theorem. **[8]**

ii) Give integral and differential form of Maxwell's equations and explain their physical significance. Write Maxwell's equations (differential form) for free space. **[8]**

b) Attempt any one of the follwoing.

i) State and explain Biot-Savart's law. **[2]**

ii) Define current density and write the equation of continuity for steady state. **[2]**

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

**P612**

[Total No. of Pages : 2

# [5115]-414
# T.Y.B.Sc.
# PHYSICS
## PH-342 : Quantum Mechanics
## (2013 Pattern) (Semester - IV) (Paper-II)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams whenever necessary.***
4) ***Use of calculator and log table is allowed.***

***Q1)*** Attempt all of the following (one Mark each) : **[10]**

a) Define group velocity.
b) State angular momentum-angular displacement uncertainty relation.
c) State normalization condition for $\psi$ (x,t).
d) What is rigid rotator?
e) Define eigen value and eigen function.
f) What is correspondence principle?
g) Define ladder operator.
h) Draw the energy spectrum of one-dimensional oscillator.
i) Define commutator.
j) State Ehrenfest first theorem.

***Q2)*** Attempt Any Two of the following (5 marks each): **[10]**

a) Find the expectation value of momentum for a particle having wave function, $\psi(x,t) = A\, e^{-x^2/2a+ikx}$. The range of x is from $-\infty$ to $+\infty$.

b) An electron of energy 200eV is passed through a circular hole of radius equal to $2 \times 10^{-4}$cm. What is the uncertainty introduced in the angle of emergence?

Given: Mass of electron, $m=0.9\times10^{-27}$gm, $\hbar = 10^{-27}$ erg-sec.

c) The moment of inertia of CO molecule is $1.46\times10^{-46}$kg m$^2$.Calculate the lowest rotational energy and angular velocity in the lowest level of CO molecule.

Given : $\hbar = 1.055\times10^{-34}$ J-sec.

***P.T.O.***

***Q3)*** Attempt Any Two of the following: (5 marks each) **[10]**

a) State and prove Ehrenfest second theorem.

b) Show that the time dependance of the expectation value of a dynamical variable can be expressed as, $\frac{d<A>}{dt} = <\frac{\partial A}{\partial t}> + \frac{i}{\hbar}<[H,A]>$.

c) Using the ground state wave function :

$\psi_o(x) = \left(\frac{\alpha}{\sqrt{\pi}}\right)^{1/2} e^{-\alpha^2 x^2/2}$ of the simple harmonic oscillator, find $<x^2>$ and $<P_x>$.

***Q4)*** a) Attempt any One of the following: **[8]**

i) Obtain Schrödinger's time independent equation from time dependent equation.

ii) Using the Schrödinger's steady state equation, obtain the energy eigen values of a particle enclosed in a three dimensional rigid box. What are degenerate states?

b) Attempt any one of the following: **[2]**

i) Prove that [A, B C] = [A, B] C+B [A,C].

ii) Draw diagram for potential barrier and define it mathematically.

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

**P613**

[Total No. of Pages : 2

# [5115]-415
# T.Y.B.Sc.
# PHYSICS
## PH-343 : Thermodynamics and Statistical Physics
## (2013 Pattern) (Semester - IV) (Paper-III)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log-tables and calculator is allowed.***

***Q1)*** Attempt all of the following. **[1 each]**

a) Define 'mean free path' of the molecules of a gas.

b) State the postulate of equal a priori probabilities.

c) What are symmetric wave function?

d) Define phase space.

e) Define grand canonical ensemble.

f) What are fermions?

g) State the dependance of coefficient of thermal conductivity on temperature.

h) What do you mean by inaccessible macrostate?

i) What is thermodynamic probability?

j) If p=q = 1/2 and total number of possibilities are N =200, find mean value of $n_1$ i.e. $\overline{n_1}$.

***Q2)*** Attempt Any Two of the following. **[10]**

a) Derive an expression for the coefficient of viscosity ($\eta$) of gas in terms of mean free path of molecules. Show that it is independent of pressure but depends upon the temperature of the gas.

b) Obtain mean square deviation $\left(\overline{\Delta n_1}\right)^2$ in case of Random walk problem.

c) Distinguish between M.B. and F.D. Statistics.

***P.T.O.***

***Q3)*** Attempt Any Two of the following: **[10]**

a) Find the mean free path, frequency of collisions and the molecular diameter of nitrogen from the following data.

Coefficient of viscosity ($\eta$) = $1.69 \times 10^{-7}$ $Nsm^{-2}$

R.M.S. velocity of molecule (c) = $4.5 \times 10^{2}$ m/s.

Density of nitrogen ($\rho$) = 1.25 $kg/m^3$.

Number of molecules per $m^3$ (n) = $2.7 \times 10^{25}$.

b) Two states with energy difference $5.52 \times 10^{-14}$ erg occur with relative probability $e^2$ erg $deg^{-1}$. calculate the temperature. Given $K = 1.38 \times 10^{-16}$erg $deg^{-1}$.

c) Prove the relations.

i) $F = U + T\left(\frac{\partial f}{\partial T}\right)_V$

ii) $G = H + T\left(\frac{\partial G}{\partial T}\right)_P$

***Q4)*** A) Attempt any ONE of the following. **[8]**

a) Show that Joule-Thompson coefficient

$$\mu = \frac{1}{C_P}\left[T\left(\frac{\partial V}{\partial T}\right)_P - V\right]$$

Where symbols have their usual meanings.

b) Derive Gaussian probability distribution in the form

$$P(x)\,dx = \frac{1}{\sqrt{2\pi}\,\sigma}\, e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

B) Attempt any one of the following. **[2]**

a) When we throw a die three times and obtain three numbers. What is the probability that these numbers are 6,4 and 2 precisely in that order?

b) An ideal gas absorbs 2000 kcal of heat and does an amount of work of 16800J during its expansion. What is the increase in its internal energy?

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

**P614**

[Total No. of Pages : 2

# [5115]-416
# T.Y.B.Sc.
# PHYSICS
## PH-344 : Nuclear Physics
## (2013 Pattern) (Semester - IV) (Paper-IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of Calculator and Log-table is allowed.***

***Q1)*** Attempt all of the following (one mark each). **[10]**

a) Define odd and even parity of nucleus.

b) What are isotopes? Give one example.

c) Define packing fraction of nucleus.

d) Calculate mean life of radioactive nucleus whose half life is 10 minutes.

e) What are Hadrons? Give one example.

f) Define dead time of G.M. counter.

g) Define endothermic nuclear reaction.

h) What is nuclear fissicn?

i) What is use of moderator in nuclear reactor.

j) Define activity of radioactive substance.

***Q2)*** Attempt Any Two of the following: **[10]**

a) Explain the structure of proton and neutron on the basis of quark model.

b) What is threshold energy of nuclear reaction? Obtain an expression for it.

c) Discuss the construction and working of cyclotron accelerator with neat diagram.

***Q3)*** Attempt Any Two of the following: **[10]**

a) The half life of $^{60}Co$ radioactive isotope is 5.27 years and has activity of 1 curie. Calculate the mass of this radioactive isotope in gram.

***P.T.O.***

b) Binding energy per nucleon of $^{64}_{29}Cu$ nucleus is 8.73 MeV per nucleon. Masses of proton and neutron are 1.007825 amu and 1.008665 amu respectively. Calculate the mass of copper $^{64}$Cu nucleus in amu.

c) Two protons and two neutrons combine to form the helium nucleus through the fusion nuclear reaction:

$2^1_1H + 2\,^1_0n \rightarrow ^4_2He$

Masses of proton and neutron are $1.673\times10^{-27}$kg and $1.675\times10^{-27}$kg respectively. The mass of Helium nucleus is $6.650\times10^{-27}$kg. Calculate the energy liberated in MeV unit.
[Given: $1eV=1.6\times10^{-19}J$, $C=3\times10^8$m/s]

***Q4)*** A) Attempt any ONE of the following: **[8]**

a) State Law of disintegration and obtain an expression: $N=N_0\ e^{-\lambda t}$
What is half life? Obtain an expression for it.

b) Explain different conservation laws in nuclear reactions. What is Q-value of nuclear reaction? Obtain Q-value equation.
as: $Q=[(M_1+M_2)-(M_3+M_4)]xC^2$.

B) Attempt any one of the following. **[2]**

a) State any four features of nuclear forces.

b) Define effective multiplication factor K of nuclear reactor and give its significance.

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No :

**P615**

[Total No. of Pages : 4

# [5115] - 417
# T.Y.B.Sc.
# PHYSICS
## PH-345(A) : Electronics
## (2013 Pattern) (Paper - V) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log-table and calculator is allowed.***

***Q1)*** Attempt all of the following(one mark each). **[10]**

a) What is varactor diode?

b) Draw the symbol of N-channel JFET.

c) Define duty cycle and conduction angle.

d) What is trip point?

e) State the special features of IC-78XX.

f) State the applications of LEDs.

g) State the types of multivibrators.

h) What is a comparator?

i) What is Karnaugh map?

j) Calculate resonant frequency of a tank circuit having capacitor of 470 pf and inductor of 2$\mu$H.

***Q2)*** Attempt any <u>two</u>:

a) Explain instrumentation amplifier with three op-amps, giving necessary equations and block diagram. **[5]**

b) Explain negative voltage regulator using IC-79XX. **[5]**

c) Discuss the construction and working of N-channel JFET. **[5]**

***P.T.O.***

***Q3)*** Attempt any <u>two</u>:

a) Find the value of capacitor for monostable multivibrator.
Given : Pulse width (t) = 1.1ms and **[5]**

$$R_A = 1k\Omega$$

b) Design and construct full adder using K-map. **[5]**

c) What is counter? Draw neat diagram of 4-bit synchronous counter. **[5]**

***Q4)*** a) Attempt any <u>one</u>:

i) With suitable circuit diagram, explain the working of class-B amplifier. **[8]**

ii) What is register? State the types of registers. Draw a circuit diagram of 4-bit SISO shift register. Explain its working. **[8]**

b) Attempt any <u>one</u>:

i) What are the advantages and disadvantages of class-A amplifier? **[2]**

ii) Draw the K-map for standard expression **[2]**

$$Y = \overline{A}\,\overline{B}C + \overline{A}B\overline{C} + AB\overline{C} + ABC$$

✓ ✓ ✓

**Total No. of Questions : 4]**

**P615**

# [5115] - 417
# T.Y.B.Sc.
# PHYSICS
## PH - 345 (B) : Advanced Electronics
## (2013 Pattern) (Paper - V) (Semester - IV)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log tables and calculator is allowed.***

***Q1)*** Attempt all of the following (one mark each) **[10]**

a) Define Sensor.

b) State peltier effect in thermocouple.

c) Define pyrometry.

d) What is photovoltaic effect?

e) State working principle of bimetal strip.

f) State the objectives of control system.

g) What do you mean by process control.

h) State the types of motion.

i) State the types of filter circuits.

j) What is turbidity?

***Q2)*** Attempt any <u>two</u>:

a) What is data acquisition system? Explain with suitable diagram. **[5]**

b) State different types of accelerometers and explain any one in detail. **[5]**

c) Discuss various elements involved in process control system. **[5]**

***Q3)*** Attempt any two.

a) Give the classification of filters. Explain the RC filter. **[5]**

b) Explain the construction of photoconductive cell and explain its working. **[5]**

c) What is multiplexer? Explain 4 : 1 line multiplexer in brief. **[5]**

***Q4)*** a) Attempt any one.

i) Explain the principle, construction and working of a broad band (total radiation) pyrometer. **[8]**

ii) Explain in detail the linearization technique used for non linear output of a sensor in signal conditioning. **[8]**

b) Attempt any one:

i) State the balancing condition for simple dc Wheatstone bridge. **[2]**

ii) Find the binary equivalent of number $(47)_{10}$. **[2]**

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

**P616**

[Total No. of Pages : 12

# [5115]-418
# T.Y.B.Sc.
# PHYSICS
## PH - 346 (G) : Medical Electronics
## (2013 Pattern) (Semester - IV) (New)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams must be draw if necessary.***

***Q1)*** Attempt all of the following: **[10]**

a) What do you mean by EEG?

b) What is sensor?

c) What is patient safety?

d) State applications of calorimeter.

e) State various disadvantages of direct arterial pressure.

f) State the Nernst equation for bio-potential.

g) State principle of resistive sensor.

h) What is function of cardiac monitor?

i) State disadvantages of flame photometer.

j) How to measure cardiac output?

***Q2)*** Attempt any two of the following: **[10]**

a) What is sensor? Describe resistive sensor used for biomedical applications. Also give its advantages.

b) Describe different types of spectrophotometers in brief.

c) Describe in detail isolation amplifier with circuit diagram.

***P.T.O.***

***Q3)*** Attempt any <u>two</u> of the following: **[10]**

a) Explain clinical photo flame photometer. Also give its applications.

b) Write a short note on piezoelectric sensor.

c) Explain differential amplifier with circuit diagram used for interference bioelectric signals.

***Q4)*** a) Attempt any <u>one</u>: **[8]**

i) Describe in detail Basic Medical Instrumentation system.

ii) Give the difference between direct and indirect measurement of blood pressure.

b) Attempt any <u>one</u>: **[2]**

i) Heart rate of a person is 90 beats/min and his cardiac output is 5,400mL/min. How much is the stroke volume?

ii) What is basic principle of resistive sensor?

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**Total No. of Questions : 4]**

**P616**

# [5115]-418
# T.Y.B.Sc.
# PHYSICS
## PH - 346 (H) : Physics of Nanomaterials
## (2013 Pattern) (Semester - IV) (New) (Elective)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat and labelled diagrams if necessary.***

***Q1)*** Attempt all (one mark each): **[10]**

a) Define nanotechnology.

b) Write down challenges that are faced by researchers in nanotechnology?

c) What is top down approach?

d) List applications of physical vapour deposition.

e) Which detectors are used in UV-VIS-NIR spectrometer?

f) Which are types of electron microscopy?

g) What is nanomagnetism?

h) What is excitation?

i) Enlist the various structure of nanotubes.

j) Define Quantum Dots.

***Q2)*** Attempt any two: **[10]**

a) Classify nanomaterials according to their dimensions.

b) What are carbon nanotubes? Explain properties of nanotubes.

c) Explain the nanoelectronics.

***Q3)*** Attempt any <u>two</u>: **[10]**

a) Describe in detail synthesis of nano-material by high energy ball milling.

b) What are carbon-nanotubes? Explain types of carbon nanotubes.

c) Describe in detail synthesis of nano-materials by sol-gel method.

***Q4)*** a) Attempt any <u>one</u>: **[8]**

i) Draw block diagram of spectrophotometer and explain each block.

ii) State Hund's Rule and Explain types of magnetic materials.

b) Attempt any <u>one</u>: **[2]**

i) Give medical applications of nanomaterials.

ii) Define nanoscience.

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**Total No. of Questions : 4]**

**P616**

# [5115]-418
# T.Y.B.Sc.
# PHYSICS
## PH - 346 (I) : Microcontrollers
## (2013 Pattern) (Semester - IV) (Paper - VI)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log-table and calculator is allowed.***

***Q1)*** Attempt all of the following: **[10]**

a) How does the 8051 represents the number (–7)?

b) Enlist the flags used in 8051.

c) What is use of TMOD register?

d) State two registers used in LCD module.

e) What is the size of on-chip ROM in 8051?

f) Give ASCII codes for 'I' one and 'B'.

g) Draw pin configuration of LM 35.

h) Compare Full duplex with half duplex serial data transfer.

i) What is the function of the bits PSW4?

j) What is the function of SBUF register?

***Q2)*** Attempt any two of the following: **[10]**

a) Explain Interrupt priority in 8051.

b) Draw interfacing diagram for 4×4 keyboard of 8051 and explain in brief.

c) Explain timer section in 8051 in brief.

***Q3)*** Attempt any <u>two</u> of the following: **[10]**

a) Write an assembly language program for finding the second compliment of given number.

b) Write an assembly language program to add first 100 natural numbers.

c) Write an assembly language program to convert BCD number to ASCII.

***Q4)*** a) Attempt any <u>one</u> of the following: **[8]**

i) Explain 8051 logic instructions AND, OR, XOR, complement and compare with one example of each.

ii) Explain the working of stack with the help of PUSH and POP operations.

b) Attempt any <u>one</u> of the following: **[2]**

i) What are assembler directives?

ii) Compare LJMP and SJMP.

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**Total No. of Questions : 4]**

**P616**

# [5115]-418
# T.Y.B.Sc.
# PHYSICS
## PH - 346 (J) : Electro Acoustics and Entertainment Electronics
## (2013 Pattern) (Semester - IV) (Paper - VI) (Elective - II)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logtable and calculator is allowed.***

***Q1)*** Attempt all of the following (one mark each): **[10]**

a) Draw equivalent circuit for a direct radiator loudspeaker.

b) Give two advantages of folded horns.

c) What is coefficient of reflection?

d) What is an equalizer?

e) Explain loudness of sound.

f) What is volume expander?

g) What is an articulation test?

h) Give the frequency theory of hearing.

i) What is the significance of cut-off frequency in case of an exponential horn?

j) What is meant by directivity index of a microphone?

***Q2)*** Attempt any <u>two</u>:

a) Write a note on Digital Audio Tape. **[5]**

b) Give strengths of medical ultrasonography. **[5]**

c) Compare polar response characteristics of cardioid and bidirectional microphones. **[5]**

***Q3)*** Attempt any two:

a) Find the reverberation time of an office which has a volume of $1600m^3$ and a total sound absorption of 100 metric sabines. What sound absorption will be required for an optimum reverberation time of 1.2 sec? **[5]**

b) A condensor microphone diaphragm of radius 0.01m is stretched to a tension of $2\times10^4$N/m. If the spacing between the diaphragm and the backing plate is $4\times10^{-5}$m, determine the open circuit voltage response for a polarizing voltage of 250V. **[5]**

c) On a 'level detector type' reverberation time measuring instrument, the upper and lower levels are 2.1 volts and 1.1 volts respectively. If the time elapsed between the two levels is 0.11 sec, determine the reverberation time. **[5]**

***Q4)*** a) Attempt any one:

i) Discuss the effect of voice-coil parameters on the acoustic output of direct radiator loudspeakers. **[8]**

ii) Explain working of monophonic magnetic tape recording and reproducing system using a block diagram. **[8]**

b) Attempt any one:

i) Distinguish between frame and sector of a digital audio CD. **[2]**

ii) Write a note on audio delay. **[2]**

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**Total No. of Questions : 4]**

**P616**

# [5115]-418
# T.Y.B.Sc.
# PHYSICS
# PH - 346 (K) : LASERS
## (2013 Pattern) (Semester - IV) (Paper - VI) (New) (Elective - II)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculator and logtable is allowed.***

***Q1)*** Attempt ALL of the following (one mark each): **[10]**

a) Define population density.

b) What is laser light?

c) Define active medium in lasers.

d) What is pumping?

e) Define round trip gain.

f) What is hologram?

g) What is optical feedback?

h) Write two applications of solid state lasers.

i) Which active medium used in tunable dye lasers.

j) What is range finder?

***Q2)*** Attempt any TWO of the following:

a) Explain characteristics of lasers. **[5]**

b) Distinguish between ordinary light and laser light. **[5]**

c) What is line broadening? Explain doppler broadening. **[5]**

***Q3)*** Attempt any TWO of the following:

a) Fluorescent tube light emit visible light of wavelengths in the range of 4000A° to 7000A° with average wavelength of 5500A° calculate coherence length and time. **[5]**

b) Find the ratio of population of two states in a He-Ne laser, that produces light of wavelength 6328A° at 27°C. **[5]**

c) Calculate length of cavity and optical path for He-Ne laser tube which achieves the condition for amplification having wavelength 6328A° and refractive index of active medium between two neighboring reflectors is 1.56. **[5]**

***Q4)*** a) Attempt any ONE of the following:

i) Explain various applications of lasers in mechanical industries. **[8]**

ii) Describe construction and working of He-Ne laser. **[8]**

b) Attempt any ONE of the following:

i) Define energy levels. **[2]**

ii) Draw the block diagram for optical resonator. **[2]**

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**Total No. of Questions : 4]**

**P616**

# [5115]-418
# T.Y.B.Sc.
# PHYSICS
## PH - 346 (L) : Radiation Physics
## (2013 Pattern) (Semester - IV) (Paper - VI)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of calculators and log-table is allowed.***

***Q1)*** Attempt all of the following (one mark each): **[10]**

a) Define radiation dose in rem.

b) Define one Gray radiation dose.

c) State law of radioactivity

d) Define linear attenuation coefficient of gamma radiation.

e) What is the use of dosimeter?

f) Define 1 curie activity of radioactive substance.

g) What is RBE?

h) What are cosmic radiations.

i) Give any two properties of X-rays.

j) What are gamma radiations?

***Q2)*** Attempt any two: **[10]**

a) Discuss the applications of X-rays in medical field.

b) Explain the working of scintillation radiation detector with neat diagram.

c) Explain radiation shielding materials.

***Q3)*** Attempt any two: **[10]**

a) 2 MeV gamma radiations from the radioactive source passes through the aluminium absorber of thickness 3cm. The intensity of radiation beam decreases to 2% after passing through aluminium. Calculate the linear attenuation coefficient.

b) Find the minimum wavelength of X-ray present in X-ray machine whose accelerating voltage is 100kV. [Given: $h=6.64\times10^{-34}$Js, $c=3\times10^{8}$m/s, $e=1.6\times10^{-19}$C]

c) Explain different laboratory sources of infrared, and ultra-violet radiations with energy spectrum.

***Q4)*** a) Attempt any one: **[8]**

i) Explain the working principles of Fricke dosimeter, Film badge dosimeter and thermoluminescent dosimeter. Draw neat diagrams.

ii) Discuss the different methods for measurement of electron and ion beam current.

b) Attempt any one: **[2]**

i) Explain any two neutron sources based on radioactive sources.

ii) Write short note on microwaves and radiowaves.

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Total No. of Questions : 4]

SEAT No. :

P617

[Total No. of Pages : 2

# [5115]-419
# T.Y.B.Sc.
# CHEMISTRY
## CH - 341: Physical Chemistry
## (2013 Pattern) (Paper - I) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator and logarithmic table is allowed.***
5) ***Actual calculations must be shown while solving the problems.***

***Q1)*** Answer the following: **[10]**

a) Define the term 'unit cell'.

b) What is meant by wave - particle duality?

c) What do you mean by average binding energy.

d) State the law of constancy of interfacial angles.

e) $^{27}_{13}Al + {}^{1}_{0}n \longrightarrow {}^{24}_{11}Na +$ ---------

f) Give any two characteristics of a standard cell.

g) Write the oxidation reaction at 25°C, for the following electrode $Pt \mid Hg \mid Hg_2Cl_{2(s)}, Cl^-$.

h) The Miller indices of a plane in a crystal are (210). What are the Weiss indices of the plane?

i) What is amalgam electrode?

j) Define the term 'Isotone'.

***Q2)*** a) Answer any two of the following: **[6]**

i) State and explain Heisenberg's uncertainty principle with suitable example.

ii) Give the classification of electrochemical cells.

iii) Discuss the Lave Method for determination of crystal structure.

***P.T.O.***

b) Solve any one of the following: **[4]**

i) Find pH of unknown solution at 25ºC.

Pt | Hg, $Hg_2Cl_{2(s)}$| sat. KCl | unknown pH solution| $H_2Q_1Q$|Pt

Given:

$E_{cal\ (oxi)} = -0.2415$ V

$E_{quinhydrone\ (red)} = 0.699$ V

$E_{cell} = 0.283$ V

ii) A wooden idol recovered in an excavation was found to contain 25.6% as much $^{14}C$ as ordinary wood to date has. What is the approximate age of the wooden idol?

Half life period of $^{14}C$ = 5760 years.

***Q3)*** Attempt any two of the following: **[10]**

a) What is element of symmetry? Explain plane of symmetry, axis of symmetry and centre of symmetry with suitable diagrams.

b) Describe Weston standard cell with respect to its diagram, construction and working.

c) Explain the terms decay constant and half life period. Derive the expression for the decay of radioactive element.

***Q4)*** a) i) What is de - Broglie hypothesis? Derive the expression for de - Broglie wavelength in terms of kinetic energy. **[3]**

ii) State and explain the conditions for well - behaved function. **[3]**

OR

What are chemical cells? Derive the expression for emf of a chemical cell without transference with suitable example. **[6]**

b) Solve any one of the following: **[4]**

i) Calculate the interplanar spacing of a set of planes, if the angle for the first order diffraction is 22.5º, when X - rays of wavelength 1.53Å are used.

ii) Write the cell reaction and calculate the emf of the following cell at 25º C.

$$^{\ominus}Pt\left|Fe^{2+}\left(a=1\right)\right|Fe^{3+}\left(a=0.1\right)\left\|Cl^{-}\left(a=0.01\right)\right|AgCl_{(S)},Ag^{\oplus}$$

Given: $E^{o}_{cell} = -0.5380\,V$

Total No. of Questions : 4]

SEAT No. :

P618

[Total No. of Pages : 2

# [5115]-420
# T.Y.B.Sc.
# CHEMISTRY
## CH - 342: Inorganic Chemistry
## (2013 Pattern) (Paper - II) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Actual calculations must be shown while solving the problems.***
5) ***Use of log table and calculator is allowed.***

***Q1)*** Answer the following: **[10]**

a) Write general electronic configuration of f - block elements.

b) Draw N (E) curve for insulators.

c) Define nuclear fuel.

d) Give any two properties of homogeneous catalyst.

e) Define Lattice energy.

f) Give biological role of calcium.

g) How many heam units are present in haemoglobin?

h) Draw BCC structure.

i) Define Intrinsic semiconductors.

j) Which catalyst is used for hydrogenation of vegetable oil.

***Q2)*** a) Answer any two of the following: **[6]**

i) Give consequences of lanthanide contraction.

ii) Distinguish between Haemoglobin and myoglobin.

iii) 'ZnO shows n - type semiconductivity'; Explain.

***P.T.O.***

b) Solve any two of the following: **[4]**

i) Explain the use of thorium as a nuclear fuel.

ii) Draw N (E) curves for univalent, divalent, and trivalent metal.

iii) What is the toxic effect of $CN^-$ in haemoglobin?

***Q3)*** Answer any two of the following: **[10]**

a) Discuss the catalytic cycle for hydrogenation of alkenes using wilkinson's catalyst.

b) Calculate pauling's univalent redii of $Na^+$ and $F^-$ in NaF crystal.

Given : Internuclear distance of NaF is 2.31A°

c) What are Actinides? Give its oxidation states and observed elecronic configuration.

***Q4)*** A) Give the different theories of metals. Explain band theory with respect to Na metal. **[6]**

OR

A) Answer the following: **[6]**

a) Write synthesis of Terephthalic acid from xylene.

b) Write short note on Fe - s protein.

B) What are voids? Explain type of voids. **[4]**

OR

B) a) Write advantages and disadvantages of heterogeneous catalysts. **[4]**

b) Give the name and atomic number of element;

i) Une

ii) Enn

Total No. of Questions : 4]

SEAT No. :

**P619**

[Total No. of Pages : 4

# [5115]-421
# T.Y.B.Sc.
# CHEMISTRY
## CH - 343 : Organic Chemistry (New)
## (2013 Pattern) (Paper - III) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw structures and neat diagrams if necessary.***
4) ***IR, NMR and UV spectroscopic data is given in Tables, 1, 2 and 3 respectively.***

***Q1)*** Answer the following: **[10]**

a) Calculate the fundamental modes of vibrations for No.

b) How will you prove presence of – NH – $CH_3$ group in ephedrine.

c) Express $\lambda$ = 690 nm in $cm^{-1}$.

d) What do you mean by ylide?

e) Define the term FGI.

f) How many sets of protons present in $CH_3$– $CH_2$– CH = CH – $CH_2$ – $CH_3$.

g) In which rearrangement reaction $\alpha$ - chlorocyclohexanone and $\overset{\ominus}{O}H$ ion are used.

h) Give evidence for number of C = C bonds in citral.

i) List the different regions in IR spectroscopy.

j) Define Auxochrome.

***Q2)*** a) Attempt any <u>two</u> of the following : **[6]**

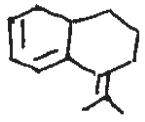
i) How will you prepare 3 - methyl - 2- pentanone from acetoacetic ester.

ii) Write retrosynthesis and synthesis of 2 - butenal.

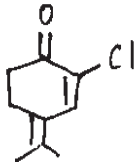
iii) Write a note on curtius rearrangement.

b) Calculate $\lambda_{max}$ for the following : **[4]**

(i)



ii)




OR

***P.T.O.***

i) Explain the preparation of cinnamic acid from benzaldehyde. **[2]**

ii) P-nitrophenol shows red shift in basic medium. Explain. **[2]**

***Q3)*** Attempt any <u>two</u> of the following:

a) i) Write synthesis of citral from methyl heptenone. **[3]**

ii) How will you distinguish following pair by IR spectroscopy

$CH_3 - CH_2 - C \equiv N$ and $CH_3 - CH_2 - C \equiv C - H$ **[2]**

b) i) Explain Beckmann rearrangement with suitable example. **[3]**

ii) How IR spectroscopy is useful for determination of size of ring Ketone? **[2]**

c) i) Explain measurement of chemical shift in NMR spectroscopy. **[3]**

ii) How will you prove presence of benzene ring in ephedrine. **[2]**

***Q4)*** a) Propose structures for the compounds from the following spectroscopic data. Justify your answer. (any two) **[6]**

i) Molecular Formula : $C_4H_8O$

IR : 1715 $cm^{-1}$

NMR i) triplet, 1.07 δ(3H)

ii) singlet, 2.12 δ(3H)

iii) quartet, 2.48 δ(2H)

ii) Molecular Formula : $C_3H_6BrI$

NMR : i) quintet, 2.27 δ(2H)

ii) triplet, 3.55 δ(2H)

iii) triplet, 3.70 δ(2H)

iii) Molecular Formula : $C_9H_{12}$

IR : 1590, 1610 $cm^{-1}$

NMR : i) doublet, 1.15 δ(6H)

ii) multiplet, 3.05 δ(1H)

iii) singlet, 6.40 δ(5H)

b) Write notes on any two of the following: **[4]**

i) Crossed aldol condensation.

ii) Hofmann's exhaustive methylation.

iii) Coupling constant (J)

iv) Synthon and synthetic equivalent.

TABLE – 1

Characteristic Infrared Absorptions of Functional Groups

| | GROUP | | FREQUENCY RANGE $cm^{-1}$ | INTENSITY |
|---|---|---|---|---|
| A. | Alkyl | | | |
| | C–H (stretching) | | 2853–2962 | (m – s) |
| | Isopropyl – $CH(CH_3)_2$ | | 1380 – 1385 | (s) |
| | | and | 1365 – 1370 | (s) |
| | tert – Butyl – $C(CH_3)_3$ | | 1385 – 1395 | (m) |
| | | and | 1365 | (s) |
| B. | Alkenyl | | | |
| | C–H (stretching) | | 3010 – 3095 | (m) |
| | C = C (stretching) | | 1620 – 1680 | (v) |
| | R– CH = $CH_2$ | | 985 – 1000 | (s) |
| | | and | 905 – 920 | (s) |
| | $R_2$ C = $CH_2$ | (out of plane | 880 – 900 | (s) |
| | cis – RCH = CHR | C–H bendings) | 675 – 730 | (s) |
| | trans – RCH = CHR | | 960 – 975 | (s) |
| C. | Alkynyl | | | |
| | ≡ C–H (stretching) | | 3300 | (s) |
| | C ≡ C (stretching) | | 2100 – 2260 | (v) |
| D. | Aromatic | | | |
| | Ar – H (stretching) | | – 3030 | (v) |
| | Aromatic substitution type (C–H out-of-plane bendings) | | | |
| | Monosubstituted | | 690 – 710 | (very s) |
| | | and | 730 – 770 | (very s) |
| | o – Disubstituted | | 735 – 770 | (s) |
| | m – Disubstituted | | 680 – 725 | (s) |
| | | and | 750 – 810 | (very s) |
| | p – Disubstituted | | 800 – 840 | (very s) |
| E. | Alcohols, Phenols, Carboxylic Acids | | | |
| | OH (alcohols, phenols, dilute solutions) | | | |
| | OH (alcohols, phenols, hydrogen bonded) | | 3200 – 3550 | (broad) |
| | OH (carboxylic acids, hydrogen bonded) | | 2500 – 3000 | (very broad) |
| F. | Aldehydes, Ketones, Esters and Carboxylic Acids | | | |
| | C = O stretch | | 1630 – 1780 | (s) |
| | aldehydes | | 1690 – 1740 | (s) |
| | ketones | | 1680 – 1750 | (s) |
| | esters | | 1735 – 1750 | (s) |
| | carboxylic acids | | 1710 – 1780 | (s) |
| | amides | | 1630 – 1690 | (s) |
| G | Amines | | | |
| | N – H | | 3300 – 3500 | (m) |
| H. | Nitriles | | | |
| | C ≡ N | | 2220 – 2260 | (m) |
| I. | –C–O stretch (alcohol, ether, phenol | | 1000 – 1300 | (s) |
| J. | Nitro N = O | | 1550 – 1350 | (s) |
| k. | Halides | F | 1400 – 1000 | (s) |
| | | Cl | 785 – 540 | (s) |
| | | Br | <667 | (s) |

TABLE – 2

Approximate Proton Chemical Shifts in NMR

| TYPE OF PROTON | CHEMICAL SHIFT, DELTA, PPM (δ) | | |
|---|---|---|---|
| 1° Alkyl, $RCH_3$ | 0.8 – 1.0 | | |
| 2° Alkyl, $RCH_2R$ | 1.2 – 1.4 | | |
| 3° Alkyl $R_3CH$ | 1.4 – 1.7 | Ester $R-\overset{\overset{O}{\|}}{C}-O-CH_2-R$ | 4 to 4.5 |
| Allylic, $R_2C=\overset{\overset{R}{\|}}{C}-CH_3$ | 1.6 – 1.9 | | |
| Benzylic, $ArCH_3$ | 2.2 – 2.5 | | |
| Alkyl chloride $RCH_2Cl$ | 3.6 – 3.8 | | |
| Alkyl bromide, $RCH_2Br$ | 3.4 – 3.6 | | |
| Alkyl iodide, $RCH_2I$ | 3.1 – 3.3 | | |
| Ether, $ROCH_2R$ | 3.3 – 3.9 | | |
| Alcohol, $HOCH_2R$ | 3.3 – 4.0 | | |
| Ketone, $RC(=O)CH_3$ | 2.1 – 2.6 | $R-\overset{\overset{O}{\|}}{C}-CH_2-$ | 2.4 δ |
| | | $R-\overset{\overset{O}{\|}}{C}-\overset{\|}{C}H-$ | 2.5 δ |
| Aldehyde, $RC(=O)H$ | 9.5 – 9.6 | | |
| Vinylic, $R_2C=CH_2$ | 4.6 – 5.0 | | |
| Vinylic $R_2C=\overset{\overset{R}{\|}}{C}H$ | 5.2 – 5.7 | | |
| Aromatic, ArH | 6.0 – 9.5 | | |
| Acetylenic, $RC\equiv CH$ | 2.5 – 3.1 | | |
| Alcohol hydroxyl, ROH | 0.5 – 6.0[a] | | |
| Carboxylic, $RC(=O)OH$ | 10 – 13[a] | | |
| Phenolic, ArOH | 4.5 – 7.7[a] | | |
| Amino $R-NH_2$ | 1.0 – 5.0 | | |

[a]The chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE – 3

**U.V. Absorption rules for diene chromosphores**

| | | | | |
|---|---|---|---|---|
| 1) | Parent | 215 nm | 6) – halogen | 5 nm |
| 2) | Each extra conjugation | 30 nm | 7) – SR | 30 nm |
| 3) | Homoannular | 39 nm | 8) – $NR_2$ | 60 nm |
| 4) | Exocylic double bond | 05 nm | 9) – OH,– OR | 5 nm |
| 5) | Each alkyl (R) substituent directly attached to double bonded carbon | 05 nm | | |

**U.V. Absorption rules for Enone System**

| | | | | |
|---|---|---|---|---|
| 1) | Parent | 215 nm (207 nm for aldehyde) (202nm for five member ring) | | |
| 2) | Each extra conjugation | 30 nm | 6) – Cl | α 15 nm |
| 3) | Homoannular | 39 nm | 7) – OH, –OR | β 12 nm |
| 4) | Substituents | | 8) – SR | α 35 nm |
| | a) Alkyl group at α | 10 nm | 9) – NR2 | β 30 nm |
| | b) Alkyl group at β | 12 nm | | β 85 nm |
| | c) Alkyl group at γ, δ & higher | 18 nm | | β 95 nm |
| 5) | Exocylic double bond | 05 nm | | |

Total No. of Questions :4]

SEAT No. :

**P620**

[Total No. of Pages :2

# [5115] - 422

## T.Y.B.Sc.

## CHEMISTRY

## CH-344: Analytical Chemistry

## (2013 Pattern) (Paper - IV) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log table and calculator is allowed.***

***Q1)*** Answer the following: **[10]**

a) What is synergistic agent?

b) What is Rf value?

c) Which chromatography technique is used for separation of aminoacids.

d) Give any one similarity of chromatography with solvent extraction.

e) Give the name of any one defector used in Gas chromatography.

f) What is SFC?

g) Define the term migration velocity.

h) Which chromatography technique is used for separation of molecular compounds.

i) At what angle the radiant power of scattered radiation is measured in mephelometry.

j) Define the term electrophoresis.

***P.T.O.***

***Q2)*** a) Answer any Two of the following: **[6]**

i) What are the advantages of gas chromatography?

ii) Explain the principle of HPLC.

iii) Discuss in brief principle underlying ion-exchange chromatography. What are the different types of ion exchangers use in ion-exchange chromatography.

b) Answer any Two of the following: **[4]**

i) Draw labeled diagram of turbidimeter.

ii) Calculate distribution ratio when concentration of solute in organic layer 0.44 m and in aqueous layer is 0.02m.

iii) Calculate turbidance, if the transmittance is 0.60.

***Q3)*** Answer any two of the following: **[10]**

a) Explain the applications of nephelometry and turbidimetry.

b) What is TLC? Give the advantages of TLC what are various types of TLC?

c) Discuss the various steps involved in paper chromatography.

***Q4)*** a) Explain the principle and Describe various components used in Gas Chromatography. **[6]**

OR

i) Explain turbidimetric titration with suitable example.

ii) Explain in brief Disc electro phoresis.

b) In the extraction of cerium (IV), with 2-Thenoyl trifluoroacetone in benzene, the distribution ratio was 999. If volume of organic phase was 10 ml and that of aqueous phase was 25ml. What is the percentage of extraction? **[4]**

OR

In the experiment of paper chromatographic separation of zinc, cadmium and mercury, the solvent front was 15 cm, while the front due to above metals were 10.00, 7.50 and 3.00 cm respectively. Calculate Rf-values of these metals.

Total No. of Questions : 4]

SEAT No :

P621

[Total No. of Pages :2

# [5115]-423
# T.Y.B.Sc.
# CHEMISTRY
## CH-345: Industrial Chemistry
## ( 2013 Pattern) (Paper- V )(Semester-IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams and flowsheet wherever necessary.***

***Q1)*** Answer the following: **[10]**

a) Define degree of polymerization.

b) What is oxochrome ?

c) Define the term messecuite.

d) What is soap ?

e) What are diuretics ?

f) What is sulphitation ?

g) What are fillers ?

h) Draw the structure of phenolphthalein.

i) Define the term moisturizer.

j) What is mean by waste reduction ?

***Q2)*** a) Answer any two of the following : **[6]**

i) Write a note on tranquilizer.

ii) Distinguish between soap and detergent.

iii) Explain the factors favourable foe fermentation.

***P.T.O.***

b) Answer any two of the following : **[4]**

i) Give the preparation of melamine monomar.

ii) Write note on Therapeutic index.

iii) What is biological treatment of waste.

***Q3)*** Answer any two of the following : **[10]**

a) What is polyethylene ? Explain the properties and uses of LDPE.

b) Draw the structures of Alizarin and Fluorescein, state their applications.

c) Give the synthesis and uses of Aspirin and Sulphanilamide.

***Q4)*** a) What are surfactant ? Discuss the various types of surfactants. **[6]**

OR

a) Discuss the utilisation of by product of sugar industry **[6]**

i) Bagasse

ii) Molasses

b) Explain the characteristics and uses of **[4]**

i) White lead

ii) Red lead

OR

b) Write note on **[4]**

i) Natural rubber

ii) Treatment of waste containing organic impurities.

✈ ✈ ✈

Total No. of Questions : 4]

SEAT No. :

**P622**

[Total No. of Pages : 2

# [5115]-424
# T.Y.B.Sc.
# CHEMISTRY
## CH - 346 (A) : Nuclear chemistry
## (2013 Pattern) (Semester - IV) (Paper - VI)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat labelled diagram wherever necessary.***
4) ***Use of log tables and calculator is allowed.***

***Q1)*** Answer the following: **[10]**

a) Define the term fission yield.

b) What is PHWR?

c) What are nuclear accelerators?

d) Give one example of commonly used Scintillator.

e) State the radioisotopes of sodium.

f) What is meant by Szilard-Chalmer's reaction?

g) Give one application of isotope dilution analysis.

h) State any two safety standards used in the study of radioactivity.

i) Give the type of nuclear reactions present in the neutron detectors.

j) What are prompt and delayed neutrons?

***Q2)*** a) Attempt any two of the following: **[6]**

i) Discuss the construction and working of cyclic accelerator.

ii) Describe a typical reaction involved in the preparation of radio isotope Tritium ($^{3}H$).

iii) Describe nuclear waste and its management.

***P.T.O.***

b) Attempt any two of the following: **[4]**

i) Explain cow and milk system with one suitable example.

ii) Explain the applications of radioactivity in the reaction mechanism.

iii) The products of fission of $^{239}_{94}Pu$ by thermal neutrons are $^{108}Pd+^{129}Xe+3n$. Find the energy released.

Given: Atomic masses of:

$^{239}Pu$=239.0522 amu; $^{108}Pd$=107.9039 amu

$^{129}Xe$=128.9048 amu; Mn=1.00897 amu

***Q3)*** Answer any two of the following: **[10]**

a) Describe all steps involved in FOUR FACTOR FORMULA.

b) Discuss principle, working and applications of semiconductor detectors.

c) Discuss the principle of neutron activation analysis with its two applications.

***Q4)*** a) Describe in detail The Fast Breeder Test Reactor at Kalpakkam (FBTR). **[6]**

OR

Write notes on: **[6]**

i) The Vande-Graff Accelerator.

ii) Medical applications of radioactivity.

b) Discuss any four typical nuclear Reactors. **[4]**

OR

Discuss radiochemical principle in the use of tracers. **[4]**

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Total No. of Questions : 4]

SEAT No. :

**P623**

[Total No. of Pages : 2

# [5115]-425
# T.Y.B.Sc.
# CHEMISTRY
## CH - 346 (B) : Polymer Chemistry
## (2013 Pattern) (Semester - IV) (Paper - VI)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***

***Q1)*** Answer the following: **[10]**

a) Define the term: Co-polymer.

b) 'A nylon rope left for long in the sun and rain loses its luster and strength'. Explain.

c) Give important IR bands of polyvinyl acetate.

d) What is meant by polymer blend.

e) Define the term: Virgin Polymer.

f) Draw the correct structure of polystyrene.

g) Give two important uses of teflon.

h) Explain the term lamination.

i) What is meant by sizing.

j) The acronym-PAN stands for.....

***Q2)*** a) Attempt <u>any two</u> of the following: **[6]**

i) 'Plasticizers are mainly affect on glass transition temperature'. Explain.

ii) Write a brief note on mechanical degradation.

iii) Comment on the effect of crystallinity on properties of polymers.

***P.T.O.***

b) Answer the following (any two): **[4]**

i) How will you distinguish polyvinyl ketone and polyvinyl alcohol by using IR spectroscopy.

ii) 'Tg of polyethylene is –125ºC while Tg of polystyrene is 100ºC'. Explain.

iii) Draw the correct structures of random and alternate co-polymers.

***Q3)*** Answer <u>any two</u> of the following: **[10]**

a) Write a detailed note on biomedical polymers.

b) Give method of preparation, properties and important uses of following polymers,

i) Polyamides.

ii) Urea-formaldehyde resin.

c) Give detail account on thermogravimetric analysis (TGA) method for study of properties of polymers.

***Q4)*** a) Attempt any two of the following: **[6]**

i) Describe the thermoforming technique in polymer processing technology.

ii) Write a short note on non-sulphur vulcanisation.

iii) Explain calendering technique in detail.

b) What is meant by safety fibre? Give a detailed account of dry spinning process in fibre technology. **[4]**

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Total No. of Questions : 4]

SEAT No. :

**P624**

[Total No. of Pages : 2

# [5115]-426
# T.Y.B.Sc.
# CHEMISTRY
## CH - 346 (C) : Introduction to Biochemistry & Molecular Biology
## (2013 Pattern) (Semester - IV) (Paper - VI)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** Answer the following: **[10]**

a) Where does glycolysis occur in the cell?

b) Name the enzyme that converts succinate to fumarate.

c) What is the role of carnitine in β-oxidation?

d) Give the significance of TATA box in Transcription.

e) How many ATPs are generated when glucose is converted to Lactate?

f) Name Two inhibitors of Translation.

g) What are Cosmids?

h) What is deamination reaction?

i) Name two restriction endonucleases.

j) Define Ketogenesis.

***Q2)*** a) Attempt <u>any two</u> of the following: **[4]**

i) Show the Central dogma of molecular biology.

ii) What are uncouplers? Give examples.

iii) Give the complementary RNA sequence of this DNA fragment 3'TACGTACAG5'

***P.T.O.***

b) Answer any two of the following : **[6]**

i) Give the role of three types of RNA.

ii) Write note on high energy compounds.

iii) List out applications of genetic engineering.

***Q3)*** Answer <u>any two</u> of the following: **[10]**

a) Discuss the salient features of Watson and Crick model of DNA.

b) Explain the features of Lac. Operon.

c) Describe the steps involved in formation of pyruvate from Glucose.

***Q4)*** Answer the following:

a) Explain the steps involved in TCA cycle with energetics. **[6]**

OR

a) Describe the steps involved in Translation of proteins.

b) Write note on Triglyceride synthesis. **[4]**

OR

b) Differentiate between the features of DNA polymerase I,II,III.

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Total No. of Questions : 4]

SEAT No. :

P625

[Total No. of Pages : 2

# [5115]-427
# T.Y.B.Sc.
# CHEMISTRY
## CH - 346 (D) : Environmental and Green Chemistry
## (2013 Pattern) (Semester - IV) (Paper - VI) (Elective - II)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Answer the following: **[10]**

a) Define Ultrafiltration.

b) What is meant by Incineration.

c) What is composition of soda glass in glass electrode.

d) Mention any two application of HPLC in environmental analysis.

e) What is source and sink of $CO_2$.

f) Define the term Surface tension.

g) What is meant by nuclear fusion.

h) What is meant by chlorination.

i) Give types of grass land soil.

j) What is meant by Global Warming.

***Q2)*** a) Explain <u>any two</u> of the following: **[6]**

i) Explain Global Warming potential.

ii) Explain Ion Exchange method in purification of water.

iii) Explain Ion selective electrode.

***P.T.O.***

b) Write short notes on any two: **[4]**

i) Nuclear fission.

ii) Oxygen in water.

iii) Water and Air is soil.

***Q3)*** Answer <u>any two</u> of the following: **[10]**

a) Explain in detail Primary Waste Water treatment.

b) Explain principle and Application of Atomic Absorption Spectrophotometry (AAS).

c) Explain in detail Water Inceractions with other phases.

***Q4)*** a) Explain in detail Chemistry of Disposal solid wastes. **[6]**

OR

a) Explain in detail Renewable energy sources.

b) Write short notes on any one of the following: **[4]**

i) Mechanism and Role of $CO_2$.

ii) Thermal stratification of water.

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Total No. of Questions : 4]

SEAT No. :

P626

[Total No. of Pages : 2

# [5115]-428
# T.Y.B.Sc.
# CHEMISTRY
## CH - 346 (E) : Dairy Chemistry
## (2013 Pattern) (New Course) (Semester - IV) (Paper - VI)
## (Elective - II)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Answer the following: **[10]**

a) What are major constituents of milk?

b) What is meant by developed acidity in milk?

c) Define pasteurization of milk.

d) Give advantages of homogenization of milk.

e) Define 'sterilized milk'.

f) Define soft curd milk.

g) Draw the structure of Thiamine.

h) How will you detect the presence of water in milk?

i) Define churning of cream.

j) Define srikhand powder and give its uses.

***Q2)*** a) Answer <u>any two</u> of the following: **[6]**

i) Discuss the products of 'Microbial growth' of Enzymes in milk sample.

ii) Give flowsheet of manufacture of standardized milk.

iii) Give structure and uses of Riboflavin.

***P.T.O.***

b) Answer any Two of the following: **[4]**

i) What is preservation of milk? How will you test the presence of salicylic acid in milk sample?

ii) Give food and nutritive value of cheese.

iii) Give advantages of dried milk products.

***Q3)*** a) Define butter milk powder. Draw flow sheet diagram for manufacture of butter milk powder from sweet butter milk. Give its uses. **[5]**

OR

State and explain the Physico-chemical properties of major constituents of milk.

b) Discuss about Vitamin $B_{12}$. **[5]**

OR

Define term cream. Give classification of cream. Give uses of cream.

***Q4)*** a) Attempt any Two. **[6]**

i) Give the importance of Vitamin-D in the milk.

ii) Define whey powder. Give flow sheet diagram for the manufacture of whey powder and give its uses.

iii) Define 'Adulteration in milk'. Comment on different modes of adulteration.

b) Answer any two of the following: **[4]**

i) Give nutritional value and uses of lactose.

ii) How formalin and hydrogen peroxide in the milk is detected?

iii) What are advantages of fermented milk?

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Total No. of Questions : 4]

SEAT No. :

P627

[Total No. of Pages : 2

# [5115]-429
# T.Y.B.Sc.
# BOTANY
## BO - 341 : Plant Physiology and Biochemistry
## (2013 Pattern) (Semester - IV) (Paper - I)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Draw neat labelled diagram wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Answer the following: **[10]**

a) Define photophosphorylation.

b) What are respiratory substrates?

c) Enlist two theories of translocation of solutes.

d) What is biotic stress?

e) What are oligo saccharides?

f) Write any two functions of lipids.

g) Define glycolipids.

h) Define chloroplast dimorphism.

i) What are secondary metabolites?

j) What are Apoenzyme?

***Q2)*** Attempt any two of the following: **[10]**

a) Describe the mechanism of ETS.

b) Explain Munch hypothesis.

c) Describe shikkimic acid pathway.

***P.T.O.***

***Q3)*** Write short notes on (any two) **[10]**

a) β-oxidation of Fatty acids.

b) Properties of proteins.

c) Salinity stress.

***Q4)*** Explain the mechanism of $CO_2$-Fixation in $C_3$-plants. **[10]**

OR

What are enzymes? Explain lock and key hypothesis of enzyme action. Add a note on inhibitors.

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**Total No. of Questions : 4]**

**SEAT No. :** ____

**P628**

**[Total No. of Pages : 2**

# [5115]-430
# T.Y.B.Sc.
# BOTANY
## BO - 342 : Plant Ecology and Biodiversity
## (2013 Pattern) (Semester - IV) (Paper - II)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Draw neat labelled diagrams wherever necessary.***
3) ***Figures to the right indicates full marks.***

***Q1)*** Attempt the following: **[10]**

a) Write any two values of Biodiversity.

b) What is Ecosystem diversity?

c) Define Monitoring.

d) What is long form of GPS?

e) Enlist any two Endemic plants.

f) Give any two causes of Environmental Crisis.

g) What is Gene Bank?

h) Give any two objectives of EIA.

i) Define Economics.

j) What is Chipko Movement?

***Q2)*** Answer <u>any two</u> of the following: **[10]**

a) Write various disciplines of Biodiversity.

b) Explain the stages of Remote Sensing.

c) Write the concept of Man and Biosphere (MAB).

***P.T.O.***

***Q3)*** Write short notes on <u>any two</u> of the following: **[10]**

a) Desertification.

b) Demographic Bottlenecks.

c) Basic data collection for EIA.

***Q4)*** What is toxicology? Explain in details about Eutrophication and Biomagnification. **[10]**

OR

Explain the role of National agencies in conservation. Add a note on Social approaches to biodiversity conservation.

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Total No. of Questions : 4]

SEAT No. :

P629

[Total No. of Pages : 2

# [5115]-431
# T.Y.B.Sc.
# BOTANY
## BO - 343 : Plant Pathology
## (2013 Pattern) (Semester - IV) (Paper - III)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following: **[10]**

a) Define parasite.

b) What is symptom?

c) Define epidemiology.

d) What is passive dissemination?

e) Give long form of ICRISAT.

f) Define quarantine.

g) Name any two viral diseases.

h) Give cause of mango necrosis.

i) Define vaccines.

j) What is sanitation.

***Q2)*** Attempt <u>any two</u> of the following: **[10]**

a) Describe biochemical defence.

b) Explain the history of plant pathology.

c) Describe mycoplasma as a plant pathogen.

***P.T.O.***

***Q3)*** Write short notes on <u>any two</u> of the following: **[10]**

a) Microbial pesticides.

b) Macroscopic studies of plant disease.

c) Herbicide injury.

***Q4)*** Give an account of Head smut of Jowar and Black arm of cotton with reference to causal organism, symptoms & control measures. **[10]**

OR

What is dissemination? Explain different ways of dessimination of inoculum.

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Total No. of Questions : 4]

SEAT No. :

**P630**

[Total No. of Pages : 2

# [5115]-432
# T.Y.B.Sc.
# BOTANY
## BO - 344 : Medicinal and Economic Botany
## (2013 Pattern) (Semester - IV) (Paper - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Draw neat labelled diagrams wherever necessary.***
3) ***Figures to the right indicates full marks.***

***Q1)*** Answer the following: **[10]**

a) Define economic botany.

b) What is crude drug?

c) Define vata.

d) What is drug adulteration?

e) What is gum?

f) Give any two uses of Glycirrhiza.

g) Give any two chemical constituents of Tinospora.

h) Define ethanobotany.

i) Mention origin of Rice.

j) Write any two names of ethanic societies of India.

***Q2)*** Attempt any two of the following: **[10]**

a) Explain methods of preparation of Bhasma and vatika.

b) Describe chemical evaluation of drugs.

c) Give economic importance of Rose.

***P.T.O.***

***Q3)*** Write notes on any two: **[10]**

a) Ayurvedic principles.

b) Garbling and drying of herbal drugs.

c) Botanical resources of paper.

***Q4)*** Give occurrence, geographical distribution, cultivation, Macroscopic characters and uses of Amla. **[10]**

OR

Give the concept of active principles and metabolic pathways of carbohydrates.

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Total No. of Questions :4]

SEAT No. :

**P631**

[Total No. of Pages :2

# [5115] - 433

## T.Y.B.Sc.

## BOTANY

## BO - 345: Plant Biotechnology

## (Semester - IV) (2013 Pattern) (Paper - V) (Theory)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Draw neat and labelled diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Answer the following: **[10]**

a) Define Genomics.

b) Enlist the types of proteiomics.

c) Define cryopreservation.

d) What is Bioplastic?

e) What is the role of Nitrogenase in nitrogen fixation?

f) Enlist two bacteria used in genetic engineering.

g) Enlist any two data retrival tools.

h) What is FASTA?

i) What is Leghaemoglobin?

j) What are cybrids?

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Explain the production of therapeutic proteins in plants.

b) Describe the global impact of Biotechnology.

c) Explain the significance of germplasm.

***Q3)*** Write short notes on any two of the following: **[10]**

a) Embryo rescue.

b) ENTREZ

c) IPR.

***Q4)*** What is plant tissue culture? Describe the concept, technique and application of protoplast culture. **[10]**

OR

What is non-symbiotic Nitrogen fixation? Write in brief the special features of Dizotrophs. **[10]**

Total No. of Questions :4]

SEAT No. :

**P632**

[Total No. of Pages :2

# [5115] - 434

## T.Y.B.Sc.

## BOTANY

## BO - 346: Plant Breeding and Seed Technology

## (Semester - IV) (2013 Pattern) (Paper - VI) (New)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Draw neat labelled diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Answer the following: **[10]**

a) Define hybrid vigour.

b) What is mutation breeding?

c) Write any two applications of polyploidy.

d) Mention any two abiotic stresses in plants.

e) Define foundation seed.

f) What is field inspection?

g) Define seed testing.

h) What is seedling evaluation?

i) Give any two scope of plant breeding.

j) Define seed processing.

***P.T.O.***

***Q2)*** Attempt any TWO of the following: **[10]**

a) What is stress tolerance? Explain breeding for tolerance.

b) Define purity components. Explain procedure of physical purity analysis.

c) What is heterosis? Explain dominance hypothesis.

***Q3)*** Write notes on any TWO of the following: **[10]**

a) Techniques of processing of seeds.

b) Advantages and disadvantages of plant introduction.

c) Basic concepts of seed marketing.

***Q4)*** What is polyploidy? Explain the methods of obtaining polyploids. **[10]**

OR

What is seed sampling? Describe various types of seed samples. **[10]**

Total No. of Questions :4]

SEAT No. :

**P633**

[Total No. of Pages :2

# [5115] - 435

## T.Y.B.Sc.

## ZOOLOGY

## ZY- 341: Biological Techniques

## (Semester - IV) (2013 Pattern) (Paper - I)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following: **[10]**

a) Define ultracentrifugation.

b) Define osmolality.

c) What is impregnation?

d) State the name of equipment used for counting of blood cells.

e) What is micrometry?

f) Define acidic stain.

g) What is electrophoresis?

h) What is a microtome?

i) State the use of camera lucida.

j) What is colorimetry?

***P.T.O.***

***Q2)*** Attempt ANY TWO of the following: **[10]**

a) Describe general procedure for staining of sections.

b) Describe the method of differential count of WBCs.

c) Explain precautions for avoiding tissue damage during procurement.

***Q3)*** Write notes on ANY TWO of the following: **[10]**

a) Block making.

b) PAS technique.

c) Scanning electron microscope.

***Q4)*** What is chromatography? Describe in detail principle and applications of gel filteration chromatography. **[10]**

OR

What is dehydration? Describe the process of clearing and dealcoholisation in microtechnique.

Total No. of Questions :4]

SEAT No. :

**P634**

[Total No. of Pages :2

# [5115] - 436

## T.Y.B.Sc.

## ZOOLOGY

## ZY- 342: Mammalian Physiology and Endocrinology

## (Semester - IV) (2013 Pattern) (Paper - II)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following: **[10]**

a) Define diastole.

b) Define renal failure.

c) Define rigor mortis.

d) What is impulse?

e) Define estrus cycle.

f) What are hormones?

g) What is angioplasty?

h) Define tissue respiration.

i) State different phases of cardiac cycle.

j) What is chloride shift?

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Describe ultrastructure of synapse.

b) Give an account of respiratory quotient.

c) Explain the process of ultrafiltration during urine formation.

***Q3)*** Write notes on any two of the following: **[10]**

a) Simple muscle twitch.

b) Gigantism.

c) Cardiac output.

***Q4)*** Define pregnancy. Describe in detail hormonal control of pregnancy. **[10]**

OR

Describe in detail physiology of digestion.

Total No. of Questions :4]

SEAT No. :

**P635**

[Total No. of Pages :2

# [5115] - 437

## T.Y.B.Sc.

## ZOOLOGY

## ZY- 343: Genetics and Molecular Biology

## (Semester - IV) (2013 Pattern) (Paper - III)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following: **[10]**

a) Enlist types of linkages in eukaryotes.

b) What is gene frequency?

c) State Hardy - Weinberg Law.

d) Define 'Operon'.

e) Give importance of PCR.

f) What is translation?

g) Define nucleoside.

h) What is probe?

i) Define euchromatin.

j) What is spontaneous mutation?

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Give an account of Mendelian population.

b) Describe nucleosome.

c) Give an account of DNA finger printing.

***Q3)*** Write short notes on any two of the following: **[10]**

a) Recombination.

b) Lac operon.

c) Gene pool.

***Q4)*** What are mutagenic agents? Describe various types of mutagenic agents. **[10]**

OR

What is DNA replication? Describe the semiconservative method of DNA replication. **[10]**

Total No. of Questions :4]

SEAT No. :

**P636**

[Total No. of Pages :2

# [5115] - 438

## T.Y.B.Sc.

## ZOOLOGY

## ZY- 344: Organic Evolution

## (Semester - IV) (2013 Pattern) (Paper - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following: **[10]**

a) What are symbionts?

b) State any one pattern of speciation?

c) What are mitochondria?

d) What is coenozoic era?

e) Define coacervate.

f) State any one embryological evidence of organic evolution.

g) Define a period of geological time scale.

h) State two characters of Homo erectus.

i) Define isolation.

j) Define allopatric speciation.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Describe animal distribution.

b) Describe factors influencing speciation.

c) Describe natural selection.

***Q3)*** Write note on any two of the following: **[10]**

a) Lamarkism.

b) Types of Isolating mechanism.

c) Geographic range and fauna of Australian and Ethiopian realms.

***Q4)*** What is organic evolution? Explain physiological and anatomical evidences to support it. **[10]**

OR

What is antiquity of man? Describe characters of Australopithecus and kenyapithecus.

Total No. of Questions :4]

SEAT No. :

**P637**

[Total No. of Pages :2

# [5115] - 439

## T.Y.B.Sc.

## ZOOLOGY

## ZY- 345: General Embryology

## (Semester - IV) (2013 Pattern) (Paper - V)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following: **[10]**

a) Define megalecithal egg.

b) What is chorion?

c) Define vertical cleavage.

d) What is secondary egg membrane?

e) What is cleavage?

f) What is tertiary organiser?

g) Define oogenesis.

h) What is hologamy?

i) What is post-vitellogenesis?

j) Define gastrulation.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Describe the structure of centrolecithal egg.

b) Describe amphiblastula.

c) Describe morphogenetic movements.

***Q3)*** Write short notes on any two of the following: **[10]**

a) Ultrastructure of sperm.

b) Significance of spermatogenesis.

c) Meroblastic cleavage.

***Q4)*** What is fertilization? Describe the types of fertilization and add a note on its significance. **[10]**

OR

Describe the development of chick embryo upto 48 hours.

Total No. of Questions :4]

SEAT No. :

**P638**

[Total No. of Pages :4

# [5115] - 440

## T.Y.B.Sc.

## ZOOLOGY

## ZY- 346 (A) : Public Health and Hygiene

## (Semester - IV) (2013 Pattern) (Elective - II) (Paper - VI)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following: **[10]**

a) Define health.

b) State any two methods of food preservation.

c) What is diabetes?

d) Define radiations.

e) State any two emergencies in home.

f) Define data.

g) State any two symptoms of influenza.

h) What are condiments?

i) Define mental hygiene.

j) Define ventilation of air.

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Give an account of causes of epidemiology.

b) Describe composition of soil.

c) Explain biological filtration of water.

***Q3)*** Write short notes on any two of the following: **[10]**

a) Applications of biostatistics.

b) Sources of food.

c) Composition of air.

***Q4)*** Explain the signs, symptoms, mode of transmission and control measures of encephalitis. **[10]**

OR

Define sewage. Describe various methods of its disposal.

**Total No. of Questions :4]**

**P638**

# [5115] - 440
# T.Y.B.Sc.
# ZOOLOGY
## ZY- 346 (B) : Medical Entomology
## (Semester - IV) (2013 Pattern) (Paper - VI)

***Time : 2 Hours]*** ***[Max. Marks :40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following: **[10]**

a) Define Veterinary Entomology.

b) Define mutualism.

c) Write any two methods for the control of carpet beetles.

d) Mention any two diseases spread by mosquito.

e) Mention the names of any two agricultural pests.

f) State the order of Louse.

g) Write any two control methods of tick.

h) What is metamorphosis?

i) Mention function of spiracle.

j) State any two adaptations in flea.

***Q2)*** Attempt any Two of the following: **[10]**

a) Describe the effects of house fly on humans.

b) Give an account of blood sucking lice of veterinary importance.

c) Describe social organisation in wasps.

***Q3)*** Write notes on any two of the following: **[10]**

a) Forest entomology.

b) Nervous system of insects.

c) Eusociality.

***Q4)*** Describe life cycle of mosquito. Add a note on diseases spread by it and its control measures. **[10]**

OR

Describe life cycle of cockroach in brief and add a note on its distribution, damage and control measures.

Total No. of Questions :4]

SEAT No. :

**P639**

[Total No. of Pages :2

# [5115] - 441
# T.Y.B.Sc.
# GEOLOGY
## GL- 341:Metamorphic Petrology
## (Semester - IV) (2013 Pattern) (Paper - I)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** Answer the following: **[10]**

a) What is metamorphic facies?

b) What is lower limit of metamorphism?

c) What is contact metamorphism?

d) What is mortar structure?

e) What is flaser rock?

f) Enlist the depth zones of regional metamorphism.

g) What structure will be shown by rocks undergoing plutonic metamorphism?

h) What is metasomatism?

i) What is mosaic structure?

j) What is gneissose structure?

***P.T.O.***

***Q2)*** Answer the following (Any two): **[10]**

a) Write the difference between metamorphic recrystallisation and igneous crystallisation.

b) Write note on aureoles of thermal metamorphism.

c) Write about foliations in regionally metamorphosed rocks.

***Q3)*** Answer the following (Any two): **[10]**

a) Write about chemical evidences of metasomatism.

b) Write about effect of thermal metamorphism on alluminous deposits.

c) Write a note on charnockites.

***Q4)*** Write a note on slaty cleavage. **[10]**

OR

Write a note on metamorphic facies. Explain in detail the facies of regional metamorphism. **[10]**

Total No. of Questions :4]

SEAT No. :

**P640**

[Total No. of Pages :2

# [5115] - 442

## T.Y.B.Sc.

## GEOLOGY

## GL- 342: Environmental Geology

## (Semester - IV) (2013 Pattern) (Paper - II)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** Answer the following in 2/3 lines: **[10]**

a) Environmental Geology.

b) Conventional source of energy.

c) Desertification.

d) Subsidence of land.

e) Give different types of environmental pollutions.

f) Alkalinity of soil.

g) Name two methods for solid waste disposal.

h) What do you mean by impact assessment?

i) Badland topography.

j) Biomass energy.

***P.T.O.***

***Q2)*** Write notes (any two): **[10]**

a) Seismic hazard map.

b) Bhopal Gas Disaster.

c) Carbon cycle.

***Q3)*** Answer the following (any two): **[10]**

a) Write a note on types of mining hazards.

b) Explain types of water pollution. Add a note on minamata disease.

c) Explain the causes of accelerated erosion.

***Q4)*** What are volcanoes? Mention the effects of volcano. Add a note on prediction of volcanic activity. **[10]**

OR

Define Floods. Mention causes of flooding and discuss on flood hazards in India.

Total No. of Questions : 4]

SEAT No. :

**P641**

[Total No. of Pages : 2

# [5115]-443
# T.Y.B.Sc.
# GEOLOGY
## GL - 343 : Economic Geology
## (2013 Pattern) (Semester - IV) (Paper - III)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** Answer in 2/3 lines: **[10]**

a) What is coal bed methane?

b) What is vug?

c) What are hypothermal deposits?

d) Give two minerals of oxides of Mn ore.

e) What is residual concentration?

f) State the important copper belts of India.

g) What is gangue?

h) What is tectonic breccia?

i) What are late magmatic deposits?

j) What are polymetallic nodules?

***P.T.O.***

***Q2)*** Answer the following: (Any two) **[10]**

a) Classification of metalliferous deposits.

b) Mineralogy and properties of Nickel ores.

c) Characteristic features of cavity filling deposits.

***Q3)*** Write notes on : (Any two) **[10]**

a) Properties of 'Au' deposits and Kolar gold field.

b) Structure and stratigraphy of Cambay basin.

c) Origin of coal.

***Q4)*** Explain the process of mechanical concentration. **[10]**

OR

Give mineralogy, geological and geographical distribution and uses of chromium deposits.

Total No. of Questions : 4]

SEAT No. :

**P642**

[Total No. of Pages : 2

# [5115]-444
# T.Y.B.Sc.
# GEOLOGY
## GL - 344 : Geotectonics
## (2013 Pattern) (Semester - IV) (Paper - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** Answer in 2/3 lines: **[10]**

a) Define continental crust.

b) Name the seismic discontinuity between crust and mantle.

c) Define TRM.

d) Name 2 reverse epochs from geomagnetic time scale.

e) Define Pwaves.

f) What is plate boundary?

g) Define Trench.

h) What are ophiolites?

i) Name the hotspot responsible for formation of Deccantraps.

j) Name 2 cratons from India.

***P.T.O.***

***Q2)*** Write notes on (Any 2) **[10]**

a) Shadow Zone.

b) Types of Meteorites.

c) Magnetic Inclination.

***Q3)*** Write notes on : (Any two) **[10]**

a) Subduction Zone.

b) Neotectonics.

c) Plate tectonic theory of formation of mountains.

***Q4)*** Describe the zones of interior of earth. **[10]**

OR

What are back are basins? Write a note on their formation. **[10]**

Total No. of Questions : 4]

SEAT No. :

**P643**

[Total No. of Pages : 2

# [5115]-445
# T.Y.B.Sc.
# GEOLOGY
## GL - 345 : Phanerozoic Stratigraphy of India and Palaeontology
## (2013 Pattern) (Semester - IV) (Paper - V)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** Answer the following questions in 2/3 lines: **[10]**

a) Age of Laterite.

b) Give the origin of Karewas of Kashmir.

c) Give history of Cenozoic life.

d) Give kossil remains of siwalik group.

e) Give the Grea of East coast tertiary rocks.

f) Give any two evidences of mass extinction at K - T boundary.

g) Define Intratrappean beds.

h) Give major mass extinction events in the earth.

i) Give area of Fertiary rock of west coast of India.

j) Define Mass Extinction.

***P.T.O.***

***Q2)*** Write notes on (Any Two) **[10]**

a) Broad lithology of silurian system.

b) Describe the classification of Deccan Traps.

c) Describe lithology of Triassic System.

***Q3)*** Write notes on : (Any two) **[10]**

a) Describe Bagh beds/Narmadavalley.

b) Describe Precambrian - Cambrian boundary.

c) Describe Jurassic of Kutch.

***Q4)*** Describe the lithological succession, Classification and fossil contents of spiti area. **[10]**

OR

Define laterite. Describe its Origin and add a notes on its type. **[10]**

Total No. of Questions : 4]

SEAT No. :

**P644**

[Total No. of Pages : 2

# [5115]-446
# T.Y.B.Sc.
# GEOLOGY
## GL - 346 : Applied Geology - II
## (2013 Pattern) (Semester - IV) (Paper - VI)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** Answer in 2/3 lines: **[10]**

a) Give any two examples of tunnels in India.

b) Define Engineering Geology.

c) Give uses of rock aggregates.

d) Explain the term "Spillway".

e) State the characters of building stones.

f) What is perched aquifer?

g) What is meant by rainwater harvesting?

h) Name two major zones of ground water.

i) What is Torsion balance?

j) What is Worden gravimeter?

***P.T.O.***

***Q2)*** Write in short (Any Two) **[10]**

a) Recharge of groundwater.

b) Porosity and secondary porosity.

c) Tunnelling in Deccan Traps.

***Q3)*** Write in short (Any two) **[10]**

a) Underground mining.

b) Significance of Geology in Civil Engineering.

c) Mineralogic guides.

***Q4)*** Explain the term aggregates. State their properties. Write in short about Runway aggregates and Highway aggregates. **[10]**

OR

What are the essential geotechnical investigations carried out while selecting dam site? Explain parts of gravity dam with the help of diagram.

Total No. of Questions : 4]

SEAT No :

**P645**

[Total No. of Pages : 3

# [5115] - 447
# T.Y.B.Sc.
# STATISTICS (Principal)
# ST - 341 : Actuarial Statistics
# (2013 Pattern) (Paper - I) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator and statistical tables is allowed.***
4) ***Symbols and abbreviations have their usual meaning.***

***Q1)*** Attempt each of the following:

A) Choose the correct alternative in each of the following: **[1 each]**

a) Range set of possible values of curtate future life time of $(x)$ is

i) $(-\infty, \infty)$ ii) $(0, \infty)$

iii) $\{0,1,2,.....\}$ iv) $\{x, x+1,.....\}$

b) The present value of annuity certain immediate at the rate of 1unit per annum for n years is given by

i) $\frac{1-v^n}{d}$ ii) $\frac{1-v^n}{i}$

iii) $\frac{1-v^n}{\delta}$ iv) $\frac{1+v^n}{d}$

c) The relationship between $T_x$ and $L_x$ is

i) $T_x = L_x + L_{x+1}$ ii) $T_x = L_x + T_{x+1}$

iii) $T_x = L_x - L_{x+1}$ iv) $T_x = L_x - T_{x+1}$

***P.T.O.***

d) The force of mortality $\mu_x$ is defined as the derivative w.r.t. $x$ of

i) $\log S(x)$ ii) $-\log S(x)$

iii) $\log F(x)$ iv) $-\log F(x)$

B) State whether each of the following statements is True or False: **[1 each]**

a) $K(x)$ is a discrete random variable.

b) Speculative risk can be insured.

C) Explain each of the following concepts: **[1 each]**

a) policy

b) rate of discount.

D) Explain each of the following terms: **[1 each]**

a) $A_x$

b) $\ddot{a}_{x:\overline{n}|}$

***Q2)*** Attempt <u>any two</u> of the following: **[5 each]**

a) The survival rates $p_x$ for a certain population are as:

| age (yrs) $x$ | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| $p_x$ | 0.85 | 0.8 | 0.4 | 0.5 | 0.2 | 0 |

i) Construct the columns $l_x$, $L_x$, $T_x$ for the cohort of 1,00,000.

ii) Obtain the limiting age $w$.

b) Show that the condition for mutually advantageous policy is $G \geq \mu$, where G is onetime premium and $\mu$ is expected value of loss random variable. (State the assumptions).

c) Explain with an illustration each:

i) $n$ year term insurance.

ii) whole life insurance.

State and explain the expression for net single premium in terms of V for each of the above schemes.

***Q3)*** Attempt <u>any two</u> of the following: **[5 each]**

a) With effective rate of interest 6% per annum, obtain

i) effective rate of discount.

ii) force of interest

iii) accumulated value of Rs. 25,000 at the end of $4^{th}$ year.

iv) Present value of Rs. 10,000 due after the end of $5^{th}$ year.

b) Examine whether the following can serve as survival functions for $x \geq 0$:

i) $S(x) = \exp\{x - 0.7(2^x - 1)\}$.

ii) $S(x) = 1/(1+x)^2$

iii) $S(x) = \exp\{-x^2\}$

c) Obtain the present value and accumulated value of 10 years annuity immediate of Rs. 1000 per annum with effective rate of interest 5%.

***Q4)*** Attempt <u>any one</u> of the following:

a) i) Explain the term 'Annuity' with an illustration. Explain

A) Annuity certain due

B) Annuity certain immediate. **[5]**

ii) On $5^{th}$ June 2000, (65) bought a Rs. 1,00,000 whole life insurance policy with death benefit payable at the end of the year of death. The policy is purchased by means of annual premiums, payable at the start of each year policy remains in force. The policy holder died on $10^{th}$ August 2007 and the loss to the insurer was Rs. 30,000. If $i = 0.06$, what was the annual premium paid? **[5]**

b) i) Explain the term 'insurable risk'. State its characteristics. **[3]**

ii) If force of interest per annum is 0.06 and if Rs. 40,000 are invested on $1^{st}$ January, 2017, obtain its accumulated value on $1^{st}$ January, 2018. **[2]**

iii) It is known that

$q_{28} = 0.135$, $q_{29} = 0.146$,

$q_{30} = 0.159$, $q_{31} = 0.173$,

$q_{32} = 0.188$ and $i = 0.05$

Obtain the annual premium paid as a 5 year temporary discrete annuity due for benefit of Rs. 1000, payable at the end of year of death in a 5 year term insurance issued to (28). **[5]**

Total No. of Questions : 4]

SEAT No :

**P646**

[Total No. of Pages : 3

# [5115] - 448
# T.Y.B.Sc.
# STATISTICS (Principal)
# ST - 342 : Testing of Hypothesis
# (2013 Pattern) (Paper - II) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator and statistical tables is allowed.***
4) ***Symbols and abbreviations have their usual meaning.***

***Q1)*** Attempt each of the following:

A) Choose the correct alternative in each of the following: **[1 each]**

a) For using MP test, the alternative hypothesis should be

i) Composite ii) Simple

iii) One sided iv) Two tailed

b) The probability of committing type I error($\alpha$) and type II error($\beta$) should be given in advance for carrying out

i) LRT ii) MP test

iii) UMP test iv) SPRT

c) For testing the randomness of a given sample, the following test is used.

i) Run test

ii) Sign test

iii) Kolmogorov Smirnov test

iv) Mann Whitney test

d) For testing a composite null hypothesis against an alternative composite hypothesis, only the following test is used.

i) LRT ii) MP test

iii) UMP test iv) SPRT

***P.T.O.***

B) State whether each of the following statements is true or false: **[1 each]**

a) UMP test cannot be used for testing a null hypothesis against a two sided alternative hypothesis.

b) Best critical region for testing any null hypothesis against an alternative hypothesis has maximum power.

C) Define the following : **[1 each]**

a) Critical region.

b) Composite hypothesis.

D) Define observed level of significance. **[1]**

E) State one advantages of carrying out SPRT over fixed sample size test.**[1]**

***Q2)*** Attempt any two of the following: **[5 each]**

a) Find MP test of size $\alpha$ for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu = \mu_1$ ($\mu_1 < \mu_0$), where $\mu$ is the mean of a normal distribution with known variance $\sigma^2$, based on a r.s. $X_1, X_2, \ldots\ldots\ldots X_n$ drawn from it.

b) Construct SPRT of strength ($\alpha, \beta$) for testing $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1$ ($\lambda_1 > \lambda_0$), where $\lambda$ is the mean of a Poisson distribution.

c) Let X be a r.v. with p.m.f. under $H_0$ and $H_1$ as given below:

| X | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| $P(x/H_0)$ | 0.01 | 0.02 | 0.03 | 0.04 | 0.6 | 0.3 |
| $P(x/H_1)$ | 0.05 | 0.1 | 0.15 | 0.25 | 0.4 | 0.05 |

Find critical regions of size 0.05. Also state which one is the best? Why?

***Q3)*** Attempt any two of the following: **[5 each]**

a) Construct likelihood ratio test of level of significance $\alpha$ for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$, where $\mu$ is the mean of a normal distribution with known variance $\sigma^2$ based on a r.s. $X_1, X_2, \ldots\ldots\ldots X_n$ drawn from it.

b) Write a note on Mann Whitney test.

c) Let $X_1, X_2, \ldots\ldots X_{15}$ be a r.s. from $N(0, \sigma^2)$. Find UMP test of level of significance 0.05 to test $H_0 : \sigma^2 = 3$ against $H_1 : \sigma^2 < 3$.

***Q4)*** Attempt any one of the following:

a) i) A coin with probability P of getting head is tossed 8 times to test the null hypothesis $H_0 : P = 0.5$.

against $H_1 : P = 0.7$. Reject $H_0$ if number of heads appear is > 5. Compute probability of type I error and power of the test. **[4]**

ii) Can the following r.s. 12, 14, 15, 18, 19 of marks obtained by 5 students be regarded as drawn from U(10, 20), test at 5% level of significance. **[6]**

b) i) Construct SPRT of strength $(\alpha, \beta)$ for testing $H_0 : \theta_0 = \theta_0$ against $H_1 : \theta = \theta_1$ $(\theta_0 > \theta_1)$, for an exponential distribution with mean $\theta$. **[5]**

ii) Test the randomness of the following sequence of ups U and downs D in the price of gold for 15 consecutive days, provided price did not remain same on 2 consecutive days: **[5]**

UUUDUDDDUUDUDUD. Test at 5% level of significance.

Total No. of Questions : 4]

SEAT No :

**P647**

[Total No. of Pages : 3

# [5115] - 449
# T.Y.B.Sc.
# STATISTICS (Principal)
# ST - 343 : Statistical Quality Control
# (2013 Pattern) (Paper - III) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator and statistical tables is allowed.***
4) ***Symbols and abbreviations have their usual meaning.***

***Q1)*** Attempt each of the following:

A) Choose the correct alternative in each of the following: **[1 each]**

a) Which of the following process control tool uses 80 : 20 principle?

i) Pareto Diagram ii) Histogram

iii) Control Chart iv) Check Sheet

b) Which of the following limits are not determined directly by using sampled observations?

i) 0.001 probability limits ii) $3\sigma$ limits

iii) $2\sigma$ limits iv) Specification limits

c) In case of acceptance sampling with incoming lot quality p, which of the following statement is true?

i) AOQ is always bigger than p.

ii) There is no order relation between AOQ and p.

iii) AOQ is always equal to p

iv) AOQ is always smaller than p.

d) For single sampling plan, with N= 100, n = 20, if ATI = 40 then the probability of rejecting the lot is

i) 0.75 ii) 0.1

iii) 0.25 iv) 1

***P.T.O.***

B) In each of the following, state whether the given statement is true or false. **[1 each]**

a) Design of Experiment is one of the '7 SPC' tools.

b) In single sampling plan, the exact sampling distribution of the number of defective in a sample is Binomial.

C) Define the following terms: **[1 each]**

a) Average Total Inspection (ATI).

b) Defect and Defective.

D) a) State any two criteria for detecting lack of control situations on control chart. **[1 each]**

b) State any two disadvantages of variable control charts.

***Q2)*** Attempt any two of the following: **[5 each]**

a) For a double sampling plan N= 1000, $n_1 = 50$, $c_1 = 1$, $n_2 = 100$, $c_2 = 3$, compute probability of accepting a lot of quality p = 0.05.

b) Explain the working of p-chart for fixed sample size when standards are not given.

c) Write a short note on cause an effect diagram.

***Q3)*** Attempt any two of the following: **[5 each]**

a) A normally distributed quality characteristic is controlled by $\overline{X}$ and R chart and it is found that the process in under control. It is given that for $\overline{X}$ chart and for R chart.

| | | |
|---|---|---|
| $UCL_{\overline{x}} = 626$ | $UCL_R = 18.795$ | |
| $CL_{\overline{x}} = 620$ | $CL_R = 8.234$ | n = 4 |
| $LCL_{\overline{x}} = 614$ | $LCL_R = 0$ | |

i) Find estimate of process standard deviation.

ii) If the specification limits were $610 \pm 15$, estimate of process percent defective.

b) Derive the expression for AOQ in double sampling plan.

c) The following is a record of the number of point defects per unit for metal disk equipment painted by dipping 6,5,7,5,4,6,8,7. Draw a suitable control chart and comment.

***Q4)*** Attempt <u>any one</u> of the following:

a) i) Distinguish between assignable causes and chance causes of variation. **[4]**

ii) Define $C_p$ and $C_{pk}$. Also interprete the following

1) $C_{pk} = 0$ 2) $C_{pk} = 1.33$ **[6]**

b) i) Draw an OC curve for the single sampling plan N = 2000, n = 100, c = 1 by taking p = 0.01, 0.05, 0.07, 0.09. Also explain how you will obtain producer's risk for AQL = 2%. using OC curve. **[7]**

ii) Write note on 'Online Process Control'. **[3]**

Total No. of Questions : 4]

SEAT No :

**P648**

[Total No. of Pages : 4

# [5115] - 450
# T.Y.B.Sc.
# STATISTICS (Principal)
# ST - 344 : Operations Research
# (2013 Pattern) (Paper - IV) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator and statistical tables is allowed.***
4) ***Symbols and abbreviations have their usual meaning.***

***Q1)*** Attempt each of the following:

A) Choose the correct alternative in each of the following: **[1 each]**

a) In the standard form of linear programming problem (LPP), the right hand side element of each constraint should be

i) zero ii) one

iii) negative iv) non-negative

b) A critical path in a network is the path with

i) Minimum number of activities

ii) Minimum duration

iii) Maximum duration

iv) Maximum number of activities

c) To test optimality of solution of a transportation problem (TP) with m origins and n destinations, the number of basic cells should be

i) $m + n - 1$ ii) $mn$

iii) $mn - 1$ iv) $m + n$

***P.T.O.***

d) In an assignment problem of 5 jobs, the number of possible solutions would be

i) 5! ii) 4!

iii) 5 iv) 25

B) State whether each of the following statements is True or False. **[1 each]**

a) If objective function in an LPP is of minimization type, then a unique optimum solution is reached if all $z_j - c_j \geq 0$.

b) Hungarian method can be used for assignment problem of minimization type only.

C) Define each of the following with respect to LPP. **[1 each]**

a) Slack variable

b) a basic solution

D) a) Define canonical form of LPP. **[1]**

b) Explain how to modify cost matrix in a TP if the objective function is to maximize the profit. **[1]**

***Q2)*** Attempt any Two of the following: **[5 each]**

a) XYZ firm is engaged in producing two models A and B of a certain machine. It requires three operations viz. assembly, painting and testing. The relevant information is given below.

| Model | Hours required per unit | | | Profit per unit (₹) |
|---|---|---|---|---|
| | Assembly | Painting | Testing | |
| A | 0.2 | 0.5 | 0.2 | 50 |
| B | 1.5 | 0.6 | 0.1 | 40 |
| Hours available | 60 | 100 | 50 | |

The firm wishes to determine product mix so as to maximize the profit. Formulate it as L.P.P.

b) Describe a T.P. what do you mean by an unbalanced TP? Explain how to convert an unbalanced TP into a balanced TP with the help of one illustration.

c) Explain the following terms in network analysis.

i) event

ii) activity

iii) total float

iv) free float

v) independent float.

***Q3)*** Attempt any Two of the following: **[5 each]**

a) Write dual of the following LPP.

Minimize $Z = 3x_1 - 3x_2 + 7x_3$

Subject to

$$x_1 + 2x_2 + 3x_3 \leq 400$$

$$x_1 + 9x_2 - 7x_3 \geq 500$$

$$5x_1 + 3x_2 = 200$$

$x_1,\ x_2 \geq 0;\ x_3$ unrestricted in sign.

b) Explain the term initial basic feasible solution (IBFS) in a TP. Describe least cost method to obtain an IBFS of TP.

c) Explain the following terms in PERT

i) three time estimates

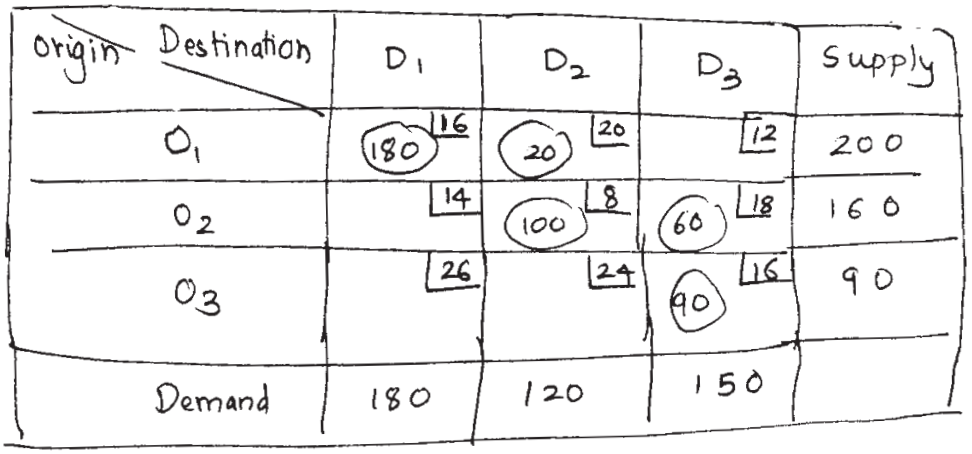
ii) expected project duration

iii) project variance

***Q4)*** Attempt any <u>One</u> of the following:

a) i) Explain Monte-Carlo method of simulation. Discuss its applications in statistics. **[5]**

ii) The IBFS of a TP is as shown below. **[5]**




Find the optimal solution so as to minimize transportation cost.

b) i) Describe how assignment problem (AP) can be treated as a particular case of transportation problem (TP). **[2]**

ii) Discuss how to resolve the problem of degeneracy in a TP. **[2]**

iii) An architect has been awarded a contract to prepare plans for an urban renewal project. The activities and their estimated times are given in the following table.

| Activity | Immediate Predecessors | Time (days) |
|---|---|---|
| A | - | 2 |
| B | - | 1 |
| C | A | 3 |
| D | A, B | 2 |
| E | C, D | 1 |
| F | B | 3 |
| G | E, F | 1 |

Draw the network diagram of activities for the project. Calculate total float for each activity. Hence indicate critical path. **[6]**

Total No. of Questions : 4]

SEAT No :

**P649**

[Total No. of Pages : 8

# [5115] - 451
## T.Y.B.Sc.
## STATISTICS (Principal)
## ST - 345 (A) : Reliability and Survival Analysis
## (2013 Pattern) (Paper - V) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator and statistical tables is allowed.***
4) ***Symbols and abbrivations have their usual meaning.***

***Q1)*** Attempt each of the following: **[1 each]**

(A) In each of the following cases choose the correct alternative:

a) In a k-out-of-*n* : G system, the number of minimal path sets and minimal cut sets are respectively.

i) $\binom{n}{k}, \binom{n}{n-k}$ ii) $\binom{n}{k}, \binom{n}{n-k-1}$

iii) $\binom{n}{k}, \binom{n}{n-k+1}$ iv) $\binom{n}{n-k}, \binom{n}{k}$

b) Structure function $\phi(\underline{X})$ of parallel system of n independent components is given by

i) $\phi(\underline{X}) = \text{Min}\{X_1, X_2, ....., X_n\}$

ii) $\phi(\underline{X}) = \prod_{i=1}^{n} X_i$

iii) $\phi(\underline{X}) = \coprod_{i=1}^{n} X_i$

iv) $\phi(\underline{X}) = \prod_{i=1}^{n} (1 - X_i)$

***P.T.O.***

c) Which one of the following relationships is incorrect?

i) $F(t) = 1 - \bar{F}(t)$

ii) $\bar{F}(t) = \exp(-R(t))$

iii) $f(t) = -\frac{d}{dt}F(t)$

iv) $r(t) = \frac{f(t)}{1 - F(t)}$

d) A system XYZ with 4 independent components A, B, C, and D works if and only if A or B or C or D works. Then XYZ is

i) an essentially series system

ii) a series system

iii) a 2-out-of-4: Good system

iv) a 1-out-of-4 : Good system

B) State whether each of the following statement is true or false. **[1 each]**

a) A coherent system is bounded below by the performance of parallel system.

b) In case of Weibull $(\lambda, \gamma)$, if shape parameter $\gamma > 1$ then it belongs to IFR class.

C) Define the following terms: **[1 each]**

a) Dual coherent structure.

b) IFR Distribution.

D) Attempt each of the following: **[1 each]**

a) What is type II censoring?

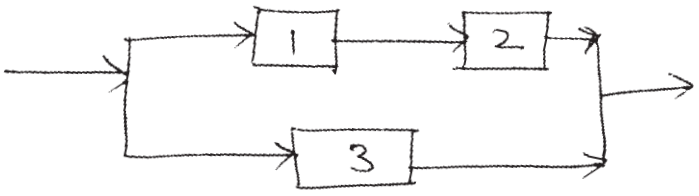
b) Obtain the value of survival function $\bar{F}(t)$ of a life time distribution with pdf $f(t) = 4e^{-4t}$ at time $t = 0.25$.

***Q2)*** Attempt <u>any two</u> of the following: **[5 each]**

a) Define relevant component.

Prove that a structure function $\phi$ increasing in each argument has at least one relevant component iff $\phi(0, 0, .....,0) = 0$ and $\phi(1, 1, .....,1) = 1$.

b) Consider a system with following reliability block diagram.




Find :

i) all possible state vectors.

ii) all possible path vectors

iii) minimal path vectors

iv) all possible cut vectors

v) minimal cut vectors

c) Define New Better than used (NBU) and New Better than Used in Expectation (NBUE) Classes of life distributions.

Show that if F belongs NBU class of life distributions then it belongs to NBUE class of life distributions.

***Q3)*** Attempt <u>any two</u> of the following: **[5 each]**

a) If mean residual life function ($L_F^{(t)}$) of a component is $3t + 1$, $t \geq 0$.

Find:

i) failure rate

ii) survival function

iii) density function

b) A system consists of 4 components, functions when both components 1 and 4 functions and at least one of the remaining two components function. Draw reliability block diagram and find reliability of the system.

c) Define non-parametric estimator of survival function. Show that it is an unbiased as well as consistent estimator of survival function.

***Q4)*** Attempt <u>any one</u> of the following:

a) i) Let T denote life time. Assume that the distribution of T is exponential show that:

I) the life time distribution is both IFR and DFR.

II) it satisfies Cauchy-functional form. **[7]**

ii) A system consists of 7 independent identical components connected in parallel. What must be the reliability of each component so that the overall reliability of the system is 0.9? **[3]**

b) i) Show that for series system, system reliability can not exceed component reliability. **[2]**

ii) Write short note on "bath tub failure rate" class of life distributions. **[4]**

iii) If $r_i(t)$, $i = 1, 2,.....,n$ are hazard rates of n independent components of a series system then prove that the hazard rate of the system

$$r(t) = \sum_{i=1}^{n} r_i(t).$$ **[4]**

**Total No. of Questions : 4]**

**P649**

# [5115] - 451
# T.Y.B.Sc.
# STATISTICS (Principal)
# ST - 345 (B) : Introduction to Stochastic Processes
# (2013 Pattern) (Paper - V) (Semester - IV)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculators and statistical tables is allowed.***
4) ***Symbols and abbreviations have their usual meaning.***

***Q1)*** Attempt each of the following: **[1 each]**

(A) Choose the correct alternative in each of the following:

a) Consider a Markov chain $\{x_n, n \geq 0\}$ with discrete state space. If the transition probabilities are independent of $n$, the Markov chain is said to be

i) independent ii) homogeneous

iii) reducible iv) non homogeneous

b) A state j of a Markov chain is persistent if

i) it is aperiodic

ii) it is ergodic

iii) return to state $j$ is certain

iv) return to state $j$ is uncertain

c) If a closed set contains only one state then that state is

i) absorbing

ii) transient

iii) communicable

iv) reducible

d) If customers arrive at a counter in accordance with poisson process with mean rate of 3 per minute, then the probability that exactly 4 customers arrive in an interval of 2 minutes is

i) 0.714 ii) 0.313

iii) 0.25 iv) 0.133

B) State whether each of the following statements is true or false.**[1 each]**

a) The state space of a finite Markov chain must contain at least one persistent state.

b) The sum of elements in each column of a one step transition probability matrix is always 1.

C) Define **[1 each]**

a) A Markov chain

b) An ergodic state of a Markov chain

D) State additive property of a Poisson process. **[1]**

E) Suppose that the probability that a target is hit is 0.8 if it is hit in the previous attempt and 0.6 if it was not hit in the previous attempt. **[1]**

What is the probability that the target will be hit in third attempt if it was not hit in first attempt?

***Q2)*** Attempt <u>any two</u> of the following: **[5 each]**

a) Consider a Markov chain with one step transition probability matrix P as,

$$P = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1/4 & 1/8 & 1/8 & 1/2 \end{bmatrix}$$

Show that the Markov chain is irreducible. Compute probability of return to state 4 for the first time in 2 steps.

b) If $\{N_1, (t), t \geq 0\}$ and $\{N_2(t), t \geq 0\}$ are two independent Poisson processes with parameters $\lambda_1$ and $\lambda_2$ respectively, then show that

$P[N_1,(t) = k \mid N_1(t) + N_2(t) = n]$

$$= \binom{n}{k} p^k \; q^{n-k} \text{ where } \quad p = \frac{\lambda_1}{\lambda_1 + \lambda_2}, \; q = \frac{\lambda_2}{\lambda_1 + \lambda_2}$$

c) Distinguish between persistent and transient states of a Markovchain. Explain with suitable illustration.

***Q3)*** Attempt any two of the following: **[5 each]**

a) A man walks along 5 block stretch. If he is at block 1, 2 or 3 then he walks to the left or right with equal probability. He continues until he reaches block 4 where there is a hotel or at block 0 where there is his home. If he reaches home or hotel, he stays there.

Show that above situation is a Markov chain and obtain 1-step transition probability matrix.

b) Suppose $\{X_n, n \geq 0\}$ is a Markov chain and $p_{jk}^{(n)}$ is m-step transition probability.

i.e. $p_{jk}^{(m)} = P[X_{n+m} = k \mid X_n = j]$

state and derive Chapman kolmogorov equation for $\{X_n, n \geq 0\}$.

c) Explain periodicity of a state of a Markov chain.

Let $\{X_n, n \geq 0\}$ be a Markov chain having state space $S = \{0, 1, 2, 3\}$ with one-step transition probability matrix

$$P = \begin{bmatrix} 1/3 & 2/3 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1/2 & 0 & 1/2 & 0 \\ 0 & 0 & 1/2 & 1/2 \end{bmatrix}$$

Show that state 0 is aperiodic.

***Q4)*** Attempt any one of the following:

a) i) State and explain three postulates of Poisson process. **[3]**

ii) The weather condition at a place is as follows: There are no two sunny days in a row. A sunny day is followed by snow or rain with equal chance. If it rains or snows on a day, there is an even chance of having the same next day and if there is change in weather from snow or rain, half the time the weather changes to sunny day.

What is the probability that February 10 would be a sunny day if it rained on February 8? **[5]**

iii) Distinguish between discrete and continuous state space of a stochastic process. **[2]**

b) i) Let $\{X_n, n \geq 0\}$ be a Markov chain with state space $\{1, 2, 3\}$ and one step transition probability matrix P as,

$$P = \begin{bmatrix} 1/2 & 1/2 & 0 \\ 0 & 1/4 & 3/4 \\ 1/3 & 1/3 & 1/3 \end{bmatrix}$$

with initial probability distribution as follows: $P[X_0 = 1] = P[X_0 = 2] = \frac{1}{4}$ and $P[X_0 = 3] = \frac{1}{2}$

Compute: 1) $P[X_3 = 3 \mid X_1 = 1]$

2) $P[X_2 = 1, X_0 = 3]$ **[5]**

ii) Define compound Poisson process. State its mean and variance.

Illustrate with suitable example. **[3]**

iii) Explain closed set of states in case of a Markov chain. **[2]**

Total No. of Questions : 4]

SEAT No. :

**P650**

[Total No. of Pages : 4

# [5115]-452
# T.Y.B.Sc.
# STATISTICS
## ST - 346 : Statistical Computing Using 'R' Software
## (2013 Pattern) (Semester - IV) (Paper - VI) (Batch - I)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Each question is to be solved using R software installed on your computer.***
4) ***Attach computer printout of your work to the answer book supplied to you.***

***Q1)*** Attempt each of the following: **[1 each]**

a) Create a vector $x$ of following observations by using scan function.

50, 50, 30, 50, 30, 20, 20, 20, 20.

Also find third quartile of $x$.

b) Let $X \sim C(3,2)$. Find $P(3 \leq X < 6)$.

c) Draw a random sample of size 10 from Hypergeometric distribution with N = 40, M = 15, $n$ = 6.

d) Write a R-program script to obtain sum of squares of numbers 1 to 5 using for statement.

e) Draw a box plot for the following data:

5, 10, 23, 40, 26, 8, 18, 14, 9, 49.

f) Create a data frame of name of 5 students and their percentage using edit command.

g) Create a file in MS-Excel containing employee identity no., monthly salary for three employees and save it as text file. Import this text file in R.

***P.T.O.***

h) Find mode of the following observations:

17, 10, 9, 10, 10, 12, 16, 19, 20, 21.

i) Compute mean deviation from median for the following data:

35, 25, 22, 29, 42, 11, 15, 20, 11, 27.

j) Compute geometric mean and harmonic mean of the following observations:

38, 35, 42, 59, 29, 21, 46, 32.

***Q2)*** Attempt <u>any two</u> of the following: **[5 each]**

a) Data on types of transportation used by 800 students to come to school are given as below.

| Type of transportation | Bus | Car | Bicycle | Walking |
|---|---|---|---|---|
| No.of students | 240 | 80 | 360 | 120 |

Draw a pie diagram for the above data.

b) i) Draw a probability curve of Weibull distribution with shape parameter 1.5 and scale parameter 2. **[3]**

ii) Each person in a random sample of 10 employees was asked about the daily time wasted at work doing non-work activities such as surfing the internet and emailing friends etc. The resulting data in minutes are as follows:

108, 112, 117, 130, 111, 131, 113, 113, 105, 128.

Use Kolmogorov - Smirnov test to test whether these data come from a normal distribution with mean 120 and standard deviation 10. **[2]**

c) The following figures relate to size of capital of 215 companies.

| Capital (in Rs. lakhs) | 1-6 | 6-11 | 10-16 | 16-21 | 21-26 | 26-31 |
|---|---|---|---|---|---|---|
| No.of companies | 20 | 27 | 29 | 38 | 48 | 53 |

Calculate Bowley's coefficient of skewness.

***Q3)*** Attempt any two of the following: **[5 each]**

a) Write R-program code to carry out two-way ANOVA for the following data:

| | Fertiliser I | Fertiliser II | Fertiliser III | Fertiliser IV |
|---|---|---|---|---|
| Seed A - 402 | 106 | 95 | 94 | 103 |
| Seed B - 894 | 110 | 98 | 100 | 108 |
| Seed C - 952 | 94 | 86 | 98 | 99 |

Also interprete the results. (Use 5% l.o.s.)

b) In a traffic survey a random sample of 50 motorists were asked the distance they drove to work daily. The results of the survey are shown in the following table.

| Distance | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|---|---|---|---|---|---|
| Count | 9 | 19 | 15 | 5 | 4 |

Draw histogram and frequency polygon for the above data.

c) Following data represent information regarding favourite colour of 500 school boys and girls.

| Color / Gender | Blue | Green | Pink |
|---|---|---|---|
| Boy | 100 | 150 | 20 |
| Girl | 20 | 30 | 180 |

Test whether the attributes Gender and favourite colour are independent. (Use $\alpha = 0.05$)

***Q4)*** Attempt any one of the following:

a) i) Fit a Poisson distribution to the following data: **[5]**

| No.of accidents per day | 0 | 1 | 2 | 3 | >3 |
|---|---|---|---|---|---|
| Frequency | 395 | 235 | 73 | 17 | 0 |

Also plot expected frequencies against observed frequencies.

ii) A cosmetic company created a small trial of a new cream for treating skin blemishes. They measured the effectiveness of the new cream compared to the leading cream on the market and a placebo. The data are given as below:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| New | 46 | 32 | 42 | 45 | 37 | 44 | 38 |
| Old | 44 | 31 | 25 | 22 | 30 | 32 | |
| Control | 25 | 49 | 33 | 19 | 31 | 38 | |

Use Kruskal Wallis test for testing whether there is difference among mean output of three cosmetics. **[5]**

b) i) Following data represent weight (grams) recorded for the product produced by 5 product lines. **[6]**

| Line A | Line B | Line C | Line D |
|---|---|---|---|
| 250 | 310 | 250 | 340 |
| 260 | 330 | 230 | 270 |
| 270 | 360 | 260 | 320 |

I) Write R-program code for test for equality of variances using Bartlett's test.

II) Check normality of observations using Shapiro-Wilk's test.

ii) Titanium content in an aircraft grade alloy is an important determinant of strength. A sample of 10 test coupons reveals the following titanium content (in %) as: **[4]**

8.32, 8.05, 8.65, 8.25, 8.36, 8.41, 8.3, 8.71, 8.6, 8.83

Use Wilcoxon's signed rank test to test the hypothesis that average titanium content is 8.5%.

Total No. of Questions :4]

SEAT No. :

**P651**

[Total No. of Pages :4

# [5115] - 452 A

## T.Y.B.Sc.

## STATISTICS (Principal)

## ST - 346: Statistical Computing Using 'R' Software (Online Paper)

## (Semester - IV) (2013 Pattern) (Paper - VI) (Batch - II) (Theory)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Each question is to be solved using R software installed on your computer.***
4) ***Attach computer printout of your work to the answer book supplied to you.***

***Q1)*** Attempt each of the following: **[1each]**

a) Draw a random sample of size 12 from a B ($n = 8, p = 0.6$).

b) Create a data frame of student name and marks obtained in one subject for 5 students, using edit command.

c) Find mean and median of the following observations:

100, 105, 109, 115, 117, 103, 114, 112.

d) Draw box plot of the following observations

28, 42, 25, 34, 25, 37, 26, 33, 36, 28, 33.

e) Create a vector $x$ of the following observations using scan function:

13, 19, 18, 17, 16, 28, 24, 26, 27, 32.

f) Let $X \sim P(m = 4.2)$, find $P(X<5)$ and $P(X \geq 7)$.

g) Compute mean deviation about mean of the following observations:

45, 48, 56, 57, 43, 44, 58, 55.

***P.T.O.***

h) Create a file in MS-EXCEL containing roll number along with marks for two students in Statistics and save it as a text file, further import this file in R.

i) Write R programme script for summing up the numbers 11 to 20 using for loop.

j) Let $X \sim N(10, 4)$, find $k$ such that $P(X < k) = 0.4$.

***Q2)*** Attempt any two of the following: **[5 each]**

a) Represent the following data by a bar diagram:

| Year | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|
| Profit (lakh Rs.) | 17.5 | 16.8 | 18.2 | 16.4 | 18.5 |

b) Fit a Poisson distribution to the following data and find expected frequencies:

| Number of misprints | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Number of pages | 142 | 84 | 37 | 7 | 3 | 2 | 1 |

c) Compute Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for the following data and comment:

12, 19, 23, 29, 24, 21, 19, 18, 19, 20.

***Q3)*** Attempt any two of the following: **[5 each]**

a) Compute geometric mean and harmonic mean for the following data:

| $x$ : | 3 | 5 | 7 | 9 | 10 |
|---|---|---|---|---|---|
| $f$ : | 10 | 12 | 21 | 17 | 5 |

b) Draw histogram and frequency polygon for the following data:

| Wage (in Rs.) | 200-300 | 300-400 | 400-500 | 500-600 | 600-700 |
|---|---|---|---|---|---|
| No.of workers | 10 | 15 | 28 | 18 | 14 |

c) The following are the weights in pounds of 8 persons after a certain weight reducing diet programme for 4 weeks:

| Person | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Weight Before | 162.8 | 197.5 | 208.4 | 178.5 | 208.3 | 191.8 | 198.4 | 184.6 |
| Weight after | 152.4 | 189.2 | 196.3 | 171.4 | 201.8 | 189.3 | 190.8 | 181.2 |

Use Wilcoxon's signed rank test to test whether the programme is effective in reducing weight at 5%l.o.s.

***Q4)*** Attempt any one of the following:

a) i) The time in minutes that a patient has to wait in a consulting room for the treatment for ten patients is recorded as given below:

21, 18, 17, 15, 30, 28, 19, 30, 27, 28.

Write R programme script to test the hypothesis that average waiting time in consulting room is 25 minutes by verifying the assumptions.

ii) The following table shows the classification of 1200 workers in a factory according to the disciplinary action taken by the management and their promotional experience:

| Promotional experience<br>Disciplinary action | Promoted | Not promoted |
|---|---|---|
| Non- offenders | 100 | 258 |
| Offenders | 42 | 800 |

Test whether promotional experience is independent of disciplinary action. Use 5% l.o.s. **[7+3]**

b) i) Write R programme script for carrying out the ANOVA for the following data of yield (in kgs):

| Manures | | |
|---|---|---|
| A | B | C |
| 15.5 | 17.2 | 16.2 |
| 17.6 | 15.6 | 18.5 |
| 19.8 | 15.4 | 14.3 |
| 16.2 | 15.6 | 16.1 |

Also verify the assumptions.

ii) Draw random samples of size 10 each from two independent standard normal distributions, hence draw a r.s.of size 10 from standard cauchy distribution. **[7+3]**

Total No. of Questions :4]

SEAT No. :

**P652**

[Total No. of Pages :4

# [5115] - 452 B

## T.Y.B.Sc.

## STATISTICS (Principal)

## ST - 346: Statistical Computing Using 'R' Software (Online Paper)

## (Semester - IV) (2013 Pattern) (Paper - VI) (Batch - III)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Each question is to be solved using R software installed on your computer.***
4) ***Attach computer printout of your work to the answer book supplied to you.***

***Q1)*** Attempt each of the following: **[1each]**

a) Create a vector of odd numbers between 1 and 100.

b) Create a data frame of 5 workers containing names and basic pay, use edit command.

c) Let $X \rightarrow N(\mu = 53, \sigma^2 = 20)$. Find $P(40 \leq X \leq 90)$.

d) Draw a random sample of size 10 from B ($n = 5$, $p = 0.25$). Also find mean of sample.

e) Create a vector $x$ of following observations by using scan function.

50, 43, 24, 27, 50, 42, 41, 37, 22, 27. Also find median of $x$.

f) Draw a box plot for the following data:

23, 25, 19, 23, 12, 18, 31, 19, 26, 17, 34, 18, 23, 22, 23.

g) Create a file in MS-Excel containing seat no., faculty for two students and save it as text file. Import this text file in R.

***P.T.O.***

h) Obtain variance of following observations:

12, 18, 31, 19, 26, 23, 25, 19, 23, 17, 34, 18, 23, 22, 23.

i) Find the value of 25!

j) A vector *x* contains elements 61, 31, 81, 100, 110, 190, 50, 100, 120, 130, Create a vector *y* from *x* containing elements of *x* which are greater than 109.

***Q2)*** Attempt any two of the following:

a) Draw histogram and frequency polygon for the following data: **[5]**

| Weight (in Kg) | No. of Students |
|---|---|
| 45-50 | 10 |
| 50-55 | 18 |
| 55-60 | 45 |
| 60-65 | 75 |
| 65-70 | 79 |
| 70-75 | 43 |
| 75-80 | 16 |
| 80-85 | 14 |

b) The time in minutes that a patient has to wait in a consulting room for the treatment for 12 patients is recorded as follows:

15, 17, 21, 20, 32, 28, 12, 26, 25, 24, 30, 35.

Write a R program script to conclude that whether average waiting time in consulting room is 20 minutes. Use 4% level of significance. **[5]**

c) i) Draw the graph of probability curve of Exponential distribution with mean 3.

ii) Use Komogorov-Smirnov test to test whether the following random sample comes from U(0, 2) distribution.

0.72, 1.5, 1.23, 0.15, 0.35, 0.49, 0.65, 0.9, 0.85, 1.69. Use 5% level of significance. **[3+2]**

***Q3)*** Attempt any two of the following: **[5 each]**

a) Represent the following data by multiple bar diagram.

| Year | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Export | 260 | 320 | 350 | 520 | 640 |
| Import | 350 | 400 | 480 | 500 | 700 |

b) Fit a Poisson distribution to the following data:

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 & above |
|---|---|---|---|---|---|---|---|
| *f* | 214 | 89 | 42 | 24 | 8 | 2 | 0 |

Also find expected frequencies and plot observed and expected frequencies. Also test the adequacy of model.

c) A group of 50 girls and 40 boys was asked to give their preference between two brands of mobile hand sets. The results obtained are as follows:

| | Brand I | Brand II |
|---|---|---|
| Boys | 23 | 17 |
| Girls | 20 | 30 |

Test at 5% level of significance whether preference of a particular brand, is independent of sex.

***Q4)*** Attempt any one of the following:

a) i) Following are the data on the number of hours that a rechargeable hedge trimmer operates before a recharge is required:

1.5, 2.2, 0.9, 1.3, 2.0, 1.6, 1.8, 1.5, 2.0, 1.2, 1.7.

Use Wilcoxn's signed rank test to test the hypothesis that this particular trimmer operates with median of 1.8 hours before requiring a recharge. Use $\alpha = 0.05$.

ii) Write R program script for carry out the ANOVA for the following data by verifying the underlying assumptions:

| Treatment | Observations | | | | | | |
|---|---|---|---|---|---|---|---|
| X | 213 | 209 | 218 | 207 | | | |
| Y | 206 | 222 | 208 | 204 | 205 | | |
| Z | 202 | 208 | 213 | 216 | 223 | 244 | |

**[3+7]**

b) i) For the following observations find

1) Karl Pearson's coefficient of skewness

2) Coefficient of skewness based on moments.

141, 162, 119, 117, 122, 133, 127, 143, 126, 134.

ii) Compute mean deviation about median for the following data:

| Life (in thousand kms.) | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 |
|---|---|---|---|---|---|---|
| No. of tyres | 5 | 8 | 13 | 20 | 14 | 10 |

**[5+5]**

Total No. of Questions :4]

SEAT No. :

**P653**

[Total No. of Pages :4

# [5115] - 452 C

## T.Y.B.Sc.

## STATISTICS (Principal)

## ST - 346: Statistical Computing Using 'R' Software (Oneline Paper)

## (Semester - IV) (2013 Pattern) (Paper - VI) (Batch - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Each question is to be solved using R software installed on your computer.***
4) ***Attach computer printout of your work to the answer book supplied to you.***

***Q1)*** Attempt each of the following: **[1each]**

a) Write a R-program script to obtain maximum of two numbers using if-else statement.

b) Draw a random sample of size 12 from Poisson distribution with mean 4.

c) Create a vector $x$ of the following observations using scan function.

12, 10, 8, 14, 16, 20, 7, 13, 15, 17.

Find quartiles of $x$.

d) Draw a rod plot of the following data:

| $x$ | 2 | 4 | 6 | 9 | 11 | 13 |
|---|---|---|---|---|---|---|
| $f$ | 6 | 11 | 20 | 24 | 13 | 8 |

e) Write R-program script for computing value of factorial 10 using a for loop.

***P.T.O.***

f) Create a file in MS-EXCEL of the following data and import it to R.

Student Number Mark in oral

1 9

g) Let $X \rightarrow N(\mu = 10; \sigma^2 = 16)$.

Find K such that $P(12 < X < K) = 0.2$

h) Draw stem and leaf diagram for the following data:

32, 12, 9, 7, 7, 5, 21, 16, 12, 35, 25, 29, 22, 42, 15, 20, 11, 19, 6, 27, 38, 31.

i) Creat a data frame *d* of X and Y where

X = 1, 2, 3, 4, 5 and Y = 10, 12, 8, 7, 9. Use edit command.

j) Waiting time (in minutes) of 12 patients in a consulting room are recorded as follows:

17, 15, 20, 21, 32, 28, 12, 26, 25, 24, 30, 22.

Using appropriate test check whether waiting times are normally distributed.

***Q2)*** Attempt <u>any two</u> of the following: **[5 each]**

a) Draw a simple bar diagram for the following data:

| Year | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Annual sales (in lakhs of Rs.) | 12.8 | 13.4 | 14.3 | 15.8 | 16.9 |

b) The frequency distribution of weight (in gms) of mangoes of a certain veriety is given below:

| Weight | 410-420 | 420-430 | 430-440 | 440-450 | 450-460 | 460-470 |
|---|---|---|---|---|---|---|
| Number of mangoes | 14 | 20 | 42 | 54 | 45 | 18 |

Calculate arithmetic mean, geometric mean, harmonic mean and mode.

c) Use the following data to test whether the attributes condition of home and condition of child are independent. Use 5% l.o.s.

| Condition of child | Condition of home: Clean | Condition of home: Dirty |
|---|---|---|
| Clean | 70 | 50 |
| Fairly clean | 80 | 20 |
| Dirty | 35 | 45 |

***Q3)*** Attempt <u>any two</u> of the following: **[5 each]**

a) Fit a Poisson distribution to the following data and find the expected frequencies. Also obtain a plot of the observed against expected frequencies.

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| $f$ | 93 | 67 | 50 | 30 | 16 | 5 | 2 |

b) Frequency distribution of number of persons according to their monthly expenditure (in Rs) on transport is given below:

| Monthely Expenditure | 300-350 | 350-400 | 400-450 | 450-500 | 500-550 | 550-600 |
|---|---|---|---|---|---|---|
| Numbers of persons | 12 | 23 | 38 | 15 | 10 | 2 |

Calculate Bowley's coefficient of skewness.

c) Draw less than and more than ogive curves for the following data:

| Weight (in lbs) | 140-144 | 145-149 | 150-154 | 155-159 | 160-164 | 165-169 |
|---|---|---|---|---|---|---|
| Number of persons | 4 | 13 | 22 | 45 | 16 | 9 |

***Q4)*** Attempt <u>any one</u> of the following:

a) i) Following are the data on yield per plot after applying three treatments $T_1$, $T_2$ and $T_3$.

| Treatment | Yields |
|---|---|
| $T_1$ | 54, 41, 64, 29, 45 |
| $T_2$ | 31, 43, 45, 62 |
| $T_3$ | 33, 30, 28, 64, 40 |

Perform ANOVA by verifying the underflying assumptions. **[7]**

ii) Draw the probability density function curve of the exponential distribution with parameter $\theta = 4$. **[3]**

b) i) The time in minutes taken to complete a job by machine I and machine II is given below:

Machine I : 20, 16, 26, 27, 23, 22, 25.

Machine II: 27, 33, 42, 35, 32, 34, 38, 29, 40.

Write R-program to test the variability in time distribution of machine I and machine II by verifying the underlying assumptions. **[5]**

ii) The following data represent the number of hours required to recharge bettery:

1.6, 2.3, 0.8, 1.5, 2.2, 1.8, 2.1, 1.7, 2.3, 1.4, 1.8.

Use Wilcoxson's signed rank test to test the hypothesis that the median time 1.9 hours is required to charge the battery. **[5]**

Total No. of Questions : 4]

SEAT No. :

**P654**

[Total No. of Pages : 2

# [5115]-453
# T.Y.B.Sc.
# GEOGRAPHY
## Gg - 341: Fundamentals of Human Geography
## (2013 Pattern) (Paper - II) (Semester - IV) (Part - II)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

***Q1)*** Answer the following questions in two or three sentences (Any ten) **[10]**

a) What is food security?

b) What is dependency ratio?

c) What are trade restrictions?

d) Give examples of two countries in the fourth stage of demographic transaction.

e) Name two factors affecting trade.

f) What are transport nodes?

g) Define Gini coefficient.

h) According to Weber what are weight gaining industries?

i) Give examples of crops grown in plantation agriculture.

j) What is subsistence agriculture?

k) Name two criteria on the basis of which one can differentiate between rural and urban settlements.

l) Whose theory mentions positive and preventive checks.

m) Whose theory mentions weight losing and weight gaining industries.

***P.T.O.***

***Q2)*** Write short notes (any two). **[10]**

a) Commercial agriculture in the U.S.A.

b) Importance of studying age sex structure of population.

c) Factors affecting occupational structure of the population.

d) Relevance of Von Thunens theory.

***Q3)*** Answer the following questions in 100 words (Any two) **[10]**

a) Differenciate between hunger and malnutrition.

b) Elaborate the characteristics of extensive farming.

c) Elaborate the characteristics of rural urban fronge.

d) State the importance of Lorenz curve and Gini coefficient.

***Q4)*** Answer the following questions in 200 words (any one) **[10]**

Explain the demographic Transition Theory and its relevance today.

OR

Explain how the balance of payments affect the trade and economy of a country.

x x x

Total No. of Questions : 4]

SEAT No. :

**P655**

[Total No. of Pages : 2

# [5115]-454
# T.Y.B.Sc.
# GEOGRAPHY
## Gg - 342: Geography of Travel and Tourism (Part - II)
## (2013 Pattern) (Paper - IV) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

***Q1)*** Answer the following questions in two to three sentences each (Any ten)**[10]**

a) What do you mean by Agro-tourism?

b) Define the term eco-tourism?

c) Name any two places in India known for sports tourism?

d) What are Yatri bhavans?

e) What do you mean by induced expenditures?

f) Define employment multiplier.

g) State any two environmental impacts of Tourism.

h) State any two factors influencing choice of transport.

i) Name any two National Parks in India.

j) In which states Darjeeling and Nainital are located?

k) State any two modern means used for tourism development in India.

l) What is 'tour package'?

m) What are the main advantages of the tourist place 'Ellora'?

***P.T.O.***

***Q2)*** Write short note (any two). **[10]**

a) Farm Tourism.

b) Sales or transaction multiplier.

c) Use of ICT for tourism development.

d) Direct and indirect expenditure.

***Q3)*** Answer the following in 100 words (Any two) **[10]**

a) Explain the cultural impact of tourism.

b) Discuss the range of services in tourism sector with proper example.

c) Explain any two cheap modes of tourist accommodation in India.

d) Describe Darjeeling and Ooty as tourists place.

***Q4)*** Answer the following in 200 words (any one) **[10]**

a) Explain the role of tourism in foreign exchange earnings and balance of payment in India.

b) Explain in detail recent development in Tourism industry in India.

x x x

Total No. of Questions : 4]

SEAT No. :

**P656**

[Total No. of Pages : 2

# [5115]-455
# T.Y.B.Sc.
# GEOGRAPHY
## Gg - 343: Fundamentals of Geo-Informatics
## (2013 Pattern) (Paper - VI) (Semester - IV) (Part - II)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

***Q1)*** Answer the following questions in <u>two or three</u> sentences each (Any ten)**[10]**

a) What is meant by Geoinformatics?

b) What is GNSS?

c) What do you mean by DBMS?

d) What is attribute data?

e) What is Topology?

f) Define containment.

g) Define foreign key.

h) What is entity?

i) Define DTM.

j) What is query?

k) Mention any four techniques of spatial analysis.

l) What is multi-criteria analysis?

m) Mention any four uses of GPS.

***P.T.O.***

***Q2)*** Write short notes on (any two). **[10]**

a) Digital data as input in GIS.

b) Topological errors.

c) DEM.

d) Polygon Merge.

***Q3)*** Answer the following question in 100 words (Any two) **[10]**

a) Explain spatial analysis in GIS.

b) Difference between spatial and non-spatial query.

c) Explain buffer analysis.

d) Explain uses of GPS technology.

***Q4)*** Answer the following question in 200 words (any one) **[10]**

a) Give an account of topographic analysis in GIS.

b) Discuss the recent trends in GIS and GPS technology.

x x x

**Total No. of Questions : 4]**

**SEAT No. :** ____

**P657**

**[Total No. of Pages : 2**

# [5115]-456
# T.Y.B.Sc.
# GEOGRAPHY
## Gg - 344: Geography of India (Part - II)
## (2013 Pattern) (Semester - IV)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necesary.***
4) ***Use of map stencile is allowed.***

***Q1)*** Answer the following questions in two or three sentences each (Any ten)**[10]**

a) Mention any two types of iron-ore found in eastern India.

b) Name the first two states in India with the highest installed wind capacity.

c) What is tissue culture?

d) State the importance of livestock in Indian economy.

e) Mention any four states in India, known for out-migration.

f) What is population composition?

g) State any two states involved in copper mining in India.

h) Mention any two river basins with the highest hydel power potential in India.

i) State any two benefits of poly-house farming.

j) Why is the population density of Maharashtra high?

k) Who is the 'Father of white Revolution' in India?

l) Why is the regional development at India uneven?

m) State any two causes of droughts in India.

***P.T.O.***

***Q2)*** Write short notes (any two). **[10]**

a) Need of regional planning.

b) Biogas potential of India.

c) Distribution of bauxite in India.

d) Cloud burst in Uttarakhand.

***Q3)*** Answer the following questions in 100 words (Any two) **[10]**

a) Give the distribution of mineral oil reserves in India.

b) Write an overview of poly-house agriculture in India.

c) Discuss the importance of livestock resources in India.

d) Describe the impact of hail storms in Maharashtra.

***Q4)*** Answer the following questions in 200 words (any one) **[10]**

a) Explain with suitable examples the causes, effects and remedies on floods in India.

b) What is overpopulation? Discuss the problems and remedies of overpopulation in India.

x x x

Total No. of Questions : 4]

SEAT No. :

**P658**

[Total No. of Pages : 2

# [5115]-457
# T.Y.B.Sc.
# GEOGRAPHY
## Gg - 345: Geography of Soils
## (2013 Pattern) (Semester - IV) (Paper - X) (Part - II)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat sketches and diagrams wherever necessary.***
4) ***Use of map stencils is allowed.***

***Q1)*** Answer the following questions in two to three sentences (Any ten) **[10]**

a) What do you understand by 'translocation processes'.

b) Define 'soil'.

c) State the importance of addition process.

d) Mention any two names of Secondary minerals?

e) What is soil acidity?

f) Define 'Desertification'.

g) Describe any two solutions for reduction of saline soils.

h) What is base cations?

i) Define CEC (Cation Exchange Capacity)?

j) What do you understand by litter matter?

k) What is the C factor in Universal Soil Loss Equation?

l) Define intensive agriculture.

m) Write two responsible processes for removal process?

***P.T.O.***

***Q2)*** Write short notes (any two). **[10]**

a) Carbon Cycle.

b) Problems of soils in Maharashtra.

c) Soil reactions.

d) Types of soil erosion.

***Q3)*** Answer the following questions in 100 words (Any two) **[10]**

a) Describe various soil survey methods.

b) Discuss the 'R' factor in Universal Soil Loss Equation (USLE).

c) Write the characteristics of tropical Soils?

d) What are the effects of strongly acidic soils?

***Q4)*** Answer the following questions in 200 words (any one) **[10]**

a) Discuss the need of soil conservation and soil resource management in India.

b) Give an account of USDA soil classification.

x x x

Total No. of Questions : 4]

SEAT No. :

**P659**

[Total No. of Pages : 2

# [5115]-458
# T.Y.B.Sc.
# GEOGRAPHY
## Gg - 346: Fundamentals of Geo-informatics (Part - II)
## (2013 Pattern) (Semester - IV) (Paper - XII)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

***Q1)*** Answer the following questions in two or three sentences (Any ten) **[10]**

a) What you understand by satellite image?

b) What is GSLV?

c) What is panchromatic image?

d) What is a multispectral image?

e) What is 'spectral resolution'?

f) Define scanner.

g) State any two satellites of LANDSAT series.

h) What do you understand by circular satellite orbit?

i) What does the abbreviation LISS stands for?

j) What is classification?

k) Define digital image processing.

l) State the primary colors.

m) Mention any two elements of interpretation of satellite image.

***P.T.O.***

***Q2)*** Write short notes (any two). **[10]**

a) SPOT satellite.

b) Polar orbiting satellite.

c) Use of radar images.

d) Supervised classification.

***Q3)*** Answer the following questions in 100 words (Any two) **[10]**

a) What are the uses of satellite data in environmental studies?

b) Explain IRS series satellite.

c) Explain radar images.

d) Explain the image interpretation key.

***Q4)*** Answer the following questions in 200 words (any one) **[10]**

a) Write an account on elements of image interpretation with suitable examples.

b) Give an account of unsupervised classification.

x x x

Total No. of Questions : 4]

SEAT No. :

**P660**

[Total No. of Pages : 2

# [5115]-459
# T.Y.B.Sc.
# MICROBIOLOGY
## MB - 341: Medical Microbiology - II
## (2013 Pattern) (Semester - IV) (Paper - I)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagram wherever necessary.***

***Q1)*** Attempt the following:

a) State true or false: **[2]**

i) Viral capsid is made up of protein.

ii) Tinea nigra is infection of palms.

b) Fill in the blanks: **[2]**

i) Scientific name of the vector responsible for transmission of plasmodium species is _____.

ii) _____ disease is caused by Entamoeba histolytica.

c) Define: $LD_{50}$. **[1]**

d) Match the following: **[5]**

| I | | II | |
|---|---|---|---|
| i) | HIV | 1) | Water |
| ii) | Japanese Encephalitis | 2) | Air |
| iii) | Rabies | 3) | Mosquito |
| iv) | Hepatitis A | 4) | Dog |
| v) | SARS | 5) | Sexual transmission |

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Describe the mode of action of nystatin.

b) Illustrate diagrammatically life cycle of plasmodium species.

c) Explain the role of metronidazole in protozoal infection.

***Q3)*** Write short note on any two of the following: **[10]**

a) Mode of action of rifamycin.

b) Morphological and cultural characters of Canida.

c) Epidemeology of Dengue.

***Q4)*** Attempt any one of the following: **[10]**

a) Explain the development of antibiotic resistance in MRSA.

b) Discuss the criteria involved in the mechanism of drug resistance.

x x x

Total No. of Questions : 4]

SEAT No. :

**P661**

[Total No. of Pages : 2

# [5115]-460
# T.Y.B.Sc.
# MICROBIOLOGY
## MB - 342: Genetics & Molecular Biology - II
## (2013 Pattern) (Semester - IV) (Paper - II)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

***Q1)*** a) Attempt the following: **[10]**

i) The full form of CCC is _____.

ii) Define - Hfr.

iii) Define - Deletion mutants.

iv) State true or false - Recombination frequency increases with decreasing distance between the genes.

v) Recombination frequency between three genes X,Y & Z is as follows. Find out the gene order.

1) X & Y = 4.5%

2) X & Z = 3.5%

3) Y & Z = 2.5%

b) Match the following:

| A | | B | |
|---|---|---|---|
| i) | Hfr | 1) | $NAD^+$ |
| ii) | Conditional lethal mutant | 2) | Benzer |
| iii) | E.Coli DNA ligase | 3) | GAATTC |
| iv) | Spot test | 4) | Site specific Recombination |
| v) | Eco $R_1$ | 5) | Temperature sensitive mutants. |

***P.T.O.***

***Q2)*** Answer any two of the following: **[10]**

a) Use of Linkers in Recombinant DNA technology.

b) Comment on - "Co - transduction and linkage analysis".

c) Type II Restriction endonucleases.

***Q3)*** Draw neat labelled diagrams of any two of the following: **[10]**

a) $F^+$ and $F^-$ Mating.

b) Structure of a typical BAC vector.

c) Competence development and natural transformation in streptococcus pneumonieae.

***Q4)*** a) What is Cis - Trans test? Who devised it? Explain in detail Intracistronic complementation with a suitable example? Give its application? **[10]**

OR

b) What is DNA modification? Which agents carry out base modifications in DNA? Give role of Glycosylases in the Base Excision repair mechanism?

x x x

Total No. of Questions : 4]

SEAT No. :

**P662**

[Total No. of Pages : 2

# [5115]-461
# T.Y.B.Sc.
# MICROBIOLOGY
## MB - 343: Metabolism
## (2013 Pattern) (Semester - IV) (Paper - III)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

***Q1)*** a) Attempt the following: **[5]**

i) Define - Osmosis.

ii) List types of amylases.

iii) Write an example of chlorophyll containing bacterium.

iv) State first law of thermodynamics.

v) Write structure of N-Acetyl Glucose amine.

b) Match the following: **[5]**

| A | | B | |
|---|---|---|---|
| i) | Symport | 1) | $CO_2$ fixation. |
| ii) | NAM | 2) | Peptidoglycan cross linking |
| iii) | Transpeptidase | 3) | Electron carrier |
| iv) | RUBISCO | 4) | Monomer of peptidoglycan |
| v) | Cytochromes | 5) | Glucose and $Na^{++}$ |

***Q2)*** Answer any two: **[10]**

a) Pathway of phospholipid synthesis.

b) List types of active transport and explain $Na^+/k^+$ pump.

c) Describe ATP synthatase.

***P.T.O.***

***Q3)*** Write short notes on any two: **[10]**

a) Pathway for β - oxidation of fatty acids.

b) Ionophores.

c) Bacterial photosynthetic apparatus.

***Q4)*** Attempt any one:

a) Describe Noncyclic and cyclic photophorylation. **[10]**

b) What are high energy compounds? List various high energy compounds, and explain pyrophosphate and enolic phosphate compounds.

x x x

Total No. of Questions : 4]

SEAT No. :

**P663**

[Total No. of Pages : 2

# [5115]-462
# T.Y.B.Sc.
# MICROBIOLOGY
## MB - 344: Immunology - II
## (2013 Pattern) (Semester - IV) (Paper - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

***Q1)*** Attempt the following: **[5]**

A) Match the following:

| | | | |
|---|---|---|---|
| a) | DP, DQ, DR regions | i) | Live attenuated |
| b) | Sabin polio vaccine | ii) | Anticancerous |
| c) | TNF | iii) | MHC I |
| d) | A,B,C regions | iv) | Inactivated |
| e) | Salk polio vaccine | v) | MHC II |

B) State true or false: **[2]**

a) All cells express class I MHC molecules.

b) One disadvantage of inactivated vaccines is that they don't induce cell mediated immunity.

C) Fill in the blanks using the correct option: **[3]**

a) Father's blood group is 'O', Mother's blood group is 'B'. The child's blood group can't be _____

i) B ii) AB

iii) O iv) none of these

***P.T.O.***

b) Organisation of MHC in mice is called _____.

i) H-2 Complex ii) HLA complex

iii) D-2 Complex iv) MLA complex

c) Anaphylaxis involves _____.

i) IgE antibodies ii) IgD antibodies

iii) IgG antibodies iv) Platelets

***Q2)*** Attempt any two: **[10]**

a) What are monoclonal antibodies? Explain its production.

b) Illustrate diagramatically : Type IV hypersensitivity.

c) Explain the structure and role of MHC class II molecules.

***Q3)*** Write short notes (any two): **[10]**

a) Attenuated vaccines.

b) Jerne hemolytic plaque assay.

c) Myesthenia Gravis.

***Q4)*** Attempt any one:

a) What are precipitation reactions? Describe ochterlony in gel and Immunoelectrophoresis. **[10]**

b) Elaborate on :

i) Biochemistry of ABO blood group substances.

ii) Bombay blood group.

x x x

Total No. of Questions : 4]

SEAT No. :

**P664**

[Total No. of Pages : 2

# [5115]-463
# T.Y. B.Sc.
# MICROBIOLOGY
## MB - 345 : Fermentation Technology - II
## (2013 Pattern) (Paper - V) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

***Q1)*** Attempt the following: **[10]**

a) What are the advantages and disadvantages of submerged fermentation?

b) Match the following:

| | | | |
|---|---|---|---|
| i) | Antitoxin | 1) | Live attenuated |
| ii) | Ergosterol | 2) | Acetobacter sp. |
| iii) | Salk vaccine | 3) | Saccharomyces cerevisiae |
| iv) | Vinegar | 4) | Immunesera |

c) Enlist the raw materials used for mushroom production.

d) State true or false:

i) Steroid precursors are obtained from specific variety of plants.

ii) 6-APA is generated by the action of penicillinase.

e) Fill in the blanks:

i) A biological product containing antibodies against venom is called as _____.

ii) Name of baker's yeast is _____.

***P.T.O.***

***Q2)*** Write short notes on any two of the following: **[10]**

a) Yoghurt manufacturing.

b) Recovery of vitamin B12.

c) Recovery of streptomycin.

***Q3)*** Attempt any two of the following: **[10]**

a) Draw flow sheet of citric acid production.

b) Describe L-lysine production by direct fermentation method.

c) Explain the production of sabin polio vaccine.

***Q4)*** Attempt any one of the following: **[10]**

a) With the help of a flowsheet describe wine making process.

b) Enlist the methods of amylase production and describe any one in detail.

Total No. of Questions : 4]

SEAT No. :

**P665**

[Total No. of Pages : 2

# [5115]-464
# T.Y. B.Sc.
# MICROBIOLOGY
## MB - 346 : Agricultural and Environmental Microbiology
## (2013 Pattern) (Semester - IV) (Paper - VI)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagram wherever necessary.***

***Q1)*** Attempt the following:

a) Define: **[3]**

i) Biosorption.

ii) Bioterrorism.

iii) Integrated Pest Management.

b) What is in situ bioremediation? **[1]**

c) Write two applications of genetically modified microorganisms. **[2]**

d) State true or false: **[2]**

i) Heap leaching is used for copper leaching.

ii) Nitrogen fixation is an aerobic process.

e) Fill in the blank: **[1]**

_____ species of Rhizobium forms nodules on soybean group.

f) Name the medium used for cultivation of phosphate solubilizing Microorganisms. **[1]**

***P.T.O.***

***Q2)*** Write short notes on any two: **[10]**

a) Antisense RNA technology.

b) Types of Biosensors.

c) Bioremediation of industrial wastes.

***Q3)*** Comment on any two: **[10]**

a) Bioleaching of iron.

b) Biosorption.

c) Biodegradable plastics.

***Q4)*** Attempt any one: **[10]**

a) Describe the control of plant diseases by eradication.

b) Explain the nonsymbiotic nitrogen fixation with respect to

i) Role of nitrogenase and hydrogenase.

ii) Mechanism of nitrogen fixation.

Total No. of Questions : 4]

SEAT No. :

**P666**

[Total No. of Pages : 2

# [5115]-465
# T.Y. B.Sc.
# ELECTRONIC SCIENCE
## EL - 341 : Advanced Communication Systems
## (2013 Pattern) (Paper - I) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***

***Q1)*** Attempt all of the following:

a) What is non-resonant antenna? **[1]**

b) What is the purpose of companding? **[1]**

c) Why combining network is necessary in television transmitter? **[1]**

d) State one disadvantage of product demodulator. **[1]**

e) "Opening the mouth of waveguide, results into a dipole antenna". Comment. **[2]**

f) Write two features of low noise amplifier. **[2]**

g) State two applications of vocoder. **[2]**

h) Write the operating frequency range for UHF and microwave antenna. **[2]**

***Q2)*** Attempt any two of the following:

a) Draw block diagram of frequency stabilized reactance FM transmitter and explain its working. **[4]**

b) Compare ground wave and sky wave propagations with respect to frequency used, polarization, fading problem and range of service. **[4]**

c) Write a note on "Helical Antenna". **[4]**

***P.T.O.***

***Q3)*** Attempt any two of the following:

a) Explain working of Speed Gun Radar with suitable diagram. **[4]**

b) Draw block diagram of Delta Modulator and explain it. **[4]**

c) Describe how to achieve phase demodulation using phase locked loop. **[4]**

***Q4)*** Attempt any two of the following:

a) Draw block diagram of filter method of side band suppression and explain its working. State advantages and disadvantages of this method. **[6]**

b) With proper block diagram, explain working of FDM receiver. State applications of FDM. **[6]**

c) i) Define following parameters of antenna.

Directivity, Power gain, bandwidth. **[3]**

ii) What is ionosphere? State its different layers. **[3]**

Total No. of Questions : 4]

SEAT No. :

**P667**

[Total No. of Pages : 2

# [5115]-466
# T.Y. B.Sc.
# ELECTRONIC SCIENCE
## EL - 342 : Microcontroller and its Applications
## (2013 Pattern) (Paper - II) (New Course) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt all of the following:

a) What is the RAM size in 18F4580 PIC Microcontroller? **[1]**

b) Write the magnitude of unsigned int. **[1]**

c) Before transmission of byte of data serially, where it is placed? **[1]**

d) How many I/O lines are provided in 18F4580 PIC Microcontroller? **[1]**

e) What voltage levels are used for binary 0 and 1 in RS232? **[2]**

f) With XTAL = 11.0592 MHz, find the TH1 value needed to have 9600 band rate. **[2]**

g) What is RTC? Where it is used? **[2]**

h) Find the content of P2 after execution of following C code: **[2]**

```
P2 = 0;
P2 = P2 / 0 × 45;
P2 = ~ P2;
```

***Q2)*** Attempt any two of the following:

a) Explain the factors which affects time delay length in 8051 timers. **[4]**

b) Write an 8051C program to convert packed BCD 0 × 29 to ASCII and display the bytes on P1 and P2. **[4]**

c) Explain access bank of PIC 18 Microcontroller in brief. **[4]**

***P.T.O.***

***Q3)*** Attempt any <u>two</u> of the following:

a) Explain the difference between CISC and RISC architecture. **[4]**

b) Write an 8051 C program to transfer the message "OK" serially at 4800 baud continuously. Use 8 bit data, 1 stop bit. **[4]**

c) Draw LCD interface to 8051 Microcontroller and explain it. **[4]**

***Q4)*** Attempt any <u>two</u> of the following:

a) Explain the bit wise logical operators in 8051C with suitable examples. **[6]**

b) Draw stepper motor interface to 8051 Microcontroller. Write a C program to rotate the motor continuously. **[6]**

c) Draw the simplified view of PIC 18 Microcontroller. Write its features. **[6]**

OR

Attempt <u>all</u> of the following:

a) Write an 8051C program to toggle all bits of P1 every 200 ms. **[4]**

b) A 8-bit DAC is interfaced to 8051 Microcontroller. Write a C program to generate a square wave on it. **[4]**

c) Explain the interrupt structure of 8051 Microcontroller in brief. **[4]**

Total No. of Questions : 4]

SEAT No. :

**P668**

[Total No. of Pages : 2

# [5115]-467
# T.Y. B.Sc.
# ELECTRONIC SCIENCE
## EL - 343 : Power Electronics
## (2013 Pattern) (Paper - III) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator is allowed.***

***Q1)*** Attempt all of the following:

a) Define: reverse recovery time of diode. **[1]**

b) What is power electronics? **[1]**

c) List types of power circuits. **[1]**

d) Draw transient model of power BJT. **[1]**

e) What are types of ac voltage controllers? What are applications of ac voltage controller? **[2]**

f) How choppers are classified according to the operations in various quadrants? **[2]**

g) What is difference between half bridge & full bridge inverter? **[2]**

h) What are different types of UPS? What are applications of UPS? **[2]**

***Q2)*** Attempt any two of the following:

a) What is IGBT? What are advantages of IGBT over BJT & MOSFET? Explain typical output and transfer characteristics of IGBT. **[4]**

b) Explain working of single phase full wave rectifier with center tapped transformer. **[4]**

c) Explain the working of flyback converter with the help of it's block diagram. **[4]**

***P.T.O.***

***Q3)*** Attempt any <u>two</u> of the following:

a) i) How power semiconductor devices are classified? **[2]**

ii) What is cycloconverter? Explain working of single phase cycloconverter using O/P waveforms. **[2]**

b) Explain gate protection circuit for thyristor. **[4]**

c) Explain the working of forward converter. **[4]**

***Q4)*** Attempt any <u>two</u> of the following:

a) What are different types of thyristor? Explain V-I characteristics of SCR. Define Holding & Latching current. **[6]**

b) Explain the working of "Single phase transformer tap changers" with the help of circuit diagram. Explain voltage waveforms in brief for different control ranges. **[6]**

c) What is principle of regenerative brake control of DC-DC converter drives? What is application of it? **[6]**

OR

Attempt <u>all</u> of the following:

a) If $R_1$ = 1K$\Omega$, $R_2$ = 2K$\Omega$, R = 1K$\Omega$, C = 0.1$\mu$f, what is period of oscillation of PUT? **[4]**

b) Single phase full converter has $v_s$ = 100 sinwt and delay angle $\alpha = \pi/3$; what is range of average output voltage? **[4]**

c) A step up converter has $V_s$ = 220V, duty cycle is 60%, what is average output voltage of it? **[4]**

Total No. of Questions : 4]

SEAT No. :

**P669**

[Total No. of Pages : 2

# [5115]-468
# T.Y. B.Sc.
# ELECTRONIC SCIENCE
## EL - 344 : Foundation of Nano-Electronics
## (2013 Pattern) (Paper - IV) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***

***Given:*** i) ***mass of electron*** $m_e = 9.1 \times 10^{-31}$ ***kg.***

ii) ***Planck's constant*** $h = 6.625 \times 10^{-34}$ ***Js.***

***Q1)*** Attempt all of the following:

a) Define skin depth. **[1]**

b) Define Lorentz force. **[1]**

c) What is Physical Statistics? **[1]**

d) What is density of states? **[1]**

e) State differential form of Maxwell's equations. **[2]**

f) What is wave particle duality? **[2]**

g) How quantum statistics differ with classical statistics? **[2]**

h) State special features of nano electronics over microelectronics. **[2]**

***Q2)*** Attempt any two of the following:

a) State and prove the Poynting Vector theorem. **[4]**

b) Explain Fermi-Dirac Statistics. **[4]**

c) Obtain expression for wave functions and energy levels in deep one dimensional potential well. **[4]**

***P.T.O.***

***Q3)*** Attempt any two of the following:

a) Explain Maxwell-Boltzmann statistics. **[4]**

b) What is Hall effect? Explain Hall effect for a semiconductor slab. Obtain expression for Hall coefficient. State applications of Hall effect. **[4]**

c) Explain reflection and refraction of EM waves at non-conducting interface. **[4]**

***Q4)*** Attempt any two of the following:

a) Explain Top-down and Bottom-up approach. Explain steps involved in optical Lithography. **[6]**

b) Derive the equations for propogation of EM waves in free space. **[6]**

c) Explain construction of quantum well and electron transport in it. **[6]**

OR

Attempt all of the following:

a) Calculate ground state energy of a particle of mass $9.0 \times 10^{-28}$kg, which is free to move in a potential well of length 100Å. **[4]**

b) For glass interface, if $n_1 = 1.28$ and $n_2 = 1.24$. Find $R_n$ and $T_n$ for normal incidence. **[4]**

c) Calculate the De-Broglie wavelength of moving molecule of mass $2.3 \times 10^{-26}$ kg is confined to a region of 50nm in length. What is minimum uncertainty in its momentum? Assume kinetic energy of molecule is 2eV. **[4]**

Total No. of Questions : 4]

SEAT No. :

**P670**

[Total No. of Pages : 2

# [5115]-469
# T.Y. B.Sc.
# ELECTRONIC SCIENCE
## EL - 345 : Mathematical Methods and Circuit Analysis using MATLAB
## (2013 Pattern) (Paper - V) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***

***Q1)*** All questions are compulsory:

a) Write the Fourier series expansion of periodic function. **[1]**

b) Describe MATLAB command to find determinant of matrix $A=\begin{vmatrix}2 & 4\\ 3 & 5\end{vmatrix}$. **[1]**

c) >>K=[2 8 40 65 3 55 9]; write MATLAB command to eliminate the $4^{th}$ element from vector K. **[1]**

d) Explain even periodic function. **[1]**

e) Define Laplace transform of $f(t)$. **[2]**

f) Write a MATLAB program to plot function $x^4$, for $0 < x < 10$. **[2]**

g) Explain 'input' command in MATLAB. **[2]**

h) "A periodic function $f(t)$ is said to have Fourier series, if it obeys certain condition". Comment. **[2]**

***Q2)*** Answer any two of the following:

a) Explain curve fitting for straight line function. **[4]**

b) Expand the following as partial fractions. **[4]**

$$F(S)=\frac{2(S+1)}{(S^2+1)}$$

c) What is variable? How it is defined in MATLAB? Give rules regarding variable names. **[4]**

***P.T.O.***

***Q3)*** Answer any two of the following:

a) Find the Laplace transform of integral of $f(t)$. **[4]**

$$\mathcal{L}\left[\int_{0_-}^{t} f(t)\,dt\right]$$

b) Explain with suitable example 'for-end' loop in MATLAB. **[4]**

c) For the following table of values, obtain an appropriate least square fit for the data: **[4]**

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| $y$ | 1.2 | 2.1 | 2.8 | 2.7 | 4.5 | 5 | 5.5 | 6.3 | 8.0 | 9.0 |

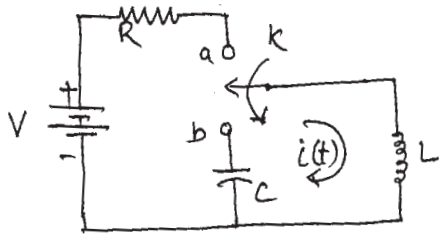
***Q4)*** Answer any two of the following:

a) Find Fourier series for function **[6]**

$$f(x) = x \qquad 0 < x < \pi$$
$$= -x \qquad -\pi < x < 0$$

b) Explain 'Switch-case' command in MATLAB with proper example. **[6]**

c) In the network shown, the switch K is moved from position $a$ to position $b$ at $t = 0$ (a steady state existing in position $a$ before $t = 0$). Solve for the current $i(t)$, using Laplace transformation method. **[6]**




OR

Attempt all the following:

a) Describe the function polyval in MATLAB. Write MATLAB script file for polynomial **[4]**

$$f(x) = x^5 - 2x^4 + 4x^3 - 7x^2 - 7x + 35$$

to calculate $f(2)$.

b) Explain break and continue commands in MATLAB. **[4]**

c) Determine Fourier coefficient $a_n$ for periodic function $f(x)$ of period $2\pi$. **[4]**

Total No. of Questions : 4]

SEAT No. :

**P671**

[Total No. of Pages : 4

# [5115]-470
# T.Y. B.Sc.
# ELECTRONIC SCIENCE
## EL - 346(A) : Industrial Automation
## (2013 Pattern) (Semester - IV) (Paper - VI) (Optional)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***

***Q1)*** Attempt all of the following:

a) What is active transducer? **[1]**

b) What is CMRR? **[1]**

c) State the function of controller. **[1]**

d) What is control lag? **[1]**

e) Explain working principle of S/H circuit. **[2]**

f) State applications of thermister. **[2]**

g) Draw circuit symbols of relay and switches used in ladder diagram. **[2]**

h) State the characteristics of derivative control mode. **[2]**

***Q2)*** Attempt any two of the following:

a) Draw and explain Hall effect sensor. **[4]**

b) Draw and explain non-inverting configuration of opamp. **[4]**

c) Describe two position (ON-OFF) controller mode. **[4]**

***P.T.O.***

***Q3)*** Attempt any <u>two</u> of the following:

a) Explain thermocouple as temperature sensor with neat diagram. **[4]**

b) Draw and explain multichannel DAS using single A/D converter. **[4]**

c) Describe the concept of continuous control system with proper example. **[4]**

***Q4)*** Attempt any <u>two</u> of the following:

a) Draw the block diagram of generalized measurement system. Explain function of each block. **[6]**

b) Describe following process characteristics. **[6]**

i) Process equation.

ii) Process load.

c) Explain Proportional - Integral (PI) control mode and state their characteristics. **[6]**

**Total No. of Questions : 4]**

**P671**

# [5115]-470
# T.Y. B.Sc.
# ELECTRONIC SCIENCE
# EL - 346(B) : Consumer Electronics
# (2013 Pattern) (Semester - IV) (Paper - VI)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat diagrams must be draw wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt all of the following:

a) State any two specifications of Digital Camera. **[1]**

b) What do you mean by CCD of Scanner. **[1]**

c) What is the Band width of Video baseband Signal used in CCIR-B Standard. **[1]**

d) State the name of sensor used in electronic weighing systems. **[1]**

e) "Crystal Microphone is active type Microphone". Comment. **[2]**

f) "The role of Microcontroller used in Washing Machine is to maintain the RPM" Comment. **[2]**

g) "OPC dram is used in Laser Jet Printer". Comment. **[2]**

h) "Hook Switch in the telephone set is used to connect the DC Power Supply to the dialing circuit". Comment. **[2]**

***Q2)*** Attempt any two of the following:

a) With the help of neat block diagram explain the working of condenser Microphone. **[4]**

b) State any four specifications of CCIR-B standard and the value of each specification. **[4]**

c) With the help of neat block diagram explain the working principle of Scanner. **[4]**

***Q3)*** Attempt any two of the following:

a) With the help of block diagram explain the working of base unit and Hand set of cordless phone. **[4]**

b) Draw the block diagram of Dot Matrix Printer and explain the working of each block. **[4]**

c) State different types of Video recording systems and state advantages of MP-4 over other systems. **[4]**

***Q4)*** Attempt any two of the following:

a) Draw the block diagram of Microwave oven and explain working of each block. **[6]**

b) Draw the block diagram of CATV and explain the working at each block. **[6]**

c) With the help of block diagram explain the Public Address System. **[6]**

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Total No. of Questions : 4]

SEAT No. :

**P672**

[Total No. of Pages : 2

# [5115]-471
# T.Y. B.Sc.
# DEFENCE AND STRATEGIC STUDIES
## DS - 401 : Internal Security of India
## (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full Marks.***

***Q1)*** Answer in 2 to 4 Sentences each: **[16]**

a) Define perspective planning.

b) Write any two economic dimensions of internal security.

c) Write any two role of leadership in the management of internal security.

d) What do you mean by organized crime?

e) Write any two characteristics of insurgency.

f) Write any two features of terrorism.

g) State the meaning of SEZ.

h) What do you mean by strength of war?

***Q2)*** Answer in 8 to 10 Sentences each (any two): **[8]**

a) Explain India's internal security perspectives.

b) Discuss agitations over SEZ issues.

c) Describe cultural dimensions of India's internal security.

***P.T.O.***

***Q3)*** Write short notes on (any two): **[8]**

a) Elements of the state.

b) Naxalite problem.

c) Cross border Terrorism.

***Q4)*** Answer in 18 to 20 sentences (Any one): **[8]**

a) Write a note on the role of military power in the management of internal security of the state.

b) Describe current security challenges to Northeast region of India.

Total No. of Questions : 4]

SEAT No. :

**P673**

[Total No. of Pages : 2

# [5115]-472
# T.Y. B.Sc.
# DEFENCE AND STRATEGIC STUDIES
## DS - 402 : Trend's in India's Defence Expenditure
## (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full Marks.***

***Q1)*** Answer in 2 to 4 Sentences each: **[16]**

a) Define Defence economy.

b) Define strategic planning.

c) Define perspective planning.

d) Define Zero budget.

e) Define performance budget.

f) Define Mixed economy.

g) Define Threat perception.

h) What are the challenges of defence preparedness?

***Q2)*** Answer in 8 to 10 Sentences each (any two): **[8]**

a) Explain relationship between parliament and defence budget.

b) Discuss role of private sector in defence production.

c) Describe structure of India's defence budget.

***P.T.O.***

***Q3)*** Write short notes on (any two): **[8]**

a) Functions of Ministry of defence.

b) DPSU.

c) DRDO.

***Q4)*** Answer in 18 to 20 sentences (Any one): **[8]**

a) Analyses India's defence spending from 1962 to till date.

b) Discuss characteristics of India's economy.

Total No. of Questions : 4]

SEAT No. :

**P674**

[Total No. of Pages : 2

# [5115]-473
# T.Y. B.Sc.
# DEFENCE AND STRATEGIC STUDIES
## DS - 404 : Information Warfare and Cyber Security
## (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are Compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer in 2 to 4 Sentences each: **[16]**

a) What is meant by the acronym C4 ISR?

b) What is INFORMATION?

c) How modern war has become Hi-Tech?

d) Elaborate the term National Security.

e) Write the Strategic Aim of Information Warfare.

f) Define Electronic Warfare.

g) What is SCADA?

h) What is meant by Propaganda?

***Q2)*** Answer in 8 to 10 Sentences each (any two): **[8]**

a) Write about the application of IW in spreading RUMOUR.

b) How IW is set to revolutionize the Concept of Warfare?

c) Write the concept of Information Technology.

***P.T.O.***

***Q3)*** Write short notes on (any two): **[8]**

a) Prospects of IW for Land Operations.

b) Prospects of IW for Naval Operations.

c) Prospects of IW for Air Operations.

***Q4)*** Answer in 16 to 20 sentences (any one): **[8]**

a) Write the role of Computer in Information System.

b) Explain about Strategic Significance of IW.

Total No. of Questions : 4]

SEAT No. :

**P675**

[Total No. of Pages : 2

# [5115]-474
# T.Y. B.Sc.
# DEFENCE AND STRATEGIC STUDIES
## DS - 405 : Defence Production and Logistics in India
## (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are Compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer in 2 to 4 Sentences each: **[16]**

a) What is meant by foreign collaboration?

b) Define the term "National development".

c) What is meant by grade of technology?

d) Define technology absorption.

e) Introduce LC A.

f) What is "Obsolescence Factor"?

g) Write the role of Technological Institutions.

h) What is meant by Technological Modifications?

***Q2)*** Answer in 8 to 10 Sentences each (any two): **[8]**

a) Give the status of Make in India and Defence Procurement.

b) Explain the status of Integrated Defence Logistics.

c) Write the significance of dual use technologies.

***P.T.O.***

***Q3)*** Write short notes on (any two): **[8]**

a) Mobilization of Logistics element during war.

b) Supply Chain Management.

c) Just in time Concept.

***Q4)*** Answer in 16 to 20 sentences (any one): **[8]**

a) Explain the role of defence production in National Development.

b) Explain about the Working Principles of Logistics.

Total No. of Questions : 4]

SEAT No. :

**P676**

[Total No. of Pages : 4

# [5115]-475
# T.Y. B.Sc.
# DEFENCE AND STRATEGIC STUDIES
## DS - 406(A) : Defence Journalism and National Security
## (2013 Pattern) (Semester - IV) (Optional)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer in 2 to 4 sentences each: **[16]**

a) What is NEWS?

b) What is meant by Column?

c) What is meant by Bulletin?

d) Define National Security.

e) Write about the importance of Military to Society.

f) What is meant by AFSPA?

g) Write the responsibility of Defence PRO.

h) What is significance of Press-Conference?

***Q2)*** Answer in 8 to 10 sentences each (any two): **[8]**

a) As a journalist, how will you make sure secrecy in defence reporting?

b) You are interviewing Army Chief; ask ten questions on its preparedness.

c) Write about the current trends in Indian Defence Journalism.

***P.T.O.***

***Q3)*** Write short notes on (any two): **[8]**

a) Essential knowledge for defence journalists.

b) Indian War Reporting.

c) Fair and Balanced Reporting.

***Q4)*** Answer in 16 to 20 sentences (any one): **[8]**

a) Explain the problems and prospects in defence journalism.

b) As a journalist, how will you encourage a debate on the subject 'National Defence and Security'?

**Total No. of Questions : 4]**

**P676**

# [5115]-475
# T.Y. B.Sc.
# DEFENCE AND STRATEGIC STUDIES
## DS - 406(B) : Gender Based Conflicts and Human Rights
## (2013 Pattern) (Semester - IV)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer in 2 to 4 sentences each: **[16]**

a) What is meant by Gender Discriminations?

b) Define the term 'Human Rights'.

c) Define 'War'.

d) What is meant by 'Positive Peace'.

e) Define 'Fundamental Rights'.

f) What is meant by 'Right to Education'.

g) Define Gender Equality.

h) Define the meaning of Gender Justice.

***Q2)*** Answer in 8 to 10 sentences each (any two): **[8]**

a) Write the concept of Women Equality.

b) Write about the women empowerment in India.

c) Write about the women empowerment in West Asia.

***Q3)*** Write short notes on (any two): **[8]**

a) Feminism and Philosophy for Peace.

b) Inter sectional in framing gender violence.

c) Universal Declaration of Human Rights.

***Q4)*** Answer in 16 to 20 sentences (any one): **[8]**

a) Discuss induction of women in Indian Armed Forces as a move to women empowerment.

b) Present your view on the women participation in the establishment of democracy.

Total No. of Questions : 4]

SEAT No. :

**P677**

[Total No. of Pages : 4

# [5115]-476
# T.Y. B.Sc.
# DEFENCE AND STRATEGIC STUDIES
## DS - 407(A) : Role of Armed Forces in Disaster Management
## (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full marks.***

***Q1)*** Answer in 2 to 4 Sentences each: **[16]**

a) Define environmental disaster.

b) What do you mean by Guideline disaster Management?

c) Define earthquake.

d) What do you mean by nuclear war?

e) Define manmade disaster.

f) Define strategic management.

g) Define sustainable development.

h) Write any two importance of pre-disaster plan.

***Q2)*** Answer in 8 to 10 Sentences each (any two): **[8]**

a) Explain challenges to disaster management.

b) Discuss role of state government in disaster relief.

c) Describe functions of Non-Governmental Organization (NGOs).

in disaster management

***P.T.O.***

***Q3)*** Write short notes on (any two): **[8]**

a) NDRF.

b) Ambegaon (Malin) Pune land slide in 2014.

c) Counter terrorism.

***Q4)*** Answer in 18 to 20 sentences (any one): **[8]**

a) Describe role of Armed Forces in disaster response.

b) Write a note on the role of local civil administration in disaster management.

**Total No. of Questions : 4]**

**P677**

# [5115]-476
# T.Y. B.Sc.
# DEFENCE AND STRATEGIC STUDIES
## DS - 407(B) : Global Security - II
## (2013 Pattern) (Semester - IV)

***Time : 2 Hours]*** ***[Max. Marks : 40***

***Instructions to the candidates:***

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full Marks.***

***Q1)*** Answer in 2 to 4 Sentences each: **[16]**

a) Define global warming.

b) Define Blue economy.

c) Define human rights.

d) Define super powers.

e) Define global security.

f) Define ethnic conflict.

g) Define International organization.

h) Define international law.

***Q2)*** Answer in 8 to 10 Sentences each (any two): **[8]**

a) Explain Chinese maritime disputes with Vietnam.

b) Discuss role of U.S.A. in South Asian conflict.

c) Describe nuclear arsenal of super power.

***Q3)*** Write short notes on (any two): **[8]**

a) Law of treaties.

b) Limitations of U.N.O.

c) Ethnicity and global conflict.

***Q4)*** Answer in 18 to 20 sentences (Any one): **[8]**

a) Describe role of U.N. in global peace and security.

b) Explain policies of U.S.A. in Non-nuclear proliferation.

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Total No. of Questions :4]

SEAT No. :

**P678**

[Total No. of Pages :4

# [5115] - 477

## T.Y.B.Sc.

## DEFENCE AND STRATEGIC STUDIES

## DS-NO-408(A): Indian Military Strategy (1947-2014)

## (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer in 2 or 4 sentences each: **[16]**

a) When the first Indo-Pak War took place?

b) Define "strategy".

c) During 1962 Chinese aggression who declared the unilateral Ceasefire?

d) What do you know about Raja Hari Singh.

e) What do you know about Chou-En-Lai.

f) Why India sent her forces to Kashmir in 1947-48?

g) State the meaning of Ceasefire.

h) Write any one example Grand strategy..

***Q2)*** Answer in 8 or 10 sentences (Any Two): **[8]**

a) Highlight on the role of U.S.S.R. during Indo-Pak War of 1965.

b) Explain in brief nature of India-China border dispute.

c) Write in brief role of U.S.A. during Indo-Pak War of 1965.

***P.T.O.***

***Q3)*** Write short notes on (any two): **[8]**

a) Concept of Ceasefire.

b) Significance of "Instrument of Accession".

c) Muktibahini.

***Q4)*** Answer in 16 to 20 sentences (any one): **[8]**

a) "During 1965 India won the war on battle field but lost it at negotiation table with Pakistan". Do you agree? Justify your answer.

b) Analyse the causes of Chinese aggression of 1962 against India.

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**Total No. of Questions :4]**

**P678**

# [5115] - 477

## T.Y.B.Sc.

## DEFENCE AND STRATEGIC STUDIES

## DS-NO-408(B): Indian Military Strategy (1680-1818)

## (2013 Pattern) (Semester - IV)

***Time : 2 Hours]*** ***[Max. Marks :40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer in 2 or 4 sentences each: **[16]**

a) What do you know about Tarabai?

b) What was the tactics of Santaji?

c) What was the aim of Mughals for battle of Bhopal?

d) Why Sambhaji revolt against Soirabai?

e) What do you know about Kanhoji Angre?

f) Who was Sadashivrao Bhau?

g) Why the first Anglo-Maratha war took place?

h) What do you know about Sahu.

***Q2)*** Answer in 8 or 10 sentences (Any Two): **[8]**

a) Write few lines on Ahmedshaha Abdali.

b) Explain in short battle of Bhopal.

c) Write in short third Anglo-Maratha war.

***Q3)*** Write short notes on (Any Two): **[8]**

a) Sadashivrao Bhau.

b) Dhanaji.

c) Significance of battle of Palkhed.

***Q4)*** Answer in 18 to 20 sentences (any one): **[8]**

a) Explain in detail the Maratha Navy during era of Kanhoji Angre.

b) Discuss in detail the third battle of Panipat (1761 A.D).

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Total No. of Questions :4]

SEAT No. :

**P679**

[Total No. of Pages :4

# [5115] - 478

## T.Y.B.Sc.

## DEFENCE AND STRATEGIC STUDIES

## DS-NO-409(A): United Nations Organisation

## (2013 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer in 2 or 4 sentences each: **[16]**

a) State the date & year of establishment of United Nations.

b) What do you mean by Globalization?

c) What do you understand by Atlantic Charter?

d) Define "Human Rights".

e) State the date & year of Universal declaration of Human rights by UN.

f) What do you mean by Disarmament?

g) State any two UN peace keeping operations.

h) Write the basic aim of UNO.

***Q2)*** Answer in 8 or 10 sentences (Any Two): **[8]**

a) Explain in brief "Unity for peace" resolution.

b) Write few lines on "Veto".

c) What are the objectives of UNO?

***P.T.O.***

***Q3)*** Write short notes on (Any Two): **[8]**

a) Concept of Arms control.

b) Concept of World Parliament.

c) W.H.O.

***Q4)*** Answer in 16 to 20 sentences (Any One): **[8]**

a) Which options you would like to suggest for strengthening the present status of UNO?

b) Explain any one UN peace keeping operation.

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**Total No. of Questions :4]**

**P679**

# [5115] - 478
# T.Y.B.Sc.
# DEFENCE AND STRATEGIC STUDIES
# DS-NO-409(B): Indias Maritime Security
# (2013 Pattern) (Semester - IV)

***Time : 2 Hours]*** ***[Max. Marks :40***

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer in 2 or 4 sentences each: **[16]**

a) Define "Maritime Security".

b) What do you mean by "Maritime Boundaries"?

c) State any two Indian Naval Ships.

d) Write the limits of Territorial waters.

e) What do you mean by Light Houses?

f) What do you understand by "Human Trafficking"?

g) State the meaning of "Maritime Trade".

h) What do you know about "Nose" of Indian sub-continent?

***Q2)*** Answer in 8 or 10 sentences (Any Two): **[8]**

a) Explain the concept of "continental shelf".

b) Write in brief limitations of Coast Guard.

c) Explain the concept of "Fixed Asstes - Ports & its infrastructure.

***Q3)*** Write short notes on (Any Two): **[8]**

a) Characteristics of Indian Navy.

b) Concept of Naval Bases.

c) L.T.T.E.

***Q4)*** Answer in 16 to 20 sentences (Any One): **[8]**

a) Explain the role of Exclusive Economic Zone for economic development of a country.

b) Discuss the role of strategic environment of Indian ocean & its relevance to Indias National Security.

*EEE*

Total No. of Questions :4]

SEAT No. :

**P680**

[Total No. of Pages :2

# [5115] - 479

## T.Y.B.Sc.

## ENVIRONMENTAL SCIENCE

## ENV-301: Aquatic Ecosystem and Management (Paper - I)

## (2008 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat and labeled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following in 1-2 lines each: **[10]**

a) Define profoundal zone.

b) Why lotic waters of streams contain high oxygen?

c) Define tectonic lakes.

d) Name the types of coral reefs.

e) Write the different zones in marine environment.

f) Give the examples of - ve species interaction in ecosystem.

g) Write any two examples of heterotherm organisms.

h) Define system ecology.

i) Define commensalism.

j) What do means by heterotherm organisms.

***Q2)*** Write a short note on (any two): **[10]**

a) Traditional methods of ecosystem managements.

b) Impact of Ecotourism.

c) Steps in lake restoration.

***P.T.O.***

***Q3)*** Attempt any two from the following: **[10]**

a) What are the factors responsible for surface runoff.

b) Significance of mangroove vegetation in coastal environment.

c) Briefly write thermal classification of lakes.

***Q4)*** Attempt any one of the following: **[10]**

What do you understand by limiting factors in ecosystem. Discuss the principles pertaining to limiting factors.

OR

Explain the application of GIS and RS in marine bioresource monitoring.

*EEE*

Total No. of Questions :4]

SEAT No. :

**P681**

[Total No. of Pages :2

# [5115] - 480

## T.Y.B.Sc.

## ENVIRONMENTAL SCIENCE

## Nature Conservation (Paper - II)

## (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory and carry equal marks.***
2) ***Neat and labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following in 1-2 lines each: **[10]**

a) What is meant by habitat conservation?

b) Mention any two objectives of nature conservation.

c) What are heritage sites?

d) Write any two merits of traditional conservation practices.

e) What is meant by captive breeding?

f) Write any two issued associated with ecotourism.

g) Mention any two functional areas of 'Greenpeace'.

h) What is the purpose of international whaling mission?

i) Write any two efforts for sustainable nature conservation.

j) What are national symbols for India?

i) Animal

ii) Plant

***P.T.O.***

***Q2)*** Write a short note on Any Two of the following: **[10]**

a) Ex-Situ methods of conservation.

b) Crocodile Farms.

c) Challenges in Nature conservation.

***Q3)*** Attempt ANY TWO questions from the following: **[10]**

a) Discuss in detail on role of NGO's in environment protection.

b) What are protected areas? Discuss on protected area network in India.

c) Which are the aspects involved in ecosystem approach of nature conservation.

***Q4)*** Attempt ANY ONE of the following: **[10]**

a) Discuss in detail In-Situ and Ex-Situ methods of nature conservation.

OR

b) What are the priorities for conservation of nature? Also add a note on international efforts implemented for conservation.

*EEE*

Total No. of Questions :4]

SEAT No. :

**P682**

[Total No. of Pages :2

# [5115] - 481

## T.Y.B.Sc.

## ENVIRONMENTAL SCIENCE

## Air and Soil Quality (Paper - III)

## (Semester - IV) (New)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory and carry equal marks.***
2) ***Neat and labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following in 1-2 lines each: **[10]**

a) What is meant by soil sickness?

b) What are macro and micro nutrients?

c) Which gas was released in Bhopal disaster?

d) Write the name of method used in determination of phosphate phosphorous.

e) Write any two types of soils found in India.

f) Mention any two ways for sustainable soil conservation.

g) Write any two health effects associated with petroleum compounds.

h) What is 'EL-Nino' phenomenon?

i) Mention any two effects of air pollution on materials.

j) Write the name of method used in determination of soluble salts.

***Q2)*** Write a short note on Any Two of the following: **[10]**

a) Ozone Hole.

b) Monitoring of Carbon Monoxide.

c) Composition of soil.

***P.T.O.***

***Q3)*** Attempt ANY TWO questions from the following: **[10]**

a) Write a detailed account on photochemical reactions involved in atmosphere.

b) Discuss sampling and monitoring procedure for determination of sulphur dioxide.

c) What are the health effects associated with carbon monoxide?

***Q4)*** Attempt ANY ONE of the following: **[10]**

a) Discuss various factors influencing on plant growth. Also add a note on remediation of contaminated soils.

OR

b) Discuss the status of air pollution in India with suitable examples. Add a note on importance of emission standards.

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Total No. of Questions :4]

SEAT No. :

**P683**

[Total No. of Pages :2

# [5115] - 482

## T.Y.B.Sc.

## ENVIRONMENTAL SCIENCE

## Issues in Environmental Science - II (Paper - IV)

## (Semester - IV) (New)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory and carry equal marks.***
2) ***Neat and labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following in 1-2 lines each: **[10]**

a) Write the full form of 'CNG'.

b) What is an 'Environmental Modelling'?

c) Give objectives of 'Chipko Movement'.

d) Write any two water conservation methods.

e) Mention causes of 'rehabilitation'.

f) Enlist environmental problems of poverty.

g) Give reasons of 'desertification'.

h) What is 'Occupational Health'?

i) Write any two applications of Remote sensing.

j) Enlist types of natural disasters?

***Q2)*** Write a short note on Any Two of the following: **[10]**

a) Ganga Action plan.

b) Need of Land use policy in India.

c) Cost - benefit analysis.

***P.T.O.***

***Q3)*** Answer ANY TWO questions from the following: **[10]**

a) Discuss methods of 'Biodiversity conservation'.

b) Explain causes and effects of Global Warming in India.

c) Discuss epidemiological issues of 'Arsenic' pollution.

***Q4)*** Attempt ANY ONE of the following: **[10]**

a) What is soil. erosion? Explain in detail formation and reclaimation of Alkaline and saline soil.

OR

b) Explain impacts of vehicular pollution on Urban air quality. Add a note on its control measures.

EEE

Total No. of Questions :4]

SEAT No. :

**P684**

[Total No. of Pages :2

# [5115] - 483

## T.Y.B.Sc.

## ENVIRONMENTAL SCIENCE

## Environmental Governance and Equity: EMS and ISO 14000

## (Semester - IV) (Paper - V)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory and carry equal marks.***
2) ***Neat and labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Answer the following in 1-2 lines each: **[10]**

a) What is the full form of 'ISO'?

b) Mention any two functions of BIS?

c) What is environmental aspect?

d) Enlist stages of Environmental Audit.

e) Which act is called as 'Umbrella Act'?

f) Write any benefits of renewable energy.

g) What is generic standard in ISO?

h) What is corrective action?

i) What is standard limit of COD for inland effluent discharge?

j) Mention any two applications of Environmental policy.

***P.T.O.***

***Q2)*** Write a short note on ANY TWO of the following: **[10]**

a) Functions of EMS.

b) Environmental status report (ESR).

c) India's constitutional provision for Environment protection.

***Q3)*** Answer ANY TWO questions from the following: **[10]**

a) Discuss importance of Environmental Economics.

b) Discuss role of NGO's in implementation of Environmental regulations.

c) Discuss WHO water quality standards.

***Q4)*** Attempt ANY ONE of the following: **[10]**

a) Explain in detail guidelines of ISO 14001.

b) What is EIA? Discuss in detail stages of EIA?

Total No. of Questions :4]

SEAT No. :

**P685**

[Total No. of Pages :2

# [5115] - 484

## T.Y.B.Sc.

## ENVIRONMENTAL SCIENCE

## Environmental Biotechnology - II

## (Semester - IV) (Paper - VI)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat and labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Attempt the following in 1-2 lines each: **[10]**

a) Define Ex-situ bioremediation.

b) Define vermicomposting.

c) Which factors influences biosorption process?

d) What is trickling filter.

e) Define pyrolysis.

f) Write full form of CSTR and UASB.

g) Define biomethanation.

h) Name any two pertoleum plants.

i) Define antagonism.

j) Define fermentation.

***P.T.O.***

***Q2)*** Write a short note on (any two): **[10]**

a) Phytoremediation.

b) Bioleaching.

c) Biofuels.

***Q3)*** Answer any two from the following: **[10]**

a) Explain the biogasification with suitable example and diagram.

b) What are the demerits of open land filling of MSW.

c) Explain the mechanism of biofilteration.

***Q4)*** Attempt any one of the following question. **[10]**

a) Briefly explain metal microbe interaction and mechanism of metal removal.

OR

b) Sketch a neat labelled diagram of UASB and write a note of its working.

Total No. of Questions :4]

SEAT No. :

**P686**

[Total No. of Pages :2

# [5115] - 485

## T.Y.B.Sc. (Vocational)

## INDUSTRIAL CHEMISTRY

## Entrepreneurship Development

## (Semester - IV) (2013 Pattern) (Paper - V)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Answer precisely the following: **[10]**

a) Enlist the key elements of an entrepreneur.

b) What is the full form of SICOM?

c) List three types of entrepreneurs.

d) Define joint stock company.

e) What is small scale industry?

f) Name one market survey technique.

g) What is working capital?

h) State any two needs to motivate employee to work.

i) What is the full form of NSSIDC?

j) What is VAT?

***P.T.O.***

***Q2)*** a) Answer the following (any two): **[6]**

i) What is the difference between an entrepreneur and an intrapreneur (any three points)?

ii) What is product innovation?

iii) What is the scope of human resource in modern industry?

b) Answer briefly the following (any two): **[4]**

i) Explain the term Break - Even point.

ii) What is project report?

iii) What is Factory - Act?

***Q3)*** Answer the following (any two): **[10]**

a) How does the family background affect entrepreneurship?

b) What are the functions of marketing (any five)?

c) Explain in detail 'Income Tax Act'.

***Q4)*** a) What is SWOT analysis? Explain its implementation. **[6]**

OR

a) How does one overcome barriers to entrepreneurship?

b) Answer the following (any one): **[4]**

i) Give the functions of DIC.

ii) What are the objectives of Management Training Programme?

Total No. of Questions :4]

SEAT No. :

**P687**

[Total No. of Pages :2

# [5115] - 486

## T.Y.B.Sc. (Vocational)

## BIOTECHNOLOGY

## Voc- Biotech-345: Environmental Biotechnology and Bioinformatics

## (Semester - IV) (2013 Pattern)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***All questions carry equal marks.***

***Q1)*** Answer each of the following in 1-2 lines: **[10]**

a) Define bioremediation.

b) Give any two applications of bioinformatics.

c) Define bioaugmentation.

d) Name two microbes involved in herbicide degradation.

e) What is gasohol?

f) Give two examples of hazardous wastes.

g) What is CATH?

h) Name two microbes used for enrichment of ores.

i) Define biofuels.

j) What is NCBI?

***P.T.O.***

***Q2)*** Answer any two of the following: **[10]**

a) Describe the production of bioethanol.

b) Explain in short about FASTA.

c) Describe any two bioreactors used in waste water treatment.

***Q3)*** Write short notes on any two of the following: **[10]**

a) BLAST.

b) Phytoremediation.

c) PubMed central.

***Q4)*** What are Biofertilizers? Explain nitrogen fixers, phosphate solubilizers and PGPR in detail. **[10]**

OR

Describe in detail nucleic acid sequence databases.

Total No. of Questions :5]

SEAT No. :

**P688**

[Total No. of Pages :1

# [5115] - 487

## T.Y.B.Sc. (Vocational)

## PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

## Entrepreneurship Development

## (2013 Pattern) (Semester - IV) (Paper - V)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***Question number one is compulsory.***
2) ***Answer any three questions from the remaining questions.***
3) ***Provide suitable examples wherever necessary.***
4) ***Figures to the right indicate full marks.***

***Q1)*** What are entrepreneurial qualities? How are they beneficial for nation building? **[10]**

***Q2)*** What is a sick industry? What are the causes for the sickness? How are these overcome? **[10]**

***Q3)*** Compare the role of a professional manager and an entrepreneur. **[10]**

***Q4)*** If you want to start a TV channel how would you prepare? **[10]**

***Q5)*** Write short notes on any two of the following: **[10]**

a) Corporate values.

b) Administrative traits of an entrepreneur.

c) Small scale industry.

Total No. of Questions :4]

SEAT No. :

**P689**

[Total No. of Pages :2

# [5115] - 488

## T.Y.B.Sc. (Vocational)

## ELECTRONIC EQUIPMENT AND MAINTENANCE (EEM)

## Entrepreneurship Development

## (2013 Pattern) (New Course) (Semester - IV) (Paper - V)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log table, calculators is allowed.***

***Q1)*** Answer the following:

a) Answer the following: **[4×1=4]**

i) State the role of MIDC in entrepreneurship.

ii) State the Job of pollution control board.

iii) What is income tax?

iv) What is patent Rule?

b) Answer the following: **[2×2=4]**

i) What is 'TDS'?

ii) State the need of 'soft skill' in entrepreneurship.

c) Comment on the following: **[2×2=4]**

i) Market survey is necessary before the start of new business.

ii) Inter-personnel relations and communication skills are necessary elements of human resource management.

***P.T.O.***

***Q2)*** Answer <u>any two</u> of the following: **[2×4=8]**

a) Explain the advantages and disadvantages of partnership.

b) State main types of small scale industry.

c) Discuss the necessary criteria for selection of new business.

***Q3)*** Answer <u>any two</u> of the following: **[2×4=8]**

a) Discuss the socio economic origins of entrepreneurship.

b) Explain the role of consultancy organization in entrepreneurship development.

c) Discuss the various difficulties encountered by entrepreneur.

***Q4)*** Answer <u>any two</u> of the following: **[2×6=12]**

a) Discuss the essential attributes of entrepreneur for running successful business.

b) Write a short note on 'legel aspects' of small business.

c) Discuss different modes of employment and placement of proper person for a job.

OR

***Q4)*** Write short notes on the following: **[3×4=12]**

a) Marketing strategy.

b) Marketing mix.

c) SWOT analysis.

Total No. of Questions :4]

SEAT No. :

**P690**

[Total No. of Pages :2

# [5115] - 489

## T.Y.B.Sc. (Vocational)

## INDUSTRIAL MICROBIOLOGY

## VOC-IND-MIC-345: Molecular Biology & Genetic Engineering

## (2013 Pattern) (Theory) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks :40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

***Q1)*** Answer the following: **[10]**

a) Name two modifications of PCR.

b) Name any one expression vector.

c) What is VNTR?

d) Represent diagrammatically only: action of Alkaline Phosphatase.

e) Write recognition site and cutting site of Hind III.

f) State whether the following statement is True or False and give reasons for your answer:
Use of Transgenic animal is beneficial.

g) Write two examples of genetic disorders.

h) Write the principle of Southern blotting technique.

i) Name the vectors developed for cloning in yeast.

j) What are linkers and adapters?

***P.T.O.***

***Q2)*** Attempt any two of the following: **[10]**

a) Discuss in brief the techniques used to transfer foreign DNA to animals.

b) What are cosmid vectors? Explain with suitable example.

c) What is alpha complementation? What is the importance of the technique?

***Q3)*** Comment on any two of the following: **[10]**

a) Ti plasmid as a vector.

b) DNA fingerprinting.

c) Non-radioactive labeling.

***Q4)*** Attempt any one of the following: **[10]**

a) What is site-directed mutagenesis? Discuss Primer extension method of inducing such mutations and its applications.

b) What is Sangers method of sequencing? Write principal and application of this method. Compare Sangers method with Maxam and Gilbert method.

Total No. of Questions : 4]

SEAT No. :

**P691**

[Total No. of Pages : 2

# [5115]-490

## T.Y.B.Sc. (Vocational)

## COMPUTER HARDWARE & NETWORK ADMINISTRATION

## Network Concepts - II

## (2013 Pattern) (Paper - V) (Semester - IV) (New Course)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt all of the following: **[10 × 1 = 10]**

a) Why do we use VPN?

b) What is a Gateway?

c) What is Email Bombing?

d) What is a IDS?

e) What is a Shared Drive on a Network?

f) What is an Access Point?

g) Why do we need a Router?

h) What is Encryption?

i) Why an antivirus is used?

j) What is a VOIP?

***Q2)*** Attempt any Two of the following: **[2 × 5 = 10]**

a) Give five uses of a UTM Device.

b) Explain the steps to share a Printer in Windows Network.

c) What are Active Attacks? Explain with proper example.

***P.T.O.***

***Q3)*** Attempt any Two of the following: **[2 × 5 = 10]**

a) Explain the importance of environmental & Site requirement in Network Planning.

b) What is a proxy server? Explain its need in a WAN Network?

c) Compare Layer 2 & Layer 3 Managed Switches.

***Q4)*** Attempt any One of the following: **[1 × 10 = 10]**

a) Explain the concept of :

i) Cold Sites

ii) Warm Sites

iii) Hot Sites

iv) Mirroring

v) RAID

b) Write the Installation Procedure for Windows 7.

x x x

Total No. of Questions : 4]

SEAT No. :

**P692**

[Total No. of Pages : 2

# [5115]-491
# T.Y.B.Sc. (Vocational)
# SEED TECHNOLOGY
## Entrepreneurship Development
## (2013 Pattern) (Paper - V) (Semester - IV) (New)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory and carry equal marks.***
2) ***Figures to the right indicate full marks.***
3) ***Neat labelled diagrams must be drawn wherever required.***

***Q1)*** Answer the following: **[10 × 1 = 10]**

a) Give the correct meaning of entrepreneurship.

b) Mention one type of small scale industry.

c) Write the full form of SISI.

d) What do you mean by VAT?

e) Mention any one criteria for selection of new product.

f) What is cash flow?

g) What is venture capital?

h) Mention any one method used for digital marketing.

i) What is service tax?

j) Give any one merit partnership business.

***Q2)*** Attempt any Two of the following: **[2 × 5 = 10]**

a) What are the characteristics of entrepreneur.

b) Give an account on joint stock company and it's merits.

c) Explain the role of pollution control board (P C B).

***P.T.O.***

***Q3)*** Write notes on any two of the following: **[2 × 5 = 10]**

a) Marketing channels.

b) Barriers in entrepreneurship.

c) Chamber of commerce.

***Q4)*** Prepare a detailed report on project formulation for the development of entrepreneurship. Add a note on the scope of entrepreneurship. **[10]**

OR

Write an account on the soft and communication skills in entrepreneurship. **[10]**

x x x

Total No. of Questions : 4]

SEAT No. :

**P693**

[Total No. of Pages : 2

# [5115]-492
# T.Y.B.Sc. (Vocational)
# INDUSTRIAL CHEMISTRY
## Basic Chemical Industries - II
## (2013 Pattern) (Paper - VI) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

***Q1)*** Answer the following questions: **[10]**

a) Define the term fixatives.

b) What are surfactants?

c) Give the definition of dye.

d) What is the meaning of functional drugs?

e) Give two properties of synthetic adhesives.

f) Define $\overline{Mn}$ and $\overline{Mw}$.

g) Write two properties of plastics.

h) Write a monomer of gutta percha rubber.

i) Give two characteristics of artificial fibres.

j) What is acetate rayon?

***Q2)*** a) Attempt any Two of the following: **[6]**

i) Give classification of surfactants.

ii) Explain in detail synthesis and uses of alizarin dye.

iii) What are chemotherapeutic drugs? Give the synthesis of benzocaine.

***P.T.O.***

b) Attempt any two of the following: **[4]**

i) Explain a method for isolation of essential vegetable oils.

ii) Discuss the classification of adhesives.

iii) Give properties of poly vinyl acetate and poly vinyl chlorides.

***Q3)*** Write notes on any two of the following: **[10]**

a) Polymers.

b) Rubbers.

c) Manufacturing of Indigo dye.

***Q4)*** a) Describe the manufacturing of Nylon 66 with flow sheet diagram. **[6]**

OR

What is drug? What are good qualities of drug? Give synthesis and uses of paracetamol. **[6]**

b) Attempt any one of the following: **[4]**

i) Give the characteristic properties, structure and uses of silicone resins.

ii) Write a note on 'special soaps'.

x x x

Total No. of Questions : 4]

SEAT No. :

**P694**

[Total No. of Pages : 2

# [5115]-493
# T.Y.B.Sc. (Vocational)
# BIOTECHNOLOGY
## Entrepreneurship Development
## (2013 Pattern) (Paper - V) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neta labelled diagrams must be drawn wherever required.***

***Q1)*** Answer the following questions in short: **[10]**

a) Mention two criteria for selection of a product or service

b) What is sole proprietorship?

c) What is full form of CGTSME.

d) What is service tax?

e) What is costing?

f) What is cash flow?

g) What is Angel finance?

h) What are marketing channels?

i) What are the different modes of employment?

j) What are the legal liabilities of employees?

***Q2)*** Answer any two of the following: **[10]**

a) Discuss role of consultancy organization.

b) Describe drafting of exit policies.

c) Define entrepreneurship. Describe the key elements of entrepreneur.

***P.T.O.***

***Q3)*** Write Short notes on any two: **[10]**

a) PMRY.

b) SSI.

c) Difference between commercial Banks and Co-operative banks.

***Q4)*** Answer any one of the following: **[10]**

a) Explain project formulation and project report in detail.

OR

b) What is marketing strategy? Discuss marketing mix and its effect in detail.

x x x

Total No. of Questions : 6]

SEAT No. :

**P695**

[Total No. of Pages : 1

# [5115]-494

## T.Y.B.Sc. (Vocational)

## PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

## Radio Software

## (Paper - VI) (Semester - IV) (2013 Pattern)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***Attempt any four questions.***
2) ***Give suitable examples wherever necessary.***
3) ***Figures to the right indicate full marks.***

***Q1)*** Compare the role of the Radio and the News paper as media of mass communication. **[10]**

***Q2)*** Discuss with suitable examples the challenges you would face while producing a radio programme. **[10]**

***Q3)*** You are asked to interview an Olympic Gold Medalist. Write down five questions you would ask him/her. **[10]**

***Q4)*** Discuss the role of an anchor in a discussion programme. **[10]**

***Q5)*** Discuss the importance of the Broadcast code. **[10]**

***Q6)*** What is an O.B. Programme? What care should be taken to broadcast a live O.B. Programme. **[10]**

x x x

Total No. of Questions : 4]

SEAT No. :

P696

[Total No. of Pages : 2

# [5115]-495

## T.Y.B.Sc. (Vocational EEM)

## ELECTRONIC EQUIPMENT MAINTENANCE

## Medical Instrumentation

## (2013 Pattern) (Paper - VI) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** a) Answer the following: **[4 × 1 = 4]**

i) State potential of cell in polarized condition.

ii) State 2 main considerations for bioelectric recorder amplifier.

iii) What is SA node?

iv) What are ion-selective electrodes?

b) Answer the following: **[2 × 2 = 4]**

i) Name 2 main body parts in CNS.

ii) State components of reflex arc.

c) Answer the following: **[2 × 2 = 4]**

i) Classify as general or special senses

1) Pressure sense,

2) Vision sense.

ii) State 2 major shock - hazards.

***P.T.O.***

***Q2)*** Answer any 2: **[2 × 4 = 8]**

a) What is EEG? State features of 4 EEG waveforms.

b) Write a short note on EMG.

c) Explain direct writing system.

***Q3)*** Answer any 2: **[2 × 4 = 8]**

a) Explain filter photometer.

b) Draw and explain ECG waveform.

c) Write short note on - body - surface recording electrodes.

***Q4)*** Answer the following: **[2 × 6 = 12]**

a) Discuss sources of external noise in medical instrumentation.

b) Discuss spectrophotometer.

OR

Answer the following: **[2 × 6 = 12]**

a) Discuss automated biochemical analysis system.

b) Explain isolation of patient from biorecording instrument.

x x x

Total No. of Questions : 4]

SEAT No. :

P697

[Total No. of Pages : 3

# [5115]-496
# T.Y.B.Sc. (Vocational)
# INDUSTRIAL MICROBIOLOGY
## VOC - IND - MIC - 346 : Entrepreneurship Development
## (2013 Pattern) (Paper - VI) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***

***Q1)*** Answer the following: **[10]**

Choose the correct option:

a) Which of the following skill is needed by an entrepreneur?

i) Technical skill.

ii) Business management skill.

iii) Personal entrepreneurial skill.

iv) all of the above.

b) Which of the following is the primary cause of failure in small business?

i) Poor financial control.

ii) Poor location.

iii) Management mistake.

iv) Improper inventory control.

c) SWOT is an acronym for:

i) Strategy, Working, Opinion, Tactical.

ii) Strength, Weaknesses, Openness, Tactics.

iii) Strength, Weaknesses, Opportunities, Threats.

iv) Strategy, Work, Opinions, Toughness.

***P.T.O.***

State whether the following statements are True or False.

d) The three basic ideas in the marketing concept are

   i) Customer satisfaction.

   ii) Confining marketing activities to marketing professionals.

   iii) Having profit as an objective.

e) A marketing manager should try to balance the interest of the consumer, company and society.

f) Entrepreneurship increases the concentration of the economic power.

Fill in the blanks:

g) Entrepreneurship plays the role of _____ for industrialization.

h) Dividing a market or a consumer base into pieces and understanding the dynamics of each category is known as _____.

i) The main objective of _____ is to set up industrial areas with provision of industrial infrastructure all over the Maharashtra.

j) _____ is anything that can be offered to a market for acquisition, use or consumption.

***Q2)*** Attempt any two of the following: **[10]**

a) Explain the role of District Industries Centre (DIC) in entrepreneurship development.

b) Write about the technical and economic feasibility of a project.

c) Explain the types of marketing channels.

***Q3)*** Attempt any two of the following: **[10]**

a) Explain the concept of marketing mix.

b) Explain the key elements of entrepreneur.

c) Explain about the Entrepreneurship Development Institute of India (EDII).

***Q4)*** Attempt any one of the following: **[10]**

a) 'The basic idea of market segmentation is not to serve the entire market but preferably only an effective section of the market more effectively for the best mutual benefit of the consumer and seller.' What are the criteria for market segmentation?

b) 'Entrepreneurial spirit is characterized by innovation and risk taking and an essential component of a nation's ability to succeed in an ever changing and more competitive global market place.' Explain the importance of entrepreneurship for the economy.

x x x

Total No. of Questions : 4]

SEAT No. :

**P698**

[Total No. of Pages : 2

# [5115]-497

## T.Y.B.Sc. (Vocational)

## COMPUTER HARDWARE & NETWORK ADMINISTRATION

## Entrepreneurship Development

## (2013 Pattern) (Paper - VI) (Semester - IV) (New Course)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

***Q1)*** Attempt all of the following: **[10 × 1 = 10]**

a) Give any one mode of Employment.

b) Define "SWOT".

c) Which Ministry empowers Entrepreneurship Development Programs?

d) Which Tax is applicable for any Trade?

e) What is Stated in Profit and Loss Statement?

f) What is the Role of SISI?

g) Define an Entrepreneur.

h) What is a Patent?

i) What does Pollution Control Board do?

j) Is 'Product Mix' one of the important factors of Marketing Mix.

***Q2)*** Attempt any <u>two</u> of the following: **[2 × 5 = 10]**

a) Why does an entrepreneur need the "Working Capital"?

b) Explain the main four elements of Marketing Mix.

c) What Soft Skills should and Entrepreneur inculcate?

***P.T.O.***

***Q3)*** Attempt any two of the following: **[2 × 5 = 10]**

a) Write a note on various forms of Business Organizations.

b) What Role does the Consultancy Organizations play in Entrepreneurship Development?

c) What are the merits of a Joint Stock Company?

***Q4)*** Attempt any <u>one</u> of the following: **[1 × 10 = 10]**

a) Why group insurance is necessary for factory workers? Explain the importance of various funding agencies.

OR

b) Explain the application of taxes given below:

i) VAT.

ii) Service Tax.

iii) Excise Rules.

iv) Income Tax.

v) Patent Rules.

Total No. of Questions : 4]

SEAT No. :

P699

[Total No. of Pages : 2

# [5115]-498
# T.Y.B.Sc. (Vocational)
# SEED TECHNOLOGY
## Voc - SETE - 322 : Biotechnology and Intellectual Property Rights
## (2013 Pattern) (New) (Paper - VI) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 40*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whrever necessary.***

***Q1)*** Answer the following: **[10]**

a) Give any two applications of Biotechnology.

b) Define SDS - PAGE.

c) What is plasmid vector?

d) Give any two applications of restriction mapping technique.

e) Give any two applications of synthetic seed.

f) What is meant by Golden Rice?

g) What is Trade secrets?

h) Give the role of vitamins in plant tissue culture.

i) Define in vivogene cloning.

j) Give any two functions of ICAR.

***Q2)*** Answer any two of the following: **[10]**

a) Explain in detail ELISA technique.

b) Comment on IARI.

c) Explain in detail use of restriction enzymes.

***P.T.O.***

***Q3)*** Write notes on (any two) **[10]**

a) Gene cloning.

b) Western Blotting techniques.

c) Anther culture.

***Q4)*** Explain in detail various steps involved in the micropropagation of embryo. **[10]**

OR

Explain in detail on Intellectual Property Right (IPR).

x x x