

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

P1641

[5522]-401

T.Y.B.Sc.

MATHEMATICS

MT - 341 : Complex Analysis

(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.*

Q1) Attempt any five of the following.

[10]

- a) Reduce $\frac{1+2i}{3-4i} + \frac{2-i}{5i}$ to a real number.
- b) Let $z = x + iy$ and $f(z) = (x^2 - y^2 - 2y) + i(2x - 2xy)$. Write $f(z)$ in terms of z and simplify the result.
- c) Find $f'(z)$ when $f(z) = \frac{(1+z^2)^4}{z^2} (z \neq 0)$.
- d) Find all z such that $e^z = -2$.
- e) Find the value of integral $\int_C \bar{z} dz$ where C is the right hand half $z = 2e^{i\theta} \left(\frac{-\pi}{2} \leq \theta \leq \frac{\pi}{2} \right)$ of the circle $|z| = 2$ from $z = -2i$ to $z = 2i$.
- f) Find a representation of function $f(z) = \frac{1}{1+z}$ in negative powers of z that is valid when $1 < |z| < \infty$.
- g) Find $\int_C \frac{z}{e^z} dz$ where C is the circle $|z| = 1$ in the positive sense.

P.T.O.

Q2) Attempt any two of the following.

[10]

- a) Find all the roots in rectangular coordinates, exhibit them as vertices of certain squares and point out which is principal root for $(-16)^{1/4}$.
- b) Let f denote the function whose values are

$$f(z) = \begin{cases} \frac{\bar{z}^2}{z} & \text{when } z \neq 0 \\ 0 & \text{when } z = 0 \end{cases}$$

Show that $f'(0)$ does not exist.

- c) Let the function $f(z) = u(x, y) + iv(x, y)$ be defined throughout some ϵ neighborhood of a point $z_0 = x_0 + iy_0$ and suppose that the first order partial derivatives of u and v with respect to x and y exist everywhere in that neighborhood. If those partial derivatives are continuous at (x_0, y_0) and satisfy the Cauchy Riemann equations $u_x = v_y$, $u_y = -v_x$ at (x_0, y_0) then show that $f'(z_0)$ exists.

Q3) Attempt any two of the following.

[10]

- a) Show that if e^z is real, then $\text{Im } z = n\pi$ ($n = 0, \pm 1, \pm 2, \dots$). If e^z is pure imaginary, what restriction is placed on z ?
- b) Let $f(z)$ be a function continuous on a domain D . Show that, if the integrals 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 then $f(z)$ has an antiderivative $F(z)$ in D .
- c) Let f be continuous in a domain D . If $\int_C f(z) dz = 0$ for every closed contour C lying in D , then show that f is analytic throughout D .

Q4) Attempt any one of the following.

[10]

- a) i) Find the Maclaurin series expansion of $f(z) = \frac{z}{z^4 + 9}$
- ii) Evaluate the integral $\int_C \frac{\cosh \pi z}{z(z^2 + 1)} dz$ where C is the circle $|z| = 2$ described in the positive sense.
- b) i) State and prove Cauchy's residue theorem.
- ii) Show that if C is the boundary of the rectangle $0 \leq x \leq 2, 0 \leq y \leq 2$ described in the positive sense then

$$\int_C (z - 2 - i)^{n-1} dz = \begin{cases} 0 & \text{when } n = \pm 1, \pm 2, \dots \\ 2\pi i & \text{when } n = 0 \end{cases}$$



Total No. of Questions :4]

SEAT No. :

P1642

[Total No. of Pages : 3

[5522]-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) True or false : If $f \in \mathbb{R}[a, b]$ and if $f(x) = g(x)$ except for countable number of points $x \in [a, b]$, then $g \in \mathbb{R}[a, b]$.
- b) Let $f(x) = x^2$, $0 \leq x \leq 1$. Let $\sigma = \{0, 1/3, 2/3, 1\}$ be subdivision of $[0, 1]$ then find $U[f, \sigma]$ and $L[f, \sigma]$.
- c) Discuss the convergence of $\int_1^{\infty} \frac{1}{x^{2/3}} dx$.
- d) For each $n \in \mathbb{N}$, Let $\chi_n(x) = 1$ if x is rational in $[0, 1]$
 $= 0$ if x is irrational in $[0, 1]$
show that $\{\chi_n\}_{n=1}^{\infty}$ converges uniformly on $[0, 1]$.
- e) Let $f_n(x) = x^n$, $x \in [0, 1]$. Find $\lim_{n \rightarrow \infty} f_n(x)$, $x \in [0, 1]$.
- f) Show that C. P. V. $\int_{-1}^1 \frac{1}{x} dx = 0$
- g) Show the series $\sum_{n=1}^{\infty} \frac{1}{n^2 + x^2}$ converges uniformly on $[0, \infty]$

P.T.O.

Q2) Attempt any two of the following:

[10]

- a) If $f \in \mathbb{R}[a, b]$ and $a < c < b$ then prove that $f \in \mathbb{R}[a, c]$ and $f \in \mathbb{R}[c, b]$.

Also, prove that
$$\int_a^b f = \int_a^c f + \int_c^b f$$

- b) If f is continuous on $[a, b]$ and $F(x) = \int_a^x f(t) dt (a \leq x \leq b)$ then prove that $F'(x) = f(x), (a \leq x \leq b)$.

- c) If f' and g' are continuous on $[a, b]$ then show that

$$\int_a^b f(x)g'(x)dx = f(b)g(b) - f(a)g(a) - \int_a^b f'(x)g(x)dx.$$

Q3) Attempt any two of the following :

[10]

- a) Let $\{f_n\}_{n=1}^{\infty}$ be a sequence of real valued functions on a metric space (M, ρ) . If each f_n is continuous at $a \in M$ and $\{f_n\}_{n=1}^{\infty}$ converges uniformly to f on M , then prove that f is continuous at $a \in M$.

- b) If $\sum_{k=1}^{\infty} u_k$ is series of functions in $\mathbb{R}[a, b]$ converges uniformly to f on

$[a, b]$ then show that $f \in \mathbb{R}[a, b]$ and
$$\int_a^b f(x)dx = \sum_{k=1}^{\infty} \int_a^b u_k(x)dx .$$

- c) Let $f_n(x) = \frac{x^n}{1+x^n}, 0 \leq x \leq 1/2$. Show that $\{f_n\}_{n=1}^{\infty}$ converges uniformly on $[0, 1/2]$.

Q4) Attempt any one of the following :

[10]

a) i) If $\int_a^{\infty} |f(x)| dx$ converges then prove that $\int_a^{\infty} f(x) dx$ converges.

ii) Let $f_n(x) = \frac{nx}{1+n^2x^2}, (-\infty < x < \infty)$ then show that $\{f_n\}_{n=1}^{\infty}$ converges to 'O' pointwise but not uniformly on $(-\infty, \infty)$.

b) i) Let $\{f_n\}_{n=1}^{\infty}$ be sequence of continuous functions which converges uniformly to f on $[a, b]$ and let g be continuous function on $[a, b]$

then prove that $\lim_{n \rightarrow \infty} \int_a^b f_n g = \int_a^b f g$.

ii) Let f be continuous function on $[a, b]$ such that $f(x) \geq 0, \forall x \in [a, b]$

and $f(c) > 0$ for some $c \in [a, b]$ then show that $\int_a^b f(x) dx > 0$.



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P1643

[5522]-403

T.Y.B.Sc.

MATHEMATICS

**MT-343: PROBLEM COURSE BASED ON MT 341 AND MT 342
(2013 Pattern) (Semester - IV) (Paper - III)**

Time : 2Hours]

[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) *Tie answer books of both sections together.*

SECTION-I

(Complex Analysis)

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

- i) Determine singular points for the function

$$f(z) = \frac{z^2 + 1}{(z + 2)(z^2 + 2z + 2)}.$$

- ii) Find the principal value of i^i .

- iii) Find $\int_C \frac{dz}{z^2 + 2z + 2}$ where the contour C is the circle $|z|=1$.

- iv) Find the residue at $z=0$ for the function $\frac{1}{z + z^2}$.

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

- i) Show that $(1 + \sqrt{3}i)^{-10} = 2^{-11}(-1 + \sqrt{3}i)$

- ii) Show that the function $f(z) = \sqrt[3]{re} \frac{i\theta}{3} (r > 0, 0 < \theta < 2\pi)$ has derivative everywhere in its domain of definition.

P.T.O.

Q2) Attempt any two of the following.

[10]

- a) Find all roots of the equation $\sin z = \cos h4$.
- b) Let C_R denote the upper half of the circle $|z| = R$ ($R > 2$) taken in the counterclockwise direction show that $\lim_{R \rightarrow \infty} \int_{C_R} \frac{2z^2 - 1}{z^4 + 5z^2 + 4} dz = 0$.
- c) Evaluate the integral of function $\frac{z+1}{z^2 - 2z}$ around the circle $|z| = 2$ in the positive sense.

SECTION-II

(Real Analysis-II)

Q3) a) Attempt any three of the following.

[6]

- i) Let $f(x) = x$ on $[0, 1]$. Show that $f \in R[0, 1]$.
- ii) If $f(x) = \int_0^x \sqrt{t + t^6} dt$, $x > 0$. Find $f'(2)$.
- iii) Prove that $\int_0^1 \frac{dx}{x^2 + x^{1/2}}$ is convergent.
- iv) Test the convergence of $\sum_{n=1}^{\infty} \frac{1}{n^2}$ by using integral test.
- v) Give an example of bounded function which is not Riemann integrable.

b) Attempt any one of the following:

[4]

- i) Test the convergence of the series.

$$\sum_{n=2}^{\infty} \frac{1}{n(\log n)^{\alpha}}, \alpha > 0$$

- ii) Show that $\int_0^1 \frac{\sin x}{x^{3/2}} dx$ is convergent.

Q4) Attempt any two of the following.

[10]

a) Show that the improper integral $\int_{\pi}^{\infty} \frac{\sin x}{x} dx$ converges conditionally.

b) i) Let $f(x) = \frac{\sin x}{x}$, if $x \neq 0$
 $= 1$, if $x=0$.

Find $W[f,0]$

ii) Let f be Riemann integrable in $[0,1]$. If $\sigma_n = \{0, \frac{1}{n}, \frac{2}{n}, \dots\}$ is a partition of $[0,1]$ and $\lim_{n \rightarrow \infty} U[f, \sigma_n] = \lim_{n \rightarrow \infty} L[f, \sigma_n] = A$ Show that

$$\int_0^1 f(x) dx = A.$$

iii) Let $\sum_{n=1}^{\infty} u_n(x)$ be a series of real valued function defined on $[0,1]$,

$$\text{Where } f_n(x) = \sum_{k=1}^n u_k(x) = n^2 x(1-x^2)^n, 0 \leq x \leq 1.$$

Then show that $\frac{d}{dx} \sum_{n=1}^{\infty} u_n(x) \neq \sum_{n=1}^{\infty} \frac{d}{dx} u_n(x)$.



Total No. of Questions : 4]

SEAT No. :

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P1644

[5522]-404

T.Y.B.Sc.

MATHEMATICS

MT-344 : Ring Theory

(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.*

Q1) Attempt any five of the following:

[10]

- a) Describe all units in the ring $R = \mathbb{Z} \times \mathbb{Z}$. List four zero divisors in R .
- b) Find the characteristic of the following rings.
 - i) $2\mathbb{Z}$
 - ii) $\mathbb{Z}_6 \times \mathbb{Z}_{15}$
- c) Give an example of a ring homomorphism $\phi: R \rightarrow R'$ where R has unity 1 and $\phi(1) \neq 0'$, but $\phi(1)$ is not unity for R' ($0'$ is the additive identity of R').
- d) Find all prime ideals and all maximal ideals of the ring $\mathbb{Z}_{12}$.
- e) Give an example to show that a factoring of an integral domain may have divisors of 0.
- f) State whether the function v for $\mathbb{Z}[x]$ given by $v(f(x)) = (\text{degree of } f(x))$ for $f(x) \in \mathbb{Z}[x]$ $f(x) \neq 0$ is an Euclidean norm on $\mathbb{Z}[x]$. Justify your answer.
- g) Write 6 in to product of irreducibles in $\mathbb{Z}[\sqrt{-5}]$ in two different ways.

P.T.O.

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

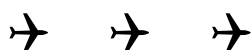
- Show that every finite integral domain is a field.
- Let D be an integral domain and N be an equivalence relation on $D \times D$ define by $(a,b) \sim (c,d)$ if and only if $ad=bc$ (for $(a,b),(c,d) \in D \times D$). Let F be the set of all equivalence classes $[(a,b)]$ for $(a,b) \in D \times D$. Also, F is a field with respect to addition $[(a,b)] + [(c,d)] = [(ac+bd, bd)]$ and multiplication $[(a,b)] \cdot [(c,d)] = [(ac, bd)]$. Prove that the map $i: D \rightarrow F$ given by $i(a) = [(a, 1)]$ is an isomorphism of D with a subring of F .
- Show that the polynomial $\phi_p(x) = x^{p-1} + x^{p-2} + \dots + x + 1$ is irreducible over $\mathbb{Q}$ for any prime p .

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

- Let H be a subring of the ring R . Prove that the multiplication of additive cosets of H is well defined by the equation $(a+H)(b+H) = ab+H$ if and only if $ah, hb \in H$ for all $a, b \in R$ and $h \in H$.
- Let R be a commutative ring with unity. Show that the ideal M is a maximal ideal of R if and only if the commutative ring R/M is a field.
- let F be a field. Show that every ideal in $F[x]$ is a principal ideal.

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

- Show that every PID is a UFD. Also, give an example of a UFD which is not a PID.
- Show that every Euclidean domain is a PID. Also, give an example of a PID which is not an Euclidean domain.
 - Show that the commutative ring $\mathbb{Z}[i]$ of Gaussian integers is an integral domain. Is $\mathbb{Z}[i]$ an Euclidean domain?



Total No. of Questions : 4]

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P1645

[5522] - 405

T.Y.B.Sc.

MATHEMATICS

**MT : 345- Partial Differential Equation
(2013 Pattern) (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.*

Q1) Attempt any Five of the following.

[10]

- a) Define pfaffian differential equation in three variables.
- b) Write Charpit's auxillary equation for $f(x, y, z, p, q) = 0$.
- c) Find the complete integral of the equation $p + q = 0$.
- d) Verify the condition of integrability for differential equation $(y + z)dx + (x + z)dy + (x + y)dz = 0$.
- e) Solve the differential equation $zydx - zxdy - y^2dz = 0$.
- f) Find the integral curves of $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{x - y}$.
- g) Eliminate the arbitrary function 'f' from the equation $z = f(x - y)$.

Q2) Attempt any two of the following.

[10]

- a) Prove that, the pfaffian differential equation $\overline{X} \cdot d\overline{r} = 0$ is integrable if and only if $\overline{X} \cdot \text{curl} \overline{X} = 0$.
- b) Find the integral curves of $\frac{dx}{x^2(y^3 - z^3)} = \frac{dy}{y^2(z^3 - x^3)} = \frac{dz}{z^2(x^3 - y^3)}$.
- c) Define Homogeneous pfaffian differential equation in three variables. Also explain method of solving it.

P.T.O.

Q3) Attempt any two of the following.

[10]

a) Explain method of solving following first order partial differential equation

i) $f(p, q) = 0$

ii) $z = px + qy + f(p, q)$

b) Find the integral surface of the differential equation

$$x(y^2 + z)p - y(x^2 + z)q = (x^2 - y^2)z$$

which contains the straight line $x + y = 0, z = 1$

c) Explain Jacobi's method for finding complete integral of first order partial differential equation $f(x, y, z, p, q) = 0$.

Q4) Attempt any one of the following.

[10]

a) i) Explain Natani's method of solving pfaffian differential equation in three variables.

ii) Solve the differential equation $z^2 = pqxy$ by charpit method.

b) i) Prove that the general solution of a linear partial differential equation $Pp + Qq = R$ is $F(u, v) = 0$ where F is an arbitrary function of $U(x, y, z) = c_1$ and $V(x, y, z) = c_2$ which forms a solution of the

equation $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

ii) Find the general integral of $zxp - zyq = y^2 - x^2$.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1646

[5522] - 406

T.Y.B.Sc.

MATHEMATICS

**MT : 346 - Problem Course Based on MT-344 and MT-345
(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 non-programmable calculator is allowed.*
- 4) *Answer to the two sections should be written in separate answer books.*
- 5) *Tie answer books of both sections together.*

SECTION-I

(Ring Theory)

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

- i) Find two elements a and b in a ring R such that both a and b are zero divisors but $a + b \neq 0$ and $a + b$ is not a zero-divisor in R .
- ii) Show that a field F has no proper ideal.
- iii) Show that a factor ring $\mathbb{Z}_3[x] / \langle x^2 + 1 \rangle$ is a field.
- iv) Find all prime numbers p such that $x + 2$ is a factor of $x^4 + x^3 + x^2 - x + 1$ in $\mathbb{Z}_p[x]$.

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

- i) Show that every field F is a Euclidean domain.
- ii) Let $\phi: R \rightarrow R'$ be a ring homomorphism and let N be an ideal of R . Show that $\phi[N]$ is an ideal of $\phi[R]$.

P.T.O.

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

- a) Let $\alpha = 7 + 2i$ and $\beta = 3 - 4i$ in $\mathbb{Z}[i]$. Find σ and ρ in $\mathbb{Z}[i]$ such that $\alpha = \beta\sigma + \rho$ with $N(\rho) < N(\beta)$, where N is norm on an integral domain $\mathbb{Z}[i]$.
- b) Show that an ideal $\langle x \rangle$ of an integral domain $\mathbb{Z}[x]$ is not maximal ideal.
- c) The polynomial $x^3 + 2x^2 + 2x + 1$ can be factored into a linear factor in $\mathbb{Z}_7[x]$. Find this factorization.

SECTION-II

(Partial Differential Equation)

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

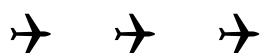
- i) Solve the differential equation $(y + z)dx + dy + dz = 0$.
- ii) Solve the clairaut's equation $z = px + qy + p^2q^2$.
- iii) Reduce the equation $(y + z)dx + (z + x)dy + (x + y)dz = 0$ into one variable separable form.
- iv) Eliminate arbitrary constant 'a' and 'b' from $z = (x + a)(y + b)$.

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

- i) Solve the differential equation $zy^2dx + zx^2dy - x^2y^2dz = 0$.
- ii) Find the general integral of the differential equation $(y - z)p + (z - x)q = x - y$.

Q4) Attempt any two of the following. [10]

- a) Find the complete integral of the equation $z + 2u_3 - (u_1 + u_2)^2 = 0$ by Jacobi's method.
- b) Find the complete integral of $p^2 + q^2 = x + y$.
- c) Find the integral curves of $\frac{dx}{y(x + y) + az} = \frac{dy}{x(x + y) - az} = \frac{dz}{x + y}$.



Total No. of Questions : 4]

SEAT No. :

P1647

[5522]-407

[Total No. of Pages :3

T.Y.B.Sc.

MATHEMATICS

**MT-347: (A) Optimization Techniques
(2013 Pattern) (Semester - IV) (Paper-VII (A))**

Time : 2Hours]

[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) State the no passing rule in a sequencing problem.
- b) What is a replacement problem? Describe some replacement policies.
- c) Write the Hessian matrix for real valued function $f(x_1, x_2, x_3)$ of three variables.
- d) Explain saddle point, pure strategy and mixed strategy for two person zero sum game.

e) Solve the game:
$$A \begin{matrix} & \begin{matrix} b_1 & b_2 \end{matrix} \\ \begin{matrix} a_1 \\ a_2 \end{matrix} & \begin{bmatrix} 0 & 2 \\ -1 & 4 \end{bmatrix} \end{matrix}$$

Is it fair game? Justify.

- f) Define critical activity in a project. State the necessary and sufficient conditions for critical activity.
- g) Distinguish between CPM and PERT.

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

- a) The running cost per year and resale price of an equipment whose purchase price is Rs.5000 are given in following table.

Year	1	2	3	4	5	6	7	8
Running cost in Rs.	1500	1600	1800	2100	2500	2900	3400	4000
Resale price in Rs.	3500	2500	1700	1200	800	500	500	500

What is the best time to replace the equipment.

P.T.O.

- b) Following table gives the processing times for 6-jobs through 3-machines A,B,C in order A-C-B.

Machine \ Job	1	2	3	4	5	6
A	12	10	9	14	7	9
B	7	6	6	5	4	4
C	6	5	6	4	2	4

Determine the optimal sequence which minimises total elapsed time.

- c) Show that $(0,3,1)$ and $(2,1,1)$ are stationary points of function $f(x_1, x_2, x_3) = 2x_1x_2x_3 - 4x_1x_3 - 2x_2x_3 + x_1^2 + x_2^2 + x_3^2 - 2x_1 - 4x_2 + 4x_3$

Q3) Attempt any two of the following.

[10]

- a) Solve the following game graphically.

$$\begin{array}{c} \text{Player B} \\ \begin{array}{c} b_1 \quad b_2 \quad b_3 \quad b_4 \\ \text{Player A} \begin{bmatrix} a_1 & 1 & 3 & -3 & 7 \\ a_2 & 2 & 5 & 4 & -6 \end{bmatrix} \end{array} \end{array}$$

- b) Solve the following game.

$$\begin{array}{c} \text{Player B} \\ \begin{array}{c} b_1 \quad b_2 \quad b_3 \quad b_4 \\ \text{Player A} \begin{bmatrix} a_1 & 2 & -2 & 4 & 1 \\ a_2 & 6 & 1 & 12 & 3 \\ a_3 & -3 & 2 & 0 & 6 \\ a_4 & 2 & -3 & 7 & 7 \end{bmatrix} \end{array} \end{array}$$

- c) Write LP form of following game for both players.

$$\begin{array}{c} \text{Player B} \\ \begin{array}{c} b_1 \quad b_2 \quad b_3 \quad b_4 \\ \text{Player A} \begin{bmatrix} a_1 & 5 & 7 & 5 & 9 \\ a_2 & 6 & 4 & 8 & 7 \\ a_3 & 9 & 6 & 7 & 4 \end{bmatrix} \end{array} \end{array}$$

Q4) Attempt any one of the following.

[10]

a) A project schedule has following characteristics.

Activity	1-2	1-3	1-4	2-5	3-7	4-6	5-7	5-8	6-7	6-9	7-10	8-10	9-10
duration in days	10	8	9	8	16	7	7	7	8	5	12	10	15

Draw the network of the project. Find critical path and project completion time. Also, find total float and free float of each noncritical activity.

b) The following table shows the activities along with their time estimates in days of a PERT project.

Activity Time estimates	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
t_o	3	2	6	2	5	3	1	3	4
t_m	6	5	12	5	11	6	4	9	19
t_p	15	14	30	8	17	15	7	27	28

Draw the network of PERT project. Find critical path and expected time of completion of project.



Total No. of Questions : 4]

SEAT No. :

P1648

[5522] - 408

[Total No. of Pages : 2

T.Y.B.Sc.

MATHEMATICS

**MT : 347 (B) - Differential Geometry
(2013 Pattern) (Semester - IV)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt any five of the following.

[10]

- a) Find arc length function for the curve $\gamma(t) = (e^t \cos t, e^t \sin t)$.
- b) Find parametrisation of the curve $x^2 + y^2 - 2y = 0$.
- c) Determine whether the curve $\left(\frac{1}{3}(1+t)^{3/2}, \frac{1}{3}(1-t)^{3/2}, \frac{t}{\sqrt{2}} \right)$ is unit speed curve.
- d) Compute unit tangent and unit normal to the curve $\left(\frac{4}{5} \cos t, 1 - \sin t, \frac{-3}{5} \cos t \right)$.
- e) Define a surface in $\mathbb{R}^3$.
- f) Find the basis for the tangent space to the surface $\bar{\sigma}(u, v) = (u, v, u^2 - v^2)$ at the point $(1, 1, 0)$.
- g) Compute the first fundamental form for the surface $\bar{\sigma}(u, v) = \gamma(u) + v\bar{a}$ where γ is a unit speed curve and $\bar{a}$ is a unit vector.

P.T.O.

Q2) Attempt any two of the following:

[10]

- a) Prove that a parametrised curve $\gamma: (a, b) \longrightarrow \mathbb{R}^n$ is unit speed curve if and only if it is regular.
- b) Let $\gamma(s)$ be a unit speed plane curve and let $\varphi(s)$ be the angle through which a fixed unit vector must be rotated anti-clockwise to bring it into coincidence with the unit tangent vector $\bar{t}$ of γ . Then prove that the signed curvature of γ is $k_s = \frac{d\varphi}{ds}$.
- c) Show that the curve $\gamma(t) = \left(\frac{1+t^2}{t}, t+1, \frac{1-t}{t} \right)$ is a planar curve.

Q3) Attempt any two of the following:

[10]

- a) Let $\gamma(t)$ be a regular curve in $\mathbb{R}^3$ with nowhere vanishing curvature. Then prove that the torsion of γ is
$$T = \frac{(\dot{\gamma} \times \ddot{\gamma}) \cdot \dddot{\gamma}}{\|\dot{\gamma} \times \ddot{\gamma}\|^2}$$
 where $\dot{\gamma}(t) = \frac{d\gamma}{dt}$, $\ddot{\gamma} = \frac{d^2\gamma}{dt^2}$, $\dddot{\gamma} = \frac{d^3\gamma}{dt^3}$.
- b) State and prove the Wirtinger's inequality.
- c) Show that the cylinder $S = \{(x, y, z) \in \mathbb{R}^3 \mid x^2 + y^2 = 1\}$ is a surface. Also, prove that it can be covered by a single surface patch.

Q4) Attempt any one of the following.

[10]

- a)
 - i) Prove that any tangent developable is isometric to a plane.
 - ii) Show that every isometry is conformal.
- b) Suppose that $f: [a, b] \rightarrow \mathbb{R}$ is a differentiable function such that $f(u) > 0 \quad \forall u \in [a, b]$.

Let γ be a curve given by $\gamma(t) = (t, f(t), 0), t \in [a, b]$ sketch the surface of revolution of γ about x -axis. Also compute the second fundamental form of the surface of revolution.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522] - 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) What is the difference between a automatic variable and an external variable?
- b) Write a macro ABS(x) to find absolute value of x .
- c) What will be the output of the following program?

```
# include <stdio.h>

struct sample
{
    int a;
} sample;

int main ( )
{
    Sample. a = 100;
    printf ("%d", sample.a);
    return 0;
}
```

- d) Suppose a and b has unsigned integer variables whose values are $0xbd67$ and $0xa726$ respectively. Find a & b.
- e) What is the purpose of library function feof?
- f) What is a stream pointer?
- g) Describe two different approaches to updating a data file.

P.T.O.

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

- a) What are the advantages of pointers?
- b) What is a union? Differentiate between a union and a structure data type?
- c) Write a C program to evaluate division of complex numbers using structures.

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

- a) Write a short note on command line arguments.
- b) Write a short note on dynamic memory allocation.
- c) A C program contains the following declaration:
Static int $x[8] = \{10, 20, 30, 40, 50, 60, 70, 80\};$
 - i) What is the meaning of x ?
 - ii) What is the meaning of $(x + 2)$?
 - iii) What is the value of $*x$?
 - iv) What is the value of $(*x+2)$?
 - v) What is the value of $*(x+2)$?

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

- a)
 - i) Define a structure named point having two members of the type float. Write a program to accept a, b, c and check whether the point (x, y) given by the user lies on the line $ax + by + c = 0$.
 - ii) Explain the use of the function 'realloc'.
- b)
 - i) Write a short note on passing structure to a function.
 - ii) Write a C program to read a line of lower case text and store in upper case within a data file.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1650

[5522]-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) Explain the difference between adjacency and Incidence matrix.
- b) Give an example of two graphs G_1 and G_2 such that $G_1 \cap G_2$ is not a graph.
- c) Draw all possible trees on 4 vertices.
- d) Define the term fusion of two vertices in a graph G with example.
- e) Give an example of a self-Complementary graph G .
- f) Show that it is impossible to have group of 9 peoples at a party such that each one knows exactly 5 others, in the group.
- g) If G is a graph with 4 connected components and 24 edges what is the maximal possible number of vertices in G .

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

- a) Show that a graph G is connected if and only if it has a spanning tree.
- b) State and prove hand shaking lemma. Also prove that in any graph G there is an even number of odd vertices.
- c) Prove that a connected graph G is an Euler graph if and only if degree of every vertex is even?

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

- a) If G is self complementary graph with n number of vertices then show that $n = 4k$ or $n=4k+1$, $K \in \mathbb{N}$.

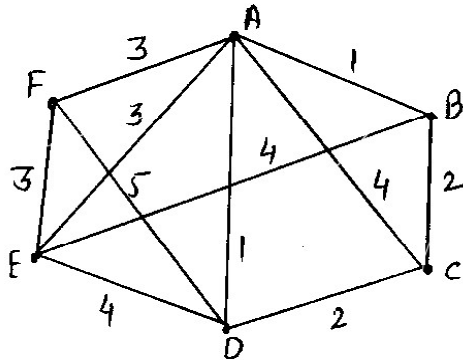
P.T.O.

- b) If G is a graph with atleast two vertices then show that G is bipartite if and only if G has no odd cycle.
- c) Define the term Bridge and hence show that, if T is a tree then every edge is a bridge.

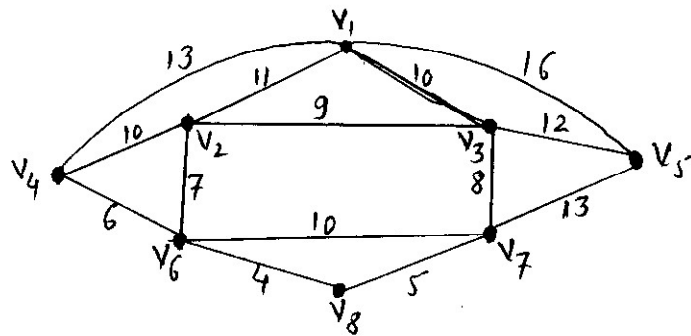
Q4) Attempt any one of the following

[10]

- a) i) Using Kruskal's algorithm find the shortest spanning tree of the following graph.



- ii) Define edge connectivity and vertex connectivity. Give an example of a graph G in which vertex connectivity is strictly smaller than edge connectivity.
- b) i) Solve chinese Postman problem for the following graph.



- ii) If D is weakly connected directed graph with atleast one arc then show that D is directed Euler digraph if and only if indegree and outdegree of every vertex is same in D .



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1651

[5522]-411

T.Y. B.Sc.

MATHEMATICS

**MT - 347 (E) : Lebesgue Integration
(2013 Pattern) (Semester-IV) (Paper - VII)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

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

- a) Show that if G is an open subset of $[a, b]$ and if $|G| = 0$ then $G = \emptyset$.
- b) Show that $[0, 1]$ is uncountable set.
- c) Prove or disprove : If $|f|$ is a measurable function on $[a, b]$ then f is also measurable function on $[a, b]$.
- d) If $f(x) = [x], \forall x \in [0, 3]$, then show that $f \in L[0, 3]$.
- e) Prove that if f and g are bounded functions in $L[a, b]$ then $fg \in L[a, b]$.
- f) Let $f(x) = x^2 - 1 \forall x \in [-2, 2]$. Then find f^+ .
- g) Let $f(x) = \begin{cases} -1, & -\pi \leq x < 0 \\ 1, & 0 \leq x \leq \pi \end{cases}$

Then find the fourier coefficients a_0 and a_k .

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

- a) Prove that if E_1 and E_2 are subsets of $[a, b]$ then $\overline{m}E_1 + \overline{m}E_2 \geq \overline{m}(E_1 \cup E_2) + \overline{m}(E_1 \cap E_2)$
- b) Prove that if f and g are measurable functions on $[a, b]$ and if $g(x) \neq 0$ in $[a, b]$ then f/g is also measurable on $[a, b]$.
- c) Show that a subset E of $[a, b]$ is measurable if and only if for a given $\epsilon > 0$ there exists an open set $G \supset E$ and a closed set $F \subset E$ such that $|G| - |F| < \epsilon$.

P.T.O.

Q3) Attempt any two of the following:

[10]

- a) Let f be a bounded function in $L[a, b]$ and let g be a bounded function on $[a, b]$ such that $f(x) = g(x)$ almost everywhere in $[a, b]$. Then prove

$$\text{that } g \in L[a, b] \text{ and } \int_a^b g = \int_a^b f.$$

- b) Let f and g are non-negative valued functions on $[a, b]$ and let $f, g \in L[a, b]$. Then prove that $f + g \in L[a, b]$ and

$$\int_a^b (f + g) = \int_a^b f + \int_a^b g$$

- c) Let $f(x) = \frac{1}{\sqrt[3]{x}}$ ($0 < x \leq 1$) and $f(0) = 0$. Then show that $f \in L[0, 1]$ and

$$\text{hence evaluate } \int_0^1 f.$$

Q4) Attempt any one of the following:

[10]

- a) i) If $E_1, E_2, E_3, \dots$ are measurable subsets of $[a, b]$ and if

$$E_1 \supset E_2 \supset E_3 \supset \dots \text{ then prove that } \bigcap_{n=1}^{\infty} E_n \text{ is measurable}$$

$$\text{and } m\left(\bigcap_{n=1}^{\infty} E_n\right) = \lim_{n \rightarrow \infty} mE_n.$$

- ii) Find the fourier series for $f(x) = |x|$ in $[-\pi, \pi]$.

- b) i) Let E be any measurable subset of $[a, b]$. If $f, g \in L[a, b]$ such that $f(x) \leq g(x)$ almost everywhere on E then prove that $\int_E f \leq \int_E g$.

- ii) Let $f \in L[a, b]$ be a bounded function. Let $E \subset [a, b]$ be such that $mE = 0$. Then show that $\int_E f = 0$.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-412

T.Y. B.Sc.

MATHEMATICS

**MT - 347 (F) : Computational Geometry
(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) Write the transformation matrix for shear in Z - coordinate proportional to x - coordinate and y - coordinate by factor 3 and 6 respectively.

- b) Determine the transformation matrix $[T] = \begin{bmatrix} 1 & 3 \\ \sqrt{10} & \sqrt{10} \\ -3 & 1 \\ \sqrt{10} & \sqrt{10} \end{bmatrix}$ preserves the

length of the line segment and the angle between two intersecting lines.

- c) The circle with radius 2 units is transformed by using the transformation matrix $[T] = \begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$. Obtain the area of transformed figure.

- d) Write the transformation matrix required to create bottom view of the object.
- e) Write the transformation matrix for cabinet projection with horizontal inclination angle $\alpha = 30^\circ$.
- f) Find the value of $\delta\theta$ to generate 40 points on the circle $(x - 2)^2 + (y - 4)^2 = 25$.
- g) Write the transformation matrix for perspective projection on to the $y = 0$ plane from the centre of projection at the point $[0 \ 2 \ 0]$.

P.T.O.

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

- a) Derive the transformation matrix for rotation about the origin through an angle θ .
- b) Write an algorithm for reflection through the line $y = mx + k$.
- c) Rotate the line segment between the points A [3 5] and B [4 1] about the point C [2 1] through an angle 90° .

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

- a) Write an algorithm to rotate an object through an angle θ about the local X-axis passing through a point P [x_0 y_0 z_0]
- b) Derive the rotation angle ϕ about y - axis and rotation angle θ about X-axis in dimetric projection for the given principal fore shortening factor f_z along Z-axis.
- c) Find the concatenated transformation matrix required to make the plane $X + Y + Z = 0$ coincident with the $Z = 0$ plane.

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

- a) i) Write an algorithm to generate uniformly spaced n points on the ellipse $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$, with the major axis inclined by angle α with positive direction of x - axis.
ii) Find the parametric equation of the Be'zier curve for the control points B_0 [2 1], B_1 [4, 4], B_2 [5 3] and B_3 [5 1]. Compute the position vectors of the points on the curve for parameter values $t = 0.1, 0.2$.
- b) i) State general parametric equation of Be'zier curve and also obtain matrix representation of Be'zier cubic curve.
ii) Generate uniformly spaced 5 points on parabolic segment in the first quadrant for $3 \leq x \leq 12$, for the parabola given by $y^2 = 12x$.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-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) Define the term volume charge density. Give its S.I. unit.
- b) State Gauss law in differential form in dielectric.
- c) Write the relation between $\vec{D}$, $\vec{E}$ and $\vec{P}$.
- d) What is non-polar molecule?
- e) Write Poisson equation in Cartesian co-ordinate system.
- f) State equation of continuity.
- g) Define term magnetic susceptibility.
- h) State Lenz's law.
- i) Write microscopic equivalence of Ohm's law.
- j) State any two properties of diamagnetic substance.

P.T.O.

Q2) Attempt any two of the following :

[10]

- a) State Amperes circuital law and show that $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$.
- b) Using Biot-Savart's law, derive an expression for magnetic induction due to a straight conductor carrying a current I at a point near the conductor.
- c) Define circular polarization. Deduce the expression for
 - i) elliptically and
 - ii) circularly polarized waves

Q3) Attempt any two of the following.

[10]

- a) Two spheres of charge $+20$ and $+80$ Coulomb are placed 9cm apart. Find the position of the point between them, where the intensity is zero.
- b) A 20cm long wire carrying a current of 10 amp is held at an angle 30° with the direction of a uniform magnetic field of strength 1Wb/m^2 . Calculate the force acting on the wire.
- c) An inductor is formed by winding 10 turns of a thin wire around a wooden dowel rod of radius 2 cm . A uniform sinusoidal magnetic field of magnitude 10 mWb/m^2 and frequency 10kHz is directed along the axis of the rod. Find the induced voltage in the winding.

Q4) a) Attempt any one of the following:

[8]

- i) Define electric image. A point charge $+q$ is placed at a perpendicular distance d from the grounded conducting plane of infinite extent obtain an expression for electrical potential and intensity at any point on the conducting plane.
- ii) State and prove Poynting theorem. Give its physical significance.

b) Attempt any one of the following:

[2]

- i) Define magnetization and write relation between $\vec{B}$, $\vec{M}$ and $\vec{H}$.
- ii) Find the magnitude of polarization($\vec{P}$) for a homogeneous & isotropic dielectric material that has $K = 3$ and $D = 3.9 \times 10^{-7}\text{ C/m}^2$.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-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 diagram wherever necessary.*
- 4) *Use calculator and log table is allowed.*

Q1) Attempt all of the following (One mark each) :

[10]

- a) What is wave packet?
- b) Define wave particle duality.
- c) State angular momentum angular displacement uncertainty relation.
- d) State equation of continuity.
- e) State Ehrenfest second theorem.
- f) When energy state of particle is said to be degenerate?
- g) Represent infinite one dimensional potential well mathematically?
- h) What is rigid rotator?
- i) State quantum numbers.
- j) Show that $[\hat{A}, \hat{B}] = -[\hat{B}, \hat{A}]$

Q2) Attempt any Two of the following (5 Marks each) :

[10]

- a) Find the expectation value of position for a particle having wave function

$$\psi(x,t) = Ae^{\frac{-x^2}{2a} + ikx} \text{ the range of } x \text{ is from } -\infty \text{ to } \infty.$$

- b) A ruby laser emits light of wavelength 693.4 nm. If this light is due to transition from $n = 2$ to $n = 1$ state of an electron in a one dimensional box. Find the width of the box. [Given $h = 6.625 \times 10^{-34}$ J.sec $C = 3 \times 10^8$ m/sec $m = 9.1 \times 10^{-31}$ kg]
- c) State and prove Ehrenfest first theorem.

P.T.O.

Q3) Attempt any Two of the following : (5 marks each)

[10]

- a) Show that for a free particle the uncertainty relation can also be written as $\Delta\lambda \Delta x \geq \lambda^2/4\pi$.
- b) Find the current density if the wave function is $\psi(x) = Ae^{ikx}$.
- c) For HCl molecule, if internuclear distance is 1.29×10^{-8} cm, $M_{\text{cl}} = 35 m_{\text{H}}$ and $m_{\text{H}} = 1.68 \times 10^{-24}$ gm. Calculate the separation of the lines in the far infra-red region.

(Given $h = 6.625 \times 10^{-27}$ ergs sec. $C = 3 \times 10^{10}$ cm/sec).

Q4) A) Attempt any one of the following.

- a) i) State the de Broglie hypothesis and hence derive an expression for de Broglie wavelength. **[4]**
- ii) Prove that eigen values of the hermitian operator are real. **[4]**

OR

- b) For a particle in a three-dimensional rigid box. Using the Schrodinger's steady state equation. Obtain the eigen values of energy of the particle. **[8]**

B) Attempt any one of the following.

- a) Give the requirements of a wave functions. **[2]**
- b) Find lowest energy of an electron confined to move in a one-dimensional potential box of $2\text{\AA}$. [Given : $M = 9.11 \times 10^{-31}$ kg, $\hbar = 1.054 \times 10^{-24}$ J.s. $L_{\text{ev}} = 1.6 \times 10^{-19}$ J] **[2]**



Total No. of Questions : 4]

SEAT No. :

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[5522]-415

[Total No. of Pages : 2

T.Y.B.Sc. (Physics)

PH-343: THERMODYNAMICS AND STATISTICAL PHYSICS
(2013 Pattern) (Semester - IV) (Paper - III)

Time : 2Hours]

[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) Define mean free path.
- b) Define coefficient of diffusion.
- c) If $p=q = \frac{1}{2}$ and $N=20$ Find the mean value of n_1 .
- d) Define grand canonical ensemble.
- e) Define thermodynamic probability.
- f) Define temperature of inversion.
- g) Define phase space.
- h) What do you mean by bosons.
- i) State Joule-Thomson effect.
- j) What do you mean by partition function.

Q2) Attempt any two (Five marks each)

[10]

- a) Establish the maxwell-boltzmann distribution law.
- b) Derive an expression for the thermal conductivity coefficient of a gas.
- c) Obtain expression for Gaussian probability distribution.

Q3) Attempt any Two (5 marks each)

[10]

- a) The mean free path of gas molecule at a pressure p and temperature T is $1.2 \times 10^{-6} \text{m}$ What will be a mean free path at a pressure $2p$ and temperature $\frac{T}{4}$?

P.T.O.

- b) Prove the thermodynamic relation $Tds = c_g dT + T \left(\frac{\partial p}{\partial T} \right)_g d_g$.
- c) In a system for thermal equilibrium at temperature T, Two states with energy difference of 5.52×10^{-14} erg. occur with relative probability e^2 erg/deg. Calculate the temperature of system if $K = 1.38 \times 10^{-16}$ erg/deg.

Q4) a) Attempt any one (Eight marks each). [8]

- i) Explain the random walk problem in one dimension and obtain the probability of finding the particles.
- ii) Derive maxwell's four thermodynamic relations.

b) Attempt any one (Two marks each) [2]

- i) What is the probability of drawing three wings in successive manner from a decle of 52 cards?
- ii) Establis the Helmholtz free energy in terms of partition function.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-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 log table and calculator is allowed.*

Q1) Attempt All of the following (1 mark each).

[10]

- a) Define isomers.
- b) Calculate decay constant of Radon whose half-life is 3.8 days.
- c) Define half-life of a radioactive substance.
- d) What is deuteron?
- e) State different types of particle accelerators.
- f) Define endo-thermic of nuclear reaction.
- g) What is nuclear fission?
- h) What do you mean by saturation of nuclear forces?
- i) Define activity of radioactive substance. Give unit of activity.
- j) Define packing fraction of nucleus.

Q2) Attempt any TWO of the following.

- a) Define mean life of radioactive substance. Obtain an expression for the mean life (τ). **[5]**
- b) What are elementary particles? Explain various types of elementary particles. **[5]**
- c) Define binding energy of nucleus. Describe the binding energy curve. **[5]**

Q3) Attempt any TWO of the following.

- a) The absolute activity of radioactive C^{14} in a living tree is 15.3 counts per gram per minute. The archaeological charcoal sample from an ancient fire-pit has activity 11.3 counts per gram per minute. Half-life of radioactive C^{14} is 5730 years. **[5]**
Estimate the age of charcoal sample.

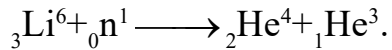
P.T.O.

- b) Calculate the binding energy of ${}_{26}\text{Fe}^{56}$ nucleus if its mass is 55.975 a.m.u. Also calculate the binding energy per nucleon.

Mass of proton (m_p) = 1.007825 a.m.u.

Mass of neutron (m_n) = 1.008665 a.m.u. [5]

- c) Calculate the energy released in the reaction



Given,

Mass of Li^6 = 6.015126 a.m.u.

Mass of He^4 = 4.002603 a.m.u.

Mass of ${}_1\text{H}^3$ = 3.016049 a.m.u.

Mass of ${}_0\text{n}^1$ = 1.008665 a.m.u.

and 1 a.m.u. = 931 Mev. [5]

Q4) a) Attempt any one of the following.

i) What is nuclear reactor? Describe essential components of nuclear reactors. Describe fast breeder reactor. [8]

ii) What are particle detectors? Describe the construction and working of G.M. counter. [8]

b) Attempt any one of the following.

i) State any two conservation laws in nuclear reactions. [2]

ii) Draw the Feynmann diagrams to represent the interaction between two nucleons. [2]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 4

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[5522] - 417

T.Y.B.Sc.

PHYSICS

PH - 345 (A): Electronics

(2013 Pattern) (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 and calculator is allowed.*

Q1) Attempt all of the following (one mark each).

[10]

- a) Define optocoupler.
- b) Define conduction angle.
- c) Draw the symbols of N channel and P channel JFETs.
- d) Define Trip point.
- e) Find the output pulse width of monostable multivibrator for $R_A = 10K\Omega$ and $C=0.1 \mu F$.
- f) Give any two special features of IC 78XX.
- g) Draw the structure of 2-variables k-map.
- h) What do you mean by synchronous counter?
- i) What is demultiplexer?
- j) If oscilloscope displays a pulse width of $0.4\mu s$ and a period of $2.0\mu s$, find the duty cycle.

Q2) Attempt any two.

- a) Explain the construction of N-channel JFET. Draw its transfer characteristic curves. **[5]**
- b) Explain IC 555 as an a stable multivibrator. Derive necessary formula for frequency obtained at it's output. **[5]**
- c) Design and construct half adder using k-map. **[5]**

P.T.O.

Q3) Attempt any two.

- a) Explain working of class - B amplifier with circuit diagram. [5]
- b) A 5 bit asynchronous counter begins with 00000 state. What will be the state of a counter after 80 input pulses? [5]
- c) What is cross over distortion? How it can be eliminated? [5]

Q4) A) Attempt any one.

- a) What is a counter? Explain the working of a 4-bit asynchronous counter with suitable diagram and input-output waveforms. [8]
- b) What is op-amp? Draw the symbol. State parameters of an ideal op-amp. Determine the value of CMRR in dB if differential voltage gain is 100 and common mode voltage gain is 0.25. [8]

B) Attempt any one.

- a) State any four applications of LED. [2]
- b) Convert $Y = AB + \bar{A}\bar{B}C$ in to standard SOP form. [2]



Total No. of Questions : 4]

SEAT No. :

P1657

[5522] - 417

T.Y.B.Sc.

PHYSICS

**PH - 345 (B): Advanced Electronics
(2013 Pattern) (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) Draw neat diagrams wherever necessary.*
- 4) Use of logtable and non programable calculator is allowed.*

Q1) Attempt all of the following (one mark each).

[10]

- a) State the seebeck effect in thermocouple.
- b) List two applications of photodiode.
- c) What is decoder?
- d) State the types of accelerometers.
- e) What is an actuator.
- f) State any two characteristics of OPAMP.
- g) State any two characteristics of LASER Source.
- h) What do you mean by linearization of signal?
- i) State the types of motion.
- j) State any two applications of piezoelectric transducer.

Q2) Attempt any two of the following.

- a) Draw a block diagram of basic instrumentation system. **[5]**
- b) What is pyrometry? Explain optical pyrometer. **[5]**
- c) What is ADC? Explain successive approximation type ADC. **[5]**

Q3) Solve any two of the following.

- a) Describe the wavelength (in m and Å) and the nature of EM radiation of $5.4 \times 10^{13} \text{ Hz}$ Frequency. [5]
- b) What is an Instrumentation amplifier? Explain 3 OPAMP instrumentation amplifier. [5]
- c) What is loading effect? Explain how it affect the output of a process variable. [5]

Q4) A) Attempt any one of the following.

- a) Draw a block diagram of 4 channel data acquisition system (DAS) and explain in brief. [8]
- b) Draw a block diagram of a simple process control loop and identify each element. [8]

B) Attempt any one of the following.

- a) Find the approximate change in a metal wire of resistance 120Ω that results from a strain of $1000 \mu\text{m/m}$. [2]
- b) What is discrete state process control system? [2]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 12

P1658

[5522]-418

T.Y.B.Sc.

PHYSICS

PH - 346 (G): Medical 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 calculator and log-table is allowed.*

Q1) Attempt all of the following (one mark each)

[10]

- a) What do you mean by ECG?
- b) What is the normal range of blood pressure.
- c) What is calorimeter?
- d) Define electrode.
- e) Define common mode rejection ratio.
- f) What is the need of Jelly in ECG measurement?
- g) What is systolic blood pressure?
- h) Write the nernst equation.
- i) State use of spectrophotometer.
- j) What are the basic requirements of bio-potential amplifier?

P.T.O.

Q2) Attempt any two of the following : (5 marks each) **[10]**

- a) Explain in detail photo cardiography with suitable examples.
- b) Explain any one method of patient monitoring safety system.
- c) Explain electrode-electrolyte interface.

Q3) Attempt any two of the following (5 marks each): **[10]**

- a) Describe in detail isolation amplifier with circuit diagram.
- b) Explain construction and working of spectrophotometer with suitable examples.
- c) What are sensors? Describe resistive sensor used for biomedical applications. Also give its advantages.

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

- i) Describe basic medical Instrumentation system with suitable examples.
- ii) Explain with diagram ultrasonic blood flow meters.

b) Attempt any One of the following. **[2]**

- i) Heart rate of a person is 90 beats/min and his cardiac output is 5400 ml/min. How much the stroke volume.
- ii) What do you mean by inductive sensor.

x x x

Total No. of Questions : 4]

P1658

[5522]-418

T.Y.B.Sc.

PHYSICS

**PH - 346 (H): Physics of Nanomaterials
(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) Draw neat diagrams wherever necessary.*
- 4) Use of log table and calculator is allowed.*

Q1) Attempt all of the following (One mark each):

[10]

- a) State the name of milestones in the development of nanotechnology.
- b) Define the term nanotechnology.
- c) State hybrid methods of synthesis of nano materials.
- d) State any two advantages of the sol-gel process.
- e) Define aerogel.
- f) State Bragg's law.
- g) State any two different scales to measure hardness.
- h) Define band gap energy.
- i) State any two nano materials prominently used in defense field.
- j) State applications of Quantum dots.

Q2) Attempt any two (Five marks each): **[10]**

- a) Describe in details of preparation of nanoparticles by colloidal type chemical route method.
- b) Write note on X-ray diffraction technique.
- c) What are carbon nanotubes? Explain properties of carbon nanotubes.

Q3) Attempt any two (Five marks each): **[10]**

- a) Explain mechanism of Electrochemical deposition process.
- b) State different types of carbon nanotubes. Explain multiwalled nanotubes.
- c) Explain the applications of nanomaterials in the field of defense.

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

- i) Explain in details
 - 1) Challenges in nanotechnology.
 - 2) Origin and dimensions of nanomaterials.
- ii) What is an electron microscopy? Explain working of scanning electron microscope. Give its advantages and disadvantages.

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

- i) What is surface and interface effect?
- ii) What is sol and gel?

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Total No. of Questions : 4]

P1658

[5522]-418

T.Y.B.Sc.

PHYSICS

PH - 346 (I): Micro Controllers

(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 log table and calculators is allowed.*

Q1) Attempt all of the following (One mark each):

[10]

- a) How (-19) is represented in 8051 microcontroller?
- b) What is data Framing?
- c) What is the Function of program counter register?
- d) What is Space and Mark in 8051?
- e) Compare the instruction JNC and JC.
- f) What is use of RSO and RSI of PSW register?
- g) What is size of RAM and ROM in 8051 microcontroller.
- h) Explain the meaning of instruction DECA.
- i) List parts of 8051 microcontroller.
- j) Find period of Machine cycle if crystal Frequency is 11.05 MHz.

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

- a) Explain Register direct addressing mode with suitable example of 8051 microcontroller.
- b) What is stack? Explain PUSH instruction of stack with suitable example.
- c) Explain following LCD pins
 - i) RS
 - ii) R/W
 - iii) E (enable)
 - iv) $D_0 - D_7$
 - v) V_{CC}

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

- a) Write an Assembly language program for finding the second complement of given number.
- b) Explain the various Flags of 8051 microcontroller and their function.
- c) Write an 8051 assembly language program to add two 16-bit numbers, the numbers are FC45H and 02ECH.

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

- i) Draw block diagram of 8051 microcontroller and write main Features of 8051 microcontroller.
- ii) Explain following instructions of 8051 with suitable example.

RRC A, RLC A, RRA, RLA

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

- i) Explain timers in 8051 micro-controller.
- ii) Explain TMOD register.

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Total No. of Questions : 4]

P1658

[5522]-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 log table and calculator is allowed.*

Q1) Attempt all of the following (One mark each):

[10]

- a) Give two advantages of carbon microphone.
- b) Give the place theory of hearing.
- c) Draw a diagram showing construction of condenser microphone. Give its equivalent circuit.
- d) What is meant by Hi-Fi?
- e) What is an articulation test?
- f) What is volume expander?
- g) What is folded horn?
- h) Define directivity factor for a microphone.
- i) Give typical frequency response of an exponential horn speaker.
- j) Give the expression for sensitivity of a carbon microphone.

Q2) Attempt any two:

- a) Write a note on bass reflex cabinet. [5]
- b) Give acoustic characteristics of the outer ear. [5]
- c) Write a note on Digital Audio Tape (DAT) [5]

Q3) Attempt any two

- a) Determine the cut-off frequency of an exponential horn having a flare constant of 4.9 on being used outdoors at a temperature of 40°C. [5]
- b) Find the reverberation time of an office which has a volume of 1600 m³ 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]
- c) A direct radiator dynamic loudspeaker has a radiation resistance of 2kg/s. Its voice coil is 7.5m in length and suspended in a magnetic field of 1.0 wb/m². Determine the acoustic power output for a current of 2A, if the mechanical impedance is 13.3 kg/S. [5]

Q4) a) Attempt any one

- i) Explain working of monophonic magnetic tape recording and reproducing system using a block diagram. [8]
 - ii) Discuss the voice mechanism in humans. [8]
- b) Attempt any one
- i) Write a note on equalizer. [2]
 - ii) Sketch the super-cardioid and hyper cardioid polar response of microphones. [2]

x x x

Total No. of Questions : 4]

P1658

[5522]-418

T.Y.B.Sc.

PHYSICS

PH - 346 (K): Lasers

(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 log table and calculator is allowed.*

Q1) Attempt all of the following (One mark each):

[10]

- a) Define population density.
- b) Who investigated first LASER and when?
- c) What is pumping?
- d) Define round trip gain?
- e) Give the expression for cavity resonance frequency.
- f) Define critical population inversion.
- g) State two types of coherence.
- h) What colour does the Ruby Laser emit?
- i) What is the ratio of mixture of Ne gas and He gas in He-Ne laser?
- j) What is a hologram?

Q2) Attempt any two of the following: (5 marks each) **[10]**

- a) Describe construction and working of He-Ne laser.
- b) What is line broadening? Explain doppler broadening.
- c) Explain characteristics of lasers.

Q3) Attempt any two of the following: (5 marks each) **[10]**

- a) What will be the reflectivity of other cavity mirror if the reflectance of first mirror is 100%? The length of the cavity is 15 cm and gain factor of laser material is 0.0005 per CM.
- b) Calculate the wavelength of beam at which rate of spontaneous emission is equal to rate stimulated emission for the temperature of 300°K.
- c) Calculate the wavelength of CO₂ beam having energy difference between two states as 0.117 eV.

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

- i) Explain various applications of lasers in mechanical industries.
- ii) Describe construction and working of Ruby laser. Also give its applications.

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

- i) Define energy levels.
- ii) Define metastable state in laser.

x x x

Total No. of Questions : 4]

P1658

[5522]-418

T.Y.B.Sc.

PHYSICS

PH - 346 (L): Radiation Physics

(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 calculator and log table is allowed.*

Q1) Attempt all of the following :

[10]

- a) What is dosimeter?
- b) What is RBE factor?
- c) What is LET dose.
- d) Define one Curie activity of source.
- e) What are gamma radiations?
- f) Define one eV energy.
- g) Give any two focusing methods for electrons & ions.
- h) Define 1 rad adsorbed dose.
- i) State any two applications of X-rays in medical.
- j) Define half life of radioactive substance.

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

- a) Explain photo-electric effect and Compton scattering for gamma radiations.
- b) Explain the interactions of electrons and ions with matter.
- c) Discuss the method of production of characteristic X-rays.

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

- a) Explain the medical applications of radioisotopes.
- b) Discuss the sources of Infrared and Ultra-violet radiations.
- c) Explain exposure dose and absorbed dose of radiations.

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

- i) Explain construction and working of ionization chamber with neat diagram.
- ii) Explain different methods for radiation shielding and guide lines of government for radiation protection.

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

- i) Explain any two neutron sources based on radioactive sources.
- ii) Explain linear attenuation coefficient for radiations.

x x x

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

P1659

[5522]-419

T.Y.B.Sc.

CHEMISTRY

**CH - 341 : Physical Chemistry
(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) 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) What are the concentration cells.
- b) Why platinum foil in SHE is coated by platinum black powder?
- c) Define e.m.f. of cell.
- d) Obtain miller indices for which the intercepts are $\frac{1}{2}$, 1 and ∞ .
- e) How many atoms are present in unit cell of a simple cubic lattice.
- f) What is meant by wave particle duality.
- g) What is dead time of G.M. Counter?
- h) Define half life period.
- i) What is degeneracy?
- j) $^{32}_{15}\text{P} \longrightarrow \dots\dots\dots + \beta^- \dots\dots + \bar{\nu}$.

P.T.O.

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

- i) Explain metal-metal ion electrode w.r.t
 - 1) Presentation
 - 2) Electrode reaction
 - 3) Expression for electrode potential
- ii) What is crystallography? Explain the law of symmetry.
- iii) What is meant by wave function? State the conditions for well behaved wave function.

b) Solve Any One of the following **[4]**

- i) For an electrochemical cell,
$$\text{Zn} | \text{ZnSO}_{4(aq)} || \text{Hg}_2\text{SO}_4 | \text{Hg}^+$$

the e.m.f. and temperature coefficient of e.m.f. are 1.4202V and -0.00133 VK^{-1} at 298K respectively.

Calculate ΔG , ΔH and ΔS for the cell.
 - ii) Calculate mass defect, binding energy and average binding energy for ${}^{56}_{26}\text{Fe}$ with atomic mass 56.975 amu.
- Given : $m_p = 1.0078 \text{ a.m.u.}$ and $m_n = 1.0086 \text{ a.m.u.}$

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

- a) Draw neat labelled diagram of Weston Saturated standard cell. Describe it with reference to its construction and working.
- b) Give the principle of Laue method. Describe the method for determination of crystal structure.
- c) Explain the construction and working of Geiger-Muller counter.

Q4) a) What are tracers? Discuss the applications of tracers in **[6]**

- i) Thyroiditis
- ii) Assessing the volume of blood in patients

OR

- a) i) Determine the degeneracy of the energy state for which the total energy is

i) $\frac{3h^2}{8ma^2}$

ii) $\frac{6h^2}{8ma^2}$

iii) $\frac{14h^2}{8ma^2}$

- ii) State and explain Heisenberg's uncertainty principle.

- b) Solve any one of the following [4]

- i) Calculate the interplaner spacing of a set of planes, if the angle for the first order diffraction is 22.5° when the X-rays of wavelength $1.53\text{\AA}$ are used.
- ii) The standard e.m.f. of the Daniell cell is 1.1 volts at 25°C . Calculate the equilibrium constant for the reaction taking place in cell $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1660

[5522]-420

T.Y. B. Sc.

CHEMISTRY

CH - 342 : Inorganic Chemistry

(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) *Neat diagram 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) Give the symbol for an element with atomic number 109 according to IUPAC rules.
- b) Define superconductor.
- c) Draw BCC structure of ionic solid.
- d) Which metal complex is used as catalyst in hydrogenation of alkenes.
- e) Define unit cell.
- f) What is function of hemoglobin?
- g) Name the elements which is artificially prepared in lanthanide series.
- h) What is function of superoxide dismutase enzyme?
- i) Enlist any two properties of heterogeneous catalyst.
- j) Arrange the elements Na^+ , Ca^{2+} , Al^{3+} with increasing order of conductivity.

Q2) a) Attempt any two of the following:

[6]

- i) Write a brief note on nuclear fuels.
- ii) What are semiconductors? Explain n-type semiconductor.
- iii) Explain the catalytic mechanism of hydrogenation of nitrobenzene to p-aminophenol in the presence of pd/c catalyst.

b) Answer any two of the following :

[4]

- i) Distinguish between homogeneous and heterogeneous catalyst.
- ii) What do you mean by supported metal catalyst?
- iii) Give biological role of magnesium.

P.T.O.

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

- a) What is lanthanide contraction? Discuss consequences of lanthanide contraction.
- b) Explain use of Born-Haber cycle in calculation of lattice energy of sodium chloride.
- c) Discuss the Monsanto process for acetic acid synthesis.

Q4) a) Explain electrical conductivity of univalent, divalent and trivalent metals on the basis of $N(E)$ Vs E curves. **[6]**

OR

- a) Answer the following. **[6]**
 - i) Give synthesis of Terephthalic acid from xylene using ZSM-5 catalyst.
 - ii) Write note on ferritin.
- b) Pauling univalent radius of Al^{3+} ion is $0.72 \text{ \AA}$ and that of O^{2-} ion is $1.76 \text{ \AA}$. Calculate their crystal radii. Born exponent for neon configuration is 7. **[4]**

OR

- b) Answer the following : **[4]**
 - i) What is transesterification?
 - ii) Give the list of iron proteins that are found in human body.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 5

P1661

[5522]-421

T.Y. B.Sc.

CHEMISTRY

CH - 343 : Organic Chemistry

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

Time : 2 Hours]

[Max. Marks : 40

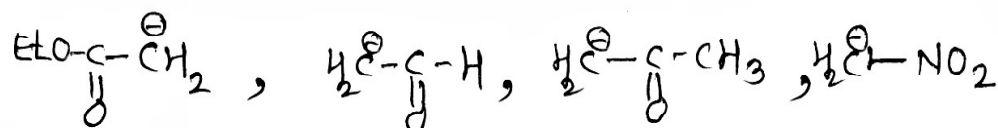
Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *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 NH_3 .
- b) Define the term synthon.
- c) Which reagent used in curtius rearrangement.
- d) Express $\lambda = 2 \mu$ in cm^{-1}
- e) Define Auxochrome.
- f) Write the stability order of carbanion.



- g) How many sets of protons are present in benzaldehyde.
- h) Give the source and uses of ephedrine.
- i) Write the name of radiation used and nature of excitation in NMR and UV spectroscopy.
- j) Give any two general properties of alkaloids.

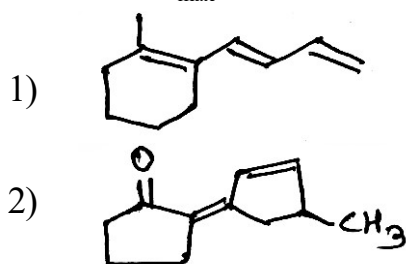
Q2) a) Attempt any two of the following:

[6]

- i) Write a note on Pinacol-Pinacolone rearrangement.
- ii) Write retrosynthesis and synthesis of crotonaldehyde.
- iii) How will you prepare 2,5-Hexadione from aceto acetic ester.

P.T.O.

- b) i) Calculate $\lambda_{\max}$ for the following. [4]

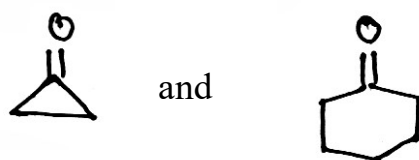


OR

- ii) Explain Dieckmann cyclisation with suitable example. [2]
 iii) What are terpenoids? Give their classification. [2]

Q3) Attempt any two of the following.

- a) i) Write Barbier-Bouveault synthesis of citral. [3]
 ii) How will you distinguish following pair by IR spectroscopy. [2]



- b) i) Explain Favorskii rearrangement. [3]
 ii) Explain finger print region in IR spectroscopy. [2]
 c) i) Write a note on 'Types of coupling'. [3]
 ii) Aniline shows hypsochromic shift in acidic medium. [2]

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

- i) M.F. - C_7H_8
 IR - 1500 - 1600 cm^{-1}
 PMR - 1) Singlet, 2.32 δ (3H)
 2) Singlet, 7.17 δ (5H)
- ii) M.F. - C_4H_9Br
 PMR - 1) doublet, 1.04 δ (6H)
 2) Multiplet, 1.95 δ (1H)
 3) doublet, 3.33 δ (2H)

iii) M.F. - C_3H_5ON

IR - 2250 cm^{-1}

PMR - 1) Singlet, 3.49δ (3H)

2) Singlet, 4.22δ (2H)

b) Write notes on any two of the following:

[4]

i) Aldol condensation

ii) FGI and target molecule.

iii) $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ electronic excitations.

iv) Effect of hydrogen bonding in IR

TABLE - 1
Characteristic Infrared Absorptions of Functional Groups

GROUP	FREQUENCY RANGE cm^{-1}	INTENSITY
A. Alkyl C-H (stretching) Isopropyl - CH(CH ₃) ₂ tert - Butyl - C(CH ₃) ₃	2853-2962 1380-1385 and 1365-1370 1385-1395 and 1365	(m-s) (s) (s) (m) (s)
B. Alkenyl C-H (stretching) C=C (stretching) R-CH=CH- R ₂ C=CR ₂ cis - RCH=CHR trans - RCH=CHR (out of plane C-H bendings)	3010-3095 1620-1680 985-1800 and 905-920 880-900 675-730 960-975	(m) (v) (s) (s) (s) (s) (s)
C. Alkynyl C-H (stretching) C≡C (stretching)	3300 2100-2260	(s) (v)
D. Aromatic Aromatic substitution type C-H out-of-plane bendings) Monosubstituted o-Disubstituted m-Disubstituted p-Disubstituted	3000-3100 690-710 and 730-770 735-770 680-725 and 750-810 800-840	(v) (very s) (very s) (s) (s) (very s) (very s)
E. Alcohols, Phenols, Carboxylic Acids OH (alcohols, phenols, dilute solutions) OH (alcohols, phenols, hydrogen bonded) OH (carboxylic acids, hydrogen bonded)	3200-3550 2500-3000	(broad) (very broad)
F. Aldehydes, Ketones, Esters and Carboxylic Acids C=O stretch aldehydes ketones esters carboxylic acids amides	1630-1780 1690-1740 1680-1750 1735-1750 1710-1780 1630-1690	(s) (s) (s) (s) (s) (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. Cl Br	1400-1000 785-540 <667	(s) (s) (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 ₂ R	1.2 - 1.4
3° Alkyl, R ₃ CH	1.4 - 1.8
Allylic, R ₂ C=C-CH ₂	1.6 - 1.9
Benzylic, ArCH ₂	2.2 - 2.5
Alkyl chloride, RCH ₂ Cl	3.6 - 3.8
Alkyl bromide, RCH ₂ Br	3.4 - 3.6
Alkyl iodide, RCH ₂ I	3.1 - 3.3
Ether, ROCH ₂ R	3.3 - 3.9
Alcohol, HOCH ₂ R	3.3 - 4.0
Ketone, RC(=O)CH ₃	2.1 - 2.6
Aldehyde, RCH=O	9.5 - 9.6
Vinyl, R ₂ C=CH ₂	4.6 - 5.0
Vinyl, R ₂ C=CH-R	5.2 - 5.7
Aromatic, ArH	6.0 - 9.5
Acetylenic, RC≡CH	2.5 - 3.1
Alcohol hydroxyl, ROH	0.5 - 6.0
Carboxylic, RCOOH	10 - 13
Phenolic, ArOH	4.5 - 7.7
Amino R-NH ₂	1.0 - 5.0

*The chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE - 3
U.V. Absorption rules for diene chromophores

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) Exocyclic double bond	05 nm	9) - OH, OR	5 nm
5) Each alkyl (k) substituent directly attached to double bonded carbon	05 nm		

U.V. Absorption rules for Enone System

1) Parent	215 nm (207 nm for α,β-unsaturated ketone)	6) - OR	15 nm
2) Each extra conjugation	30 nm	7) - OH, OR	12 nm
3) Homoannular	39 nm	8) - SR	35 nm
4) Substituents		9) - NR ₂	30 nm
a) Alkyl group at α	10 nm		85 nm
b) Alkyl group at β	12 nm		95 nm
c) Alkyl group at γ, δ & higher	18 nm		
5) Exocyclic double bond	05 nm		

Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-422

T.Y. B.Sc.

CHEMISTRY

**CH - 344 : Analytical Chemistry
(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 log tables and calculator is allowed.*

Q1) Answer the following.

[10]

- a) Define distribution ratio.
- b) Give principle of solvent extraction.
- c) What is demineralised water?
- d) What is elution?
- e) Define the term GSC.
- f) Define the term stationary phase.
- g) What is SFC?
- h) Give the units of electrophoretic mobility (μ).
- i) Give principle of turbidimetry.
- j) Give the mathematical relationship of turbidance & transmittance.

Q2) a) Answer any two of the following.

[6]

- i) Write a note on multiple extraction.
- ii) Give principle & working of flame ionization detector.
- iii) Give advantages & applications of SFC.

b) Answer any two of the following.

[4]

- i) Give principle of certain electrophoresis.
- ii) Calculate the distribution ratio when concentration of solute in organic phase is 0.025m & in aqueous phase is 0.05m.
- iii) Calculate the transmittance of a solution having turbidance value of 0.51.

P.T.O.

Q3) Answer any two of the following. [10]

- a) Explain the principle & working technique of column chromatography.
- b) Sketch the schematic diagram of GLC. Describe its components in brief.
- c) State & explain principle of electrophoresis. Explain the technique of moving boundary electrophoresis.

Q4) a) Draw block diagram of HPLC. Explain role of various components involved in it.

OR

- a) i) Explain separation of metal ions using ion exchange chromatography.
- ii) Explain turbidimetric titration with figure.

[5]

- b) 200 mg of solute in 100ml of water has a distribution ratio 5. Calculate amount of solute extracted after two successive extractions with 40 ml organic solvent.

OR

- b) In the separation of compounds of Zinc, cd, Hg by TLC, the respective spots were obtained at 10, 15 & 20 cm from the base line with the solvent front at 25 cm. An unknown compound has R_f value of 0.4. Does it fit any of the above.

[5]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-423

T.Y.B.Sc.

CHEMISTRY

CH - 345: Industrial Chemistry

(2013 Pattern) (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) Draw neat and labelled diagram and flowsheet wherever necessary.*

Q1) Answer the following.

[10]

- a) What is monomer?
- b) Explain the term atom economy.
- c) Define the term chromophore.
- d) What is detergent?
- e) Define the term durg.
- f) What do you mean by molasses.
- g) Define the term Aging.
- h) What are cosmetics?
- i) Define the term homopolymer.
- j) What are coatings?

P.T.O.

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

- i) Write a note tranquilizers.
- ii) What are advantages of detergents.
- iii) Discuss the manufacture of ethyl alcohol from hydrocarbon.

b) Answer any two of the following. [4]

- i) Give applications of nylon-6,6.
- ii) Explain the term chemotherapeutic agent with suitable example.
- iii) What do you mean by inorganic process waste.

Q3) Answer any two of the following. [10]

- a) Discuss the manufacture, properties and uses of poly vinyl chloride.
- b) What is dye? Give the structures and applications of
 - i) Phenolphthalein
 - ii) Alizarin
- c) Give the synthesis and uses of
 - i) Sulphanilamide
 - ii) Paracetamol

Q4) a) Describe the manufacture of raw sugar from sugarcane with flowsheet and special reference to crystallisation of sugar. [6]

OR

- a) Discuss different types of soap.
- b) Write a note on high density poly ethylene. [4]

OR

- b) Discuss various types of paints.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-424

T.Y.B.Sc.

CHEMISTRY

CH-346 (A) : Nuclear Chemistry

(2013 Pattern) (Semester - IV) (Paper - VI) (Elective-II)

Time : 2Hours]

[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.*
- 4) *Use of log table and calculator is allowed.*

Q1) Answer the following.

[10]

- a) State Hahn and strassman experiment on discovery of nuclear fission.
- b) Give any one example of nuclear fission.
- c) What is the principle of Breeder reactor?
- d) Define Heterogeneous reactor. Give it's example.
- e) How Tritium is prepared on a large scale.
- f) State the names of electrostatic accelerators.
- g) State a principle of neutron detector.
- h) State different types of scintillators.
- i) Define prompt and delayed neutrons.
- j) Give any two safety precautions taken while handling radioactive substance.

Q2) a) Attempt any two of the following.

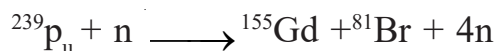
[10]

- i) Explain the working of Natural uranium reactor.
- ii) Write short note on fission energy.
- iii) Explain charge carriers in semiconductor detector.

P.T.O.

b) Attempt any two of the following. [4]

- i) Explain classification of nuclear reactors.
- ii) Explain the applications of radioactivity in the reaction mechanism.
- iii) Calculate the fission energy for the following reaction.



Given :- Atomic Masses of

$$^{239}\text{Pu} = 239.0522 \text{ amu}, ^{81}\text{Br} = 80.9163 \text{ amu}$$

$$^{155}\text{Gd} = 154.9220 \text{ amu}, m_{\text{n}} = 1.00897 \text{ amu}$$

Q3) Answer any two of the following. [10]

- a) Discuss the discovery of nuclear fission with different experiments.
- b) Explain the principle of radiometric titration with examples.
- c) Explain the principle and working of cock-croft walton accelerator with neat diagram.

Q4) What are semi conductors? Explain the principle and working of semiconductor detector. [6]

OR

- a) Discuss the method of preparation of the following
 - i) Carbon-14
 - ii) Sodium-22
 - iii) Phosphorus - 32
- b) 1 ml of solution of radioisotope of iron containing 500000cpm was injected into human being. After 15 minutes 1 ml of blood was withdrawn and it contained 100 cpm of radioactivity. Find the blood volume. [4]

OR

Explain cow and milk system with suitable example.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522] - 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 side indicate full marks.*
- 3) Draw the neat diagrams wherever necessary.*

Q1) Answer the following.

[10]

- a) Define the term: photodegradation.
- b) What is meant by crystallisability.
- c) State whether the following statement is true or false. 'Polycarbonate is used to make bullet proof jackets'.
- d) Define the hetrochain polymers.
- e) Write the correct structure of polystyrene.
- f) 'T_g value of polyethylene is - 125°C'. Explain.
- g) Explain the meaning of the term - scouring.
- h) Define the term: Gloss.
- i) Give two important uses of polyvinyl chloride.
- j) What is meant by polymer blends?

P.T.O.

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

- i) Explain the importance of glass transition temperature.
- ii) Give a brief account of thermal degradation.
- iii) Write a short note on: Degree of crystallinity.

b) Answer any two of the following. [4]

- i) How will you distinguish polyvinyl alcohol and polyacrylonitrile by using IR spectroscopy.
- ii) Give a brief account of geometrical isomerism in polymers.
- iii) Explain the effect of branching chain in polymers on glass transition temperature

Q3) Attempt any two of the following. [10]

- a) Write a detailed note on: Bio-degradable polymers.
- b) Discuss the thermal analysis of polymeric materials.
- c) Give method of preparation, properties and their important applications of following polymers.
 - i) Polymethyl methacrylate
 - ii) Polyisoprene

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

- i) Write a note on: compounding.
- ii) Describe the compression molding technique in polymer technology.
- iii) Explain the injection molding process in detail.

b) Define the meaning of fibre spinning. Give a detailed account of wet spinnig process. [4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522] - 426

T. Y. B. Sc.

CHEMISTRY

**CH- 346(C): Introduction to Biochemistry and 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 and labelled diagrams must be drawn wherever necessary.*

Q1) Answer the following.

[10]

- a) Give the significance of acetyl - CoA.
- b) Define catabolism.
- c) What causes ketogenesis?
- d) Define deamination of amino acid.
- e) What is reverse transcription.
- f) Give the role of termination codon.
- g) What are the components of nucleotide?
- h) Define proton gradient.
- i) Give the structure of UMP.
- j) What are restriction enzymes?

P.T.O.

Q2) a) Attempt any two of the following. [4]

- i) Name the enzyme and co-enzymes in PDC.
- ii) Write transamination reaction of tyrosine.
- iii) Give the complementary sequence of DNA fragment
5' CTAGAACT3' or RNA.

b) Answer any two of the following. [6]

- i) What is fate of pyruvate?
- ii) Write note on klenow fragment.
- iii) Write note on tRNA.

Q3) Answer the following. (any two) [10]

- a) Give the applications of genetic engineering.
- b) Explain chemiosmotic hypothesis.
- c) Discuss the experiment of Macleod, McCarty and Avery.

Q4) Answer the following.

- a) Give the steps involved in TCA cycle with its energetics. [6]

OR

Elaborate the DNA replication in detail.

- b) Write note on Lac. operon. [4]

OR

Write note on ketogenesis.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522] - 427

T. Y. B. Sc.

CHEMISTRY

**CH- 346 (D): Environmental and Green Chemistry
(2013 Pattern) (Semester - IV) (Elective - II) (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) Answer the following.

[10]

- a) Define sedimentation.
- b) What is pyrolysis.
- c) Define Horizon's
- d) Which radiations absorbs by carbondioxide.
- e) Which types of molecules are soluble in water
- f) What is bond energy stored in O-H bond.
- g) Define flocculation.
- h) What is the value of Heat of vaporization of water.
- i) What is the role of glass electrode in potentiometry.
- j) Give the examples of conversion of mechanical energy in to electrical energy.

P.T.O.

Q2) a) Explain any two of the following. [6]

- i) Explain 'Sanitary Landfills'.
- ii) Explain Green House Coefficient.
- iii) Explain Wind Energy.

b) Write short notes on any two of the following. [4]

- i) Ultrafiltration
- ii) Hydrologic cycle
- iii) Nuclear Fusion

Q3) Solve any two of the following. [10]

- a) Explain in detail method of sludge treatment and disposal.
- b) Discuss principle and working of NDIR spectrometry.
- c) Explain Living organism in water.

Q4) a) Describe in brief principle and working of A.A.S. [6]

OR

What is Biomass? How is biomass used to generate energy.

b) Write note on any one. [4]

- i) Acid - Base Reactions in soil
- ii) Mechanism and Roll of CO₂



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522] - 428

T. Y. B. Sc.

CHEMISTRY

CH- 346(E₄): Dairy Chemistry

(2013 Pattern) (Semester - IV) (Elective - II) (Paper - X)

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 indicates full marks.*

Q1) Answer the following.

[10]

- a) Define the term 'Market Milk'.
- b) Define 'HTST' process of pasteurization.
- c) Give advantages of vitaminized milk.
- d) Draw structure of vitamin B₆
- e) How is starch detected in the milk sample?
- f) What are objective of salting in cheese manufacture?
- g) Give uses of 'Whey Powder'
- h) What is acidophilus milk?
- i) Give uses of casein.
- j) Name the fat soluble vitamins.

P.T.O.

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

- i) How will you destroy micro-organisms in milk?
- ii) Give comparison of Glass bottle and paper packing of milk?
- iii) Draw flow sheet diagram for manufacture of homogenized milk.

b) Answer any two of the following. [4]

- i) What is the purpose of pasteurization?
- ii) How will you detect presence of formalin?
- iii) Give uses of cheese powder.

Q3) a) State the stages of growth of micro-organisms and explain factors affecting growth of micro-organisms. [5]

OR

Define ice-cream. Give flow sheet diagram of manufacture of ice-cream. Give its food and nutritive value.

b) Define 'Vitamins'. Give types of vitamins. Give uses of vitamin A and D. [5]

OR

What is flavoured milk? Draw flow sheet diagram for manufacture of chocolate flavoured milk. What are precautions required in manufacture of flavoured milk?

Q4) a) Attempt any two: [6]

- i) Write a note on milk and public health.
- ii) Define 'Preservative'. How will you detect presence of hydrogen peroxide in milk?
- iii) Define 'Cheese'. Give its food and Nutritive value of cheese.

b) Answer any two of the following. [4]

- i) Give uses, food and nutritive value of srikhand powder.
- ii) Name the methods used for detection of adulterated milk.
- iii) Define 'Cream'. Name the methods used for cream separation.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-429

T.Y.B.Sc.

BOTANY

**BO - 341 : Plant Physiology & 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 diagrams wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following :

[10]

- a) Define translocation of organic solutes.
- b) Enlist any two secondary metabolites.
- c) Define Co-enzymes.
- d) What is xenobiotic stress?
- e) What is the function of light reaction?
- f) What are non-competitive inhibitors?
- g) Give first stable product of C₃-pathway.
- h) Write any two functions of secondary metabolites.
- i) Define polysaccharides.
- j) Define photophosphorylation.

P.T.O.

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

- a) Describe the reactions of H.S.K pathway.
- b) Give properties and functions of Carbohydrates.
- c) Write the effects of salt stress on plant growth.

Q3) Write short notes on any two of the following. [10]

- a) Source and sink relationship.
- b) Functions of proteins.
- c) Classification of enzymes.

Q4) What are lipids? Describe the steps involved in fatty acid synthesis. [10]

OR

Describe the mechanism of Glycolysis in details with ATP output.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1670

[5522]-430

T.Y. B. Sc.

BOTANY

BO - 342 : Plant Ecology and Biodiversity

(2013 Pattern) (Paper - II) (Semester - IV) (New Course)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following :

[10]

- a) Define EIA.
- b) Write any one cause of Desertification.
- c) What is Global warming?
- d) Mention any one relation between ecology and economics.
- e) What is Biosphere?
- f) Give any two values of Biodiversity.
- g) Define Phytogeography.
- h) What is long form of RET plants?
- i) What is monitoring of Biodiversity?
- j) Enlist any two Botanical Gardens in India.

P.T.O.

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

- a) Explain the process of Environmental Audit.
- b) Explain concept of Endemism.
- c) Define Remote Sensing. Explain basic principles of Remote Sensing.

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

- a) Sthalavrikshas
- b) Inbreeding Depression
- c) Ozone depletion

Q4) What is air pollution? Describe the causes, prevention and control measures of air pollution. **[10]**

OR

Enlist National Agencies playing role in Biodiversity conservation. Explain in details social approaches to Biodiversity conservation.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-431

T.Y.B.Sc.

BOTANY

BO-343: PLANT PATHOLOGY

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

Time : 2Hours]

[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) Answer the following:

[10]

- a) Define penetration.
- b) Give the name of casual organism of grassy shoot disease of sugarcane.
- c) Give the symptoms of Tobacco mosaic disease.
- d) What is non parasitic disease.
- e) Give two control measures of Bunchy top of Banana.
- f) Name the abiotic factor that have impact on plants.
- g) Give casual organism of Tikka disease.
- h) Give the full form of IARI.
- i) Give two control measures of Ear cockle of wheat.
- j) Give two control measures of little leaf of Brinjal.

Q2) Attempt any two of the following.

[10]

- a) Give contribution of Anton De Bary in plant pathology.
- b) Give Biological controls.
- c) Describe structural defence mechanism.

P.T.O.

Q3) Write notes on any two of the following.

[10]

- a) Nematocles as plant pathogen.
- b) Pure culture methods.
- c) Monoclonal antibodies.

Q4) What is disease cycle? Describe in details stages involved in the development of disease.

OR

Give an account of Downy mildews of Grapes and citrus canker with reference to causal organism, symptoms and control measures.

[10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1672

[5522]-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 indicate full marks.*

Q1) Answer the following:

[10]

- a) Give any two methods of classification of crude drugs.
- b) Define pharmacognosy.
- c) Give two scopes of economic botany.
- d) Define pharmacodynamics.
- e) Give any two names of ethnic societies of India.
- f) What is drug evaluation?
- g) What is crude drug?
- h) Mention the origin of Rice.
- i) Give any two uses of Curcuma longa.
- j) Define economic botany.

Q2) Attempt any two of the following.

[10]

- a) Explain the methods of preparation of vatika and Bhasma.
- b) Explain the concept of Triclosa.
- c) Describe the physical evaluation of crude drugs.

P.T.O.

Q3) Write notes on any two of the following:

[10]

- a) Botanical resources of Geum.
- b) Garbling and drying of crude drugs.
- c) Origin, sources and uses of Rose.

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

OR

Give the biological source, geographical distribution, macroscopic and microscopic characters, chemical constituents and uses of Tinospora cordifolia.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-433

T.Y.B.Sc.

BOTANY

**BO: 345: Plant Biotechnology
(2013 Pattern) (Semester - IV) (Paper - V)**

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) What is redifferentiation?
- b) Enlist types of genomics.
- c) Define explant.
- d) What are phytoprotectants.
- e) What is IPR?
- f) Define embryo rescue.
- g) What are diazotrophs?
- h) Define micropropagation.
- i) What are edible vaccines?
- j) Define a database.

P.T.O.

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

- a) What is proteomics?
- b) Describe in brief, any two methods to produce somatic hybrids.
- c) Explain applications and limitations of cryopreservation.

Q3) Write notes on any two of the following. [10]

- a) Molecular farming.
- b) Safety of GM foods.
- c) Applications of haploid production.

Q4) Explain in brief the steps and mechanism of symbiotic nitrogen fixation. [10]

OR

What are types of embryos culture? Explain in detail the various applications of embryo culture.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522] - 434

T. Y. B. Sc.

BOTANY

BO 346: Plant Breeding and Seed Technology

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

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) Attempt the following.

[10]

- a) Write any two scopes of plant breeding.
- b) Define hybridization.
- c) What is pure line selection?
- d) What is seed processing?
- e) Define foundation seed.
- f) What is bagging?
- g) What do you mean by field count?
- h) What is long form of ODV test?
- i) Define seed . Technology.
- j) What is emasculation.

P.T.O.

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

- a) What is stress tolerance? Describe characteristics evaluated for pest tolerance.
- b) What is polyploidy? Describe in brief any two methods of obtaining polyploids.
- c) What is seed testing? Explain moisture testing of seeds by hot air oven method.

Q3) Write notes on any two of the following. **[10]**

- a) Duties of seed Inspector.
- b) Types of Mutation.
- c) Organization for seed marketing.

Q4) What is heterosis ? Explain causes of heterosis. Add a note on its applications. **[10]**

OR

What is seed sampling? Describe methods of protection and control of seed storage. **[10]**



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1675

[5522]-435

T.Y.B.Sc.

ZOOLOGY

**ZY - 341 : Biological Techniques
(2013 Pattern) (Semester - IV) (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 normality.
- b) Write the significance of bleeding time test.
- c) What is impregnation?
- d) What is mounting?
- e) Write two examples of vital stains.
- f) Define percent solution.
- g) Write two applications of paper chromatography.
- h) Write the principle of colorimetry.
- i) Write the significance of WBC count.
- j) What is microtechnique?

P.T.O.

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

- a) Explain the principle and working of electron microscope.
- b) Describe any two types of microtomes.
- c) Mention the defects in sectioning.

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

- a) Ion exchange chromatography
- b) Feulgen reaction
- c) Clearing agents

Q4) Explain the histochemical detection of carbohydrate. **[10]**

OR

What are fixatives? Give the classification of fixatives with suitable examples. **[10]**



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-436

T.Y. B. Sc.

ZOOLOGY

ZY - 342 : Mammalian Physiology And Endocrinology

(2013 Pattern) (Paper - II) (Semester - 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) Define nutrition.
- b) State the function of amylase in digestion.
- c) Define angioplasty.
- d) Define inspiration.
- e) Give the clinical significance of renal failure.
- f) What is muscle fatigue?
- g) Define EEG.
- h) What is menstrual cycle?
- i) Give any two symptoms of gigantism.
- j) Name the hormone secreted by Leydig's cell.

P.T.O.

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

- a) Describe role of Pancreas in digestion
- b) Describe ultrastructure of striated muscle.
- c) Explain the concept of respiratory quotient.

Q3) Write note on any two of the following : **[10]**

- a) Renin - Angiotensin system
- b) Cardiac - output
- c) Synapse

Q4) Give an account of the hormonal control of parturition. **[10]**

OR

Explain the mechanism of hormone action for steroid hormones. **[10]**



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-437

T.Y.B.Sc.

ZOOLOGY

**ZY-343: Genetics and Molecular Biology
(2013 Pattern) (Semester - IV) (Paper - III)**

Time : 2Hours]

[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 recombination.
- b) Give an example of alkylating agent.
- c) What is reverse mutation?
- d) Define Hardy-weinberg law.
- e) What are histones?
- f) Define Gene pool.
- g) Define promoter region
- h) What is meant by semiconservative DNA replication?
- i) Define Nucleoside?
- j) What are cosmids?

Q2) Attempt any two of the following.

[10]

- a) Describe the structure of nucleosome.
- b) Explain in brief the regulation of Lac operon.
- c) Write the properties of genetic code.

P.T.O.

Q3) Write short notes on any two of the following.

[10]

- a) Restriction enzymes.
- b) Hershey- chase experiment
- c) Chromatin

Q4) What is mutation? Describe in details any three types of point mutation. **[10]**

OR

Describe the process of protein synthesis in prokaryotes.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-438

T.Y.B.Sc.

ZOOLOGY

ZY - 344 : Organic Evolution

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

Time :2 Hours]

[Max. Marks :40

Instructions to the candidates:

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

Q1) Attempt the following.

[10]

- a) Define palaeontology.
- b) What is endosymbiotic hypothesis?
- c) What is a realm?
- d) What is Biochemical recapitulation.
- e) What is interspecific struggle?
- f) Define living fossil.
- g) Give any two examples of connecting links is animals.
- h) What is convergent evolution?
- i) What is genetic drift?
- h) Define geobiotic distribution.

Q2) Attempt any two of the following.

[10]

- a) Explain in brief darwinism.
- b) Distinguish between APL and Man.
- c) With refrence to fauna describe oriented real.

P.T.O.

Q3) Write short notes any two of the following.

[10]

- a) Geological time scale.
- b) Factors affecting animal distribution.
- c) True speciation.

Q4) Explain Anatomical and embryological evidences in support of organic evolution. **[10]**

OR

What is organic evolution. Explain modern synthetic theory of evolution.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-439

T.Y.B.Sc.

ZOOLOGY

**ZY - 345: General Embryology
(2013 Pattern) (Semester - IV) (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 pangenesis.
- b) Define Growth.
- c) What is Regeneration?
- d) Give an example of alecithal egg.
- e) Give an example of radial cleavage.
- f) What is the role of primitive streak?
- g) Define Amphimixis.
- h) What is the significance of vitellogenesis?
- i) What is somite?
- j) What is morula?

P.T.O.

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

- a) Describe the process of gastrulation in frog.
- b) Describe the structure of hen's egg with a suitable diagram.
- c) Explain the fertilizin-antifertilizin reaction.

Q3) Write short note on any two of the following. **[10]**

- a) Types of egg membranes
- b) Allantois
- c) Types of blastulae

Q4) Describe the process of spermatogenesis. Add a note on the ultra-structure of typical sperm. **[10]**

OR

Describe the development of nervous system in chick upto 48 hours.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :4

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[5522] - 440

T.Y.B.Sc.

ZOOLOGY

**ZY - 346 (A) : Public Health and Hygiene
(2013 Pattern) (Semester - IV) (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) Define refuse.
- c) State any two sources of water.
- d) State any one epidemiological method.
- e) Give any two methods of ventilation.
- f) State any two emergencies in industry.
- g) State any two symptoms of encephalitis.
- h) State any two food deficiency of diseases.
- i) State any two harmful effects of radiations.
- j) State any two constituents of soil.

P.T.O.

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

- a) Explain the methods of data sampling.
- b) Give an account of diseases spread by soil.
- c) Describe purification of air.

Q3) Write notes on any two of the following. **[10]**

- a) Causes or epidemiology.
- b) Condiments.
- c) Rapid sand filtration of water.

Q4) Explain the signs, symptoms, mode of transmission and control measures of Leprosy. **[10]**

OR

Explain the concept of sanitation with reference to disposal of sewage.



Total No. of Questions :4]

P1680

[5522] - 440

T.Y.B.Sc.

ZOOLOGY

**ZY - 346 (B) : Medical Entomology
(2013 Pattern) (Semester - IV) (Paper - VI)**

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

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

Q1) Attempt the following.

[10]

- a) Define Agricultural entomology.
- b) Write any two control methods of ants.
- c) Define interspecific relationship.
- d) Write any two diseases spread by Louse.
- e) State the order of Blister beetle.
- f) Mention the names of any two forest pests.
- g) Write names of any two thoracic appendages.
- h) What is cursorial type of leg?
- i) What is maggote?
- j) What is pterygotan insect?

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

- a) Describe male reproductive system of insect.
- b) Describe the harmful effects of mosquito on man.
- c) Describe social organisation in wasps.

Q3) Write notes on any two of the following. **[10]**

- a) Effects of cockroach on human health.
- b) Forest entomology.
- c) Control of veterinary insect pests.

Q4) Describe life cycle of louse. Add a note on disease spread by it and its control measures. **[10]**

OR

Describe life cycle do House cricket and add a note on its distribution, damage and control measures.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-441

T.Y.B.Sc.

GEOLOGY

**GL - 341: Metamorphic Petrology
(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) 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) Define Domain of Metamorphism.
- b) What is 'Schistosity'?
- c) State the 'Depth zones' of regional metamorphism.
- d) Aureoles of thermal metamorphism.
- e) Define the term 'crystalloblastic series'.
- f) What is 'tourmalinisation'?
- g) Concept of metamorphic facies.
- h) Define Plutonic metamorphism.
- i) What is Palimpsest structure?
- j) What is mylonite?

P.T.O.

Q2) Answer the following (Any Two) [10]

- a) Effects of thermal metamorphism on aluminous and ferruginous sediments.
- b) Explain the formation of 'slaty cleavages'.
- c) Describe formation of Granulites.

Q3) Answer the following (Any Two) : [10]

- a) Define Metasomatism. Describe the evidences of Metasomatism.
- b) Describe the facies of Contact metamorphism.
- c) Explain the regional metamorphism of calcareous sediments.

Q4) Discuss Cataclastic metaorphism of argillaceous rocks. [10]

OR

Discuss the growth of crystals in solid state. Add a note on crystalloblastic series. [10]



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-442

T.Y. B. Sc.

GEOLOGY

GL : 342 Environmental Geology

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

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) All question carry equal marks.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagram must be drawn wherever necessary.*

Q1) Define/ Answer the following in 2/3 line's :

[10]

- a) Soil conservation.
- b) Biogeochemical cycle.
- c) Basic lava.
- d) Causes of accelerated erosion.
- e) Earthquake.
- f) Badland topography.
- g) Hazard & diaster.
- h) Socio- geological environment.
- i) Impact assessment.
- j) Seismic wave's.

P.T.O.

Q2) Write Notes on (Any Two) :

[10]

- a) Causes of desertification.
- b) Volcanic hazard's
- c) Solid waste disposal

Q3) Answer the following (Any Two) :

[10]

- a) Explain Nitrogen Cycle.
- b) Describe diaster profile in India.
- c) Describe the cause's and mitigation of Flood's.

Q4) Define land subsidence. Give cause's of subsidence of land. Add note on prediction & mitigation.

[10]

OR

What is water pollution? Explain in detail source of water pollution. Add a note on Fluorosis.

[10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-443

T.Y.B.Sc.

GEOLOGY

GL-343: ECONOMIC GEOLOGY

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

Time : 2Hours]

[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 labelled diagrams must be drawn wherever necessary.*

Q1) Answer the following in 2/3 lines:

[10]

- a) What is gangue?
- b) State the ore minerals of lead.
- c) Define gossans
- d) Define peat.
- e) Define mesothermal deposits.
- f) Enlist any two requirements for supergene enrichment.
- g) Define gas hydrates.
- h) Enlist any two uses of radioactive minerals.
- i) Define zone of oxidation.
- j) What are volcanic breccia?

Q2) Write notes on: (Any Two)

[10]

- a) Geological & geographical distribution of copper deposits in India.
- b) Alluvial placer deposits.
- c) Types of coal.

P.T.O.

Q3) Write notes on (Any Two).

[10]

- a) Mineralogy and uses of lead and Zinc.
- b) Early magmatic deposits.
- c) Principles involved in the process of mechanical concentration.

Q4) Explain the types of oil traps.

[10]

OR

Explain the various types of cavity filling mineral deposits.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-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 labelled diagrams must be drawn if necessary.*

Q1) Answer the following in 2/3 lines.

[10]

- a) Give characters of P-wave.
- b) Define magnetic anomalies.
- c) Give present motion of world large plates.
- d) Define plate boundary.
- e) Define convection currents.
- f) Define major discontinuities.
- g) Define Asthenosphere.
- h) Composition of crust.
- i) Define magnetic dipole.
- h) Give TRM.

Q2) Write notes on (ANY TWO)

[10]

- a) Plate tectonics as a unifying theory.
- b) Oceanic-continental subduction.
- c) Tectonic evolution of India.

P.T.O.

Q3) Write notes on (Any Two)

[10]

- a) Magnetic reversal.
- b) Divergent boundary as a constructive plate boundary.
- c) Assumptions and problems in plate tectonics.

Q4) Origin & Type of meteorites.

[10]

OR

Tectonic evolution of India.

[10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522]-445

T.Y.B.Sc.

GEOLOGY

**GL - 345: Phanerozoic Stratigraphy of India & Palaentology
(2013 Pattern) (Semester - IV) (Paper - V) (41345)**

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) Which system/period is known as 'Age of Trilobites'?
- b) What is Index fossil?
- c) Give type locality of Permian system.
- d) What are intertrappean beds? Give one example.
- e) Age of K-G Basin.
- f) In which parts/districts of Maharashtra the exposures of Precambrian rocks are found?
- g) Name two Palaeozoic orogenies?
- h) Give any two modes of preservations of plant fossils.
- i) Give age of Karewas of kashmir.
- j) Define marine transgression.

P.T.O.

Q2) Write notes on (any two): **[10]**

- a) Bagh beds
- b) Classification of Deccan volcanic province
- c) P-C Boundary

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

- a) Lithostratigraphic classification of siwaliks.
- b) Devonian system.
- c) Origin and types of laterites.

Q4) What is mass extinction? What are causes of mass extinction? Discuss the major mass extinctions of phanerozoic E on. **[10]**

OR

- a) Tripartite classification of Gondwana sequence.
- b) Geographical distribution of palaeoclimate of Gondwana sequence/ Supergroup. **[10]**



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

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[5522] - 446

T. Y. B. Sc.

GEOLOGY

GL- 346: Applied Geology–II

(Engineering Geology Geohydrology & Prospecting)

(2013 Pattern) (Semester - IV) (Elective - II) (Paper - VI)

Time : 2 Hours]

[Max. Marks :40

Instructions to the candidates:

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

Q1) Write in 2/3 Lines

[10]

- a) What do you mean by Rain water Harvesting?
- b) Name two major zones of Groundwater.
- c) What is Tortion Balance?
- d) Name two types of Dams?
- e) What are highway assregates?
- f) What is water Table?
- g) What is Juvenile water?
- h) Define Tunnel.
- i) What is wordon Gravimeter?
- j) Define an ARCH DAM.

P.T.O.

Q2) Explain in short (any two).

[10]

- a) Mineralogic guides
- b) Significance of Geology in civil Engineering.
- c) Rain water Harvesting

Q3) Write in short (any two)

[10]

- a) Principles of Geophysical prospecting.
- b) Recharge of Ground water.
- c) Open cast mining.

Q4) What are essential geotechnical investigations carried out while selecting a dam site. Explain parts of. Gravity dam with the help of diagram. **[10]**

OR

Define the terms Hydrology, Geohydrology and Hydrogeology. Explain the vertical distribution of Groundwater. **[10]**



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

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[5522]-447

T.Y.B.Sc.

STATISTICS (Principal)

ST - 341 : Actuarial Statistics

(2013 Pattern) (Semester - IV) (Paper - I) (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) *Use of calculator and statistical table 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 is not a property of survival function $S(t)$

- i) $\lim_{t \rightarrow 0} S(t) = 1$
- ii) $\lim_{t \rightarrow \infty} S(t) = 0$
- iii) $S(t)$ is a continuous function.
- iv) $S(t)$ is increasing function.

b) The effective rate of discount is

- i) $i - V$
- ii) $i + V$
- iii) $i V$
- iv) $\frac{i}{V}$

c) If w is the limiting age then

- i) $s(w) > s(0)$
- ii) $s(w) = 0$
- iii) $s(w) = 1$
- iv) none of the above

d) The present value of n -year annuity certain immediate at the rate of 1 unit per annum

- i) $\frac{1 + V^n}{d}$
- ii) $\frac{1 - V^n}{\delta}$
- iii) $\frac{1 - V^n}{i}$
- iv) $\frac{1 - V^n}{d}$

P.T.O.

- B) State whether the following statement are True or False : [1 each]
- K(x) is a discrete random variable.
 - Premiums are determined by actuary.
- C) a) Explain the term loss at issue random variable. [1 each]
- Explain the term : nominal rate of interest.
- D) Explain each of the following terms : [1 each]
- $\ddot{a}_{x:n}$
 - A_x

Q2) Attempt any Two of the following: [5 each]

- Explain the concept of utility function $U(w)$. If G is one time premium and X is loss at issue random variable with $E(X) = \mu$, then prove that $G \geq \mu$.
- For a certain insect population, the probability q_x obtained for 5 weeks are given below:

x	0	1	2	3	4	5
q_x	0.3	0.1	0.2	0.4	0.7	1

Taking cohort of 1,000, construct the life table with value for l_x , d_x , L_x , T_x .

- A loan of Rs. 60,000 is taken and it has to be repaid in 5 equal instalments payable at the beginning of the year based on 5% effective rate of interest. Determine the amount of instalments.

Q3) Attempt any Two of the following: [5 each]

- If effective rate of interest is 6.5% per annum, then obtain
 - Accumulated value of Rs. 50,000 at the end of 8th year
 - Present value of Rs. 35,000 due at the end of fourth year
- Define curtate future lifetime random variable $K(x)$ and find its probability mass function.
- Explain the term 'Annuity certain' with an illustration. Also explain its types.

Q4) Attempt any One of the following:

- a) i) Examine whether the following can serve as survival function for $x \geq 0$: [5]

1) $S(x) = \exp\{x - 0.7(2^x - 1)\}$

2) $S(x) = 1/(1 + x)^2$

3) $S(x) = \exp\{-x^2\}$

- ii) In annuity certain, the payments are made regularly at the beginning of the year then show that $\ddot{S}_{n|} = (1+i)^n \ddot{a}_{n|}$. [5]

- b) i) A 20 year endowment policy with benefit of Rs. 1,00,000 is issued to (30). Level premiums are payable annually in advance throughout the term of the policy or until death, whichever is earlier. Calculate the level premium P on the basis of the information below :

$A_{30:20|} = 0.2595, \ddot{a}_{30:20|} = 13.081$ [5]

- ii) Explain, each of the following insurance policy :

1) n year term insurance

2) whole life insurance

When benefit is payable at the end of year of death. Also state the relation between them. [5]



Total No. of Questions :4]

SEAT No. :

P1688

[5522]-448

[Total No. of Pages : 3

T.Y. B. Sc.

STATISTICS (Principal)

ST - 342 : Testing of Hypotheses

(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 calculator and statistical table is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following :

A) Choose the correct alternatives of the following : **[1 each]**

a) For using MP test, the alternative hypothesis should be

- | | |
|----------------|---------------|
| i) composite | ii) simple |
| iii) two-sided | iv) one-sided |

b) Which of the following test is considered as a test of goodness of fit?

- | | |
|------------------------------|-----------------------|
| i) Sign test | ii) Mann-Whitney test |
| iii) Kolmogorov-Smirnov test | iv) Run test |

c) For carrying out SPRT, the following should be fixed in advance.

- | | |
|------------------------------|----------------------------------|
| i) Both α and β | ii) only α |
| iii) only β | iv) Neither α nor β |

d) For a random sample of size n from the normal distribution with mean θ and variance θ the BCR for testing the hypothesis $H_0: \theta = \theta_0$ against $H_1: \theta = \theta_0 + 1$ is to reject H_0 if

- | | |
|-----------------------|---------------------|
| i) $\sum X_i^2 < C$ | ii) $ \bar{X} < C$ |
| iii) $\sum X_i^2 > C$ | iv) $ \bar{X} > C$ |

P.T.O.

B) State whether the following statements are **True or False**. [1 each]

- a) For testing randomness of the sample, run test is used.
- b) We can use UMP test, when the null hypothesis is composite.

C) Define each of the following : [1 each]

- a) Simple hypothesis
- b) Critical region

D) Explain each of the following : [1 each]

- a) Power of the test
- b) Level of significance

Q2) Attempt any two of the following : [5 each]

- a) Construct MP test of size α for testing $H_0: \mu = \mu_0$ against $H_1: \mu = \mu_1 (\mu_0 < \mu_1)$, where μ is the mean of $N(\mu, 3^2)$ based on a random sample of size n drawn from it.
- b) Construct SPRT of strength (α, β) for testing $H_0: \lambda = \lambda_0$ against $H_1: \lambda = \lambda_1 (\lambda_0 > \lambda_1)$ where λ is the mean of Poisson distribution.
- c) A fair coin is tossed to test the hypothesis $H_0: P = \frac{1}{2}$ against $H_1: P = \frac{3}{4}$, where P is the probability of getting head. Let X be the number of heads appear in 10 tosses. Reject H_0 if $X > 6$, Find Probability of type I error and power of the test.

Q3) Attempt any two of the following : [5 each]

- a) Can the following r.s. can be regarded as drawn from $U(60, 80)$: 61, 73, 79, 63, 70, 62, 65, 78, 66, 74 test at 5% level of significance.
- b) Find UMP test of level α for testing the null hypothesis $H_0: \sigma^2 = \sigma_0^2$ against $H_1: \sigma^2 > \sigma_0^2$ for a random sample of size n taken from $N(\mu_0, \sigma^2)$ distribution.

- c) Construct LRT of level α for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu < \mu_0$, where μ is the mean of $N(\mu, 3^2)$ based on a random sample of size n drawn from it.

Q4) Attempt any One of the following.

- a) i) Construct a SPRT of strength (α, β) for testing the hypothesis $H_0 : \theta = \theta_0$ against an alternative hypothesis $H_1 : \theta = \theta_1 (\theta_0 < \theta_1)$ for exponential distribution with mean θ . [5]
- ii) Following is a random sample drawn from the continuous population in the order in which the observations are made : 78, 45, 89, 95, 58, 82, 74, 47, 71, 68, 81, 83. Test the hypothesis of randomness of the sample. Use 5% level of significance. [5]
- b) i) Let $X_1, X_2, \dots, X_n$ denote the random sample of size n from the normal distribution with mean θ and standard deviation 16. Find UMP test of level of significance 0.1 to test $H_0 : \theta = 25$ against $H_1 : \theta < 25$ with power function $K(\theta)$. Find n such that $K(22) = 0.95$. [6]
- ii) Write a note on Mann-Whitney test. [4]



Total No. of Questions : 4]

SEAT No. :

P1689

[5522]-449

[Total No. of Pages : 3

T.Y.B.Sc.

STATISTICS (Principal)

ST-343: Statistical Quality Control

(2013 Pattern) (Semester - IV)

Time : 2Hours]

[Max. Marks : 40

Instructions:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of scientific calculator and statistical table is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt the following:

A) Choose the correct alternative in each of the following. (1 each)

- a) The central line on p-chart is at 0.4. If fraction defective of a sample of size 5 is 0.58, then the production process is.
 - i) under statistical control with respect to fraction defective.
 - ii) out of statistical control with respect to fraction defective.
 - iii) under statistical control with respect to number of defect.
 - iv) out of statistical control with respect to number of defect.
- b) The nature of operating characteristic curve for a single sampling plan is.
 - i) Increasing
 - ii) Increasing first and then decreasing
 - iii) Step function
 - iv) Decreasing
- c) A process is said to be in statistical control if
 - i) it's free from defective
 - ii) it's free from defect
 - iii) it's free from assignable cause
 - iv) it's free from chance cause.

P.T.O.

Q4) Attempt any one of the following.

- a) i) Define specification limit and natural tolerance limit. Also compare them with respect to percent defective.
- ii) The product is made in batches of thousand. The past practice regarding inspection has been to test 4 articles from each batch. If all the 4 articles are good, the batch is accepted. If two or more are defective the batch is rejected. If one article is found defective another sample of 4 is taken. What is the probability that the batch containing 5% defective would be accepted by this procedure?

[4+6]

- b) i) Derive an expression for exact probability of acceptance for double sampling plan.
- ii) The length of rod is normally distributed. The process is in statistical control with $\bar{X}=310$, $\bar{R}=4.118$ for each subgroup of size 4. Given that the specification limits are 310 ± 8 . If value of $\bar{X}$ shifts to 308, Find the probability of catching shift after second sample.

[5 +5]



Total No. of Questions :4]

SEAT No. :

P1690

[5522]-450

[Total No. of Pages : 4

T.Y. B.Sc.

STATISTICS (Principal)

ST - 344 : Operations Research

(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 scientific calculators & 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: **[1each]**

- a) If a constraint in LPP is of ' $\geq$ ' type then to convert it into an equation we subtract a variable such a variable is called
 - i) Slack variable
 - ii) Surplus variable
 - iii) Artificial variable
 - iv) None of above
- b) In an assignment problem of m jobs, the number of possible solutions would be
 - i) $m!$
 - ii) $(m-1)!$
 - iii) m
 - iv) m^2
- c) In transportation problem, if opportunity cost $d_{ij} = c_{ij} - (u_i + v_j) = 0$ for some i and j in the optimal solution then there exists
 - i) bounded solution
 - ii) Alternate solution
 - iii) Infeasible solution
 - iv) Alternate solution does not exist.
- d) Critical path in a Network is the path which determines the
 - i) longest possible time to complete the project
 - ii) Shortest possible time to complete the project
 - iii) Both (i) & (ii)
 - iv) Can't give any idea about time required to complete the project.

P.T.O.

- B) State whether each of following is True or False. **[1each]**
- A critical activity must have zero total float.
 - A transportation problem (T.P) can be consider as Linear programming problem (L.P.P).
- C) Define each of the following. **[1each]**
- Alternate solution of LPP.
 - Optimal solution of LPP.
- D) a) Check whether following Assignment problem (A.P) have unique optimal solution? **[1]**

	P	Q	R
I	4	9	4
II	7	4	6
III	4	10	4

- b) Explain how to convert unbalanced Assignment problem to balanced Assignment problem (A.P)? **[1]**

Q2) Attempt any two of the following. **[5 each]**

- Define the following terms in network analysis.
 - Event
 - Activity
 - Earliest start time (E)
 - Latest finish time (L)
 - Total float
- What is transportation problem? Give the mathematical formulation of a T.P. Explain 'degeneracy' with respect to transportation problem.
- What are pseudo random numbers? Use the Midsquare method to generate a random sample of size 5 from $U(0,1)$. Start with $z_0 = 8695$.

Q3) Attempt any two of the following. **[5 each]**

- Obtain Initial basic feasible solution of following T.P by vogel's approximation method (VAM)

To From	w ₁	w ₂	w ₃	w ₄	Supply
F ₁	30	25	40	20	100
F ₂	29	26	35	40	250
F ₃	31	33	37	30	150
Demand	90	160	200	50	

- b) Solve the following linear programming problem by simplex method

$$\max z = 2x_1 + 3x_2 + 7x_3$$

subject to,

$$3x_1 + 2x_2 + 4x_3 \leq 100$$

$$x_1 + 4x_2 + 2x_3 \leq 100$$

$$x_1 + x_2 + 3x_3 \leq 100$$

$$x_1, x_2, x_3 \geq 0$$

- c) What is Assignment problem? Obtain optimal assignment of four workers A,B,C and D to four jobs w, x y and z so as to minimize cost. The cost matrix is given below:

workers	Jobs			
	w	x	y	z
A	1000	1200	400	900
B	600	500	300	800
C	200	300	400	500
D	600	700	300	1000

Q4) Attempt any one of the following:

- a) i) What is dual problem? Give advantages of dual. [2]

- ii) Obtain the dual of following LPP. [5]

$$\min z = 10x_1 + 8x_2$$

subject to

$$x_1 + 2x_2 \leq 20$$

$$3x_1 - 12x_2 \geq 25$$

$$30x_1 + 18x_2 = 100$$

$$x_1 \geq 0, x_2 \text{ is unrestricted in sign.}$$

- iii) Using simplex method solve the following LPP. Check whether the given LPP has an optimum solution or not [3]

$$\text{maximize } z = 3x_1 + 2x_2$$

subject to,

$$2x_1 + x_2 \leq 2$$

$$3x_1 + 4x_2 \geq 12$$

$$x_1 \geq 0, x_2 \geq 0$$

- b) i) A project consists of 7 activities with the following relevant information. Draw the PERT network & find out the expected project duration. Also find variance of project duration. [6]

Activity	Immediate Predecessor	Estimated duration (days)		
		optimistic	most likely	Pessimistic
A	-	1	1	6
B	-	2	2	3
C	B	1	2	1
D	A	2	4	3
E	A	1	8	12
F	D	3	6	10
G	E, F, C	1	5	6

- ii) Explain monte-Carlo method of simulation. Discuss its applications in statistics. [4]



Total No. of Questions : 4]

SEAT No. :

P1691

[5522]- 451

[Total No. of Pages : 7

T.Y. B.Sc.

STATISTICS (Principal)

**ST - 345(A) : Reliability and Survival Analysis
(2013 Pattern) (Semester-IV) (Paper-V) (Regular)**

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 statistical tables and calculator 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) Structure function of series system of n independent components is,

- i) $\phi(\underline{X}) = 1 - \prod X_i$ ii) $\phi(\underline{X}) = \prod X_i$
iii) $\phi(\underline{X}) = \prod X_i$ iv) $\phi(\underline{X}) = \prod (1 - X_i)$

b) Which of the following interrelation between hazard rate and survival function is incorrect?

- i) $r(t) = f(t) / \bar{F}(t)$ ii) $r(t) = -\frac{d}{dt} \log \bar{F}(t)$

- iii) $\bar{F}(t) = \frac{-\frac{d}{dt} \bar{F}(t)}{r(t)}$ iv) $\bar{F}(t) = \exp \left\{ -\int_0^t r(x) dx \right\}$

c) For a coherent structure function ϕ , which of the following expression is correct?

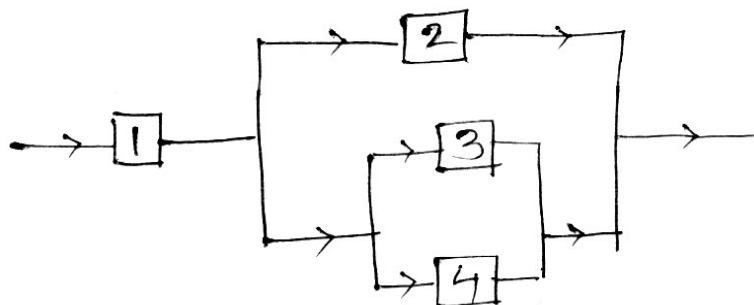
- i) $\phi(\underline{X}) < \prod X_i$
ii) $\phi(\underline{X}) > \prod X_i$
iii) $\prod (1 - X_i) > \phi(\underline{X}) > \prod X_i$
iv) $\prod X_i < \phi(\underline{X}) < \prod X_i$

P.T.O.

- d) For constant hazard rate say θ , lifetime of a component always follow the,
- i) $Weibull(\theta=0.5, \beta=1)$ ii) $Weibull(\theta=0, \beta=1)$
 iii) $Weibull(\theta=1, \beta=1)$ iv) $Weibull(\theta=2, \beta=1)$
- B) In each of the following cases state whether the given statement is true or false: **[1 each]**
- a) The dual of a parallel system is always parallel.
- b) $\bar{F}_n(t)$ is an unbiased and consistent estimator of $\bar{F}(t)$.
- C) Define the following terms: **[1 each]**
- a) Reliability importance of a component.
- b) Mean residual life function.
- D) Attempt each of the following: **[1 each]**
- a) Let the lifetime of a component follows an exponential distribution with parameter $\theta = 4$. Find $\bar{F}(x|t)$ of this component.
- b) Define Harmonically New Worse Than Used In Expectation (HNWUE) life distribution. State the notations used clearly.

Q2) Attempt any two of the following: **[5 each]**

- a) Show that, if a lifetime distribution F belongs to Increasing Failure Rate Average (IFRA) class of lifetime distributions then it belongs to New Better Than Used (NBU) class of lifetime distributions i.e., $IFRA \Rightarrow NBU$.
- b) For the system having following reliability block diagram:



Find structure function of the system hence find its reliability function.

- c) For 2-out-of-3 system find minimal path sets and minimal cut sets. Also, find structure function of the system using minimal path sets and minimal cut sets.

Q3) Attempt any two of the following:

[5 each]

- a) Let $h(\underline{P})$ be the reliability function of a coherent structure. Then show that $h(\underline{P})$ is strictly increasing in each P_i for $i = 1, 2, \dots, n$ and $0 < h(\underline{P}) < 1$.
- b) With usual notation, derive the Greenwoods formula for variance of an actuarial estimator.
- c) State and prove characterization of no ageing by failure rate function.

Q4) Attempt any one of the following:

- a) i) With usual notations prove that,

$$r_H(t) = \frac{1}{L_F(t)}$$
 where $r_H(t)$ be the failure rate function associated with equilibrium distribution function $H_F(t)$ and $L_F(t)$ be the mean residual life function. **[6]**

- ii) Consider the coherent system with structure function, $\phi(x) = (x_1 x_2) \amalg (x_3 x_4)$. Find reliability function of this system using minimal path sets. **[4]**

- b) i) The following data shows the time of survival (in days) among the patients entered in study. This study is performed on a group of patients receiving standard anti-retro viral therapy.

6, 12, 21, 27, 32, 39, 43, 43, 46⁺, 89, 115⁺, 139⁺, 181⁺, 211⁺, 217⁺, 261, 263, 270, 295⁺, 311, 335⁺, 346⁺, 365⁺ (+ indicates these patients are still surviving after mentioned days in the study). Obtain the Kaplan-Meier estimate of survival function. **[8]**

- ii) Write a note on pivotal decomposition of structure function. **[2]**



Total No. of Questions : 4]

P1691

[5522]- 451

T.Y. B.Sc.

STATISTICS (Principal)

**ST - 345(B) : Introduction to Stochastic Processes
(2013 Pattern) (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 statistical tables and scientific calculator 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) If a closed set contain only one state then state is
 - i) absorbing
 - ii) transient
 - iii) communicable
 - iv) reducible
- b) A persistent state is non null persistent if mean recurrence time is
 - i) finite
 - ii) infinite
 - iii) 0
 - iv) 1
- c) State ' i ' is said to be transient if
 - i) $\sum_{n=0}^{\infty} p_{ii}^{(n)} > \infty$
 - ii) $\sum_{n=0}^{\infty} p_{ii}^{(n)} < \infty$
 - iii) $\sum_{n=0}^{\infty} p_{ii}^{(n)} = \infty$
 - iv) $\sum_{n=0}^{\infty} p_{ii}^{(n)} = 0$
- d) Let $\{N(t), t \geq 0\}$ be a Poisson process with parameter λ , Mean number of occurrences in a interval of length t is
 - i) λt
 - ii) $\frac{1}{\lambda t}$
 - iii) $\frac{1}{\lambda}$
 - iv) $\lambda^2 t$

- B) State whether each of the following is TRUE or False: **[1 each]**
- a) The difference between two independent Poisson processes is also Poisson process.
 - b) The row sum of transition probability matrix need not be equal to 1.
- C) Define: **[1 each]**
- a) Markov Chain
 - b) Recurrent state
- D) Explain absorbing state of a Markov chain with suitable illustration. **[1 each]**
- E) Explain one step transition probability matrix of Markov chain. **[1 each]**

Q2) Attempt any two of the following: **[5 each]**

- a) State and prove Chapman-Kolmogorov equation for Markov Chain.
- b) State and prove addition property of Poisson Process.
- c) Let $\{X_n, n \geq 0\}$ be a Markov Chain with three states 0, 1, 2 and one step transition probability matrix P as

$$P = \begin{bmatrix} \frac{3}{4} & \frac{1}{4} & 0 \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ 0 & \frac{3}{4} & \frac{1}{4} \end{bmatrix}$$

and initial distribution $P(X_0 = i) = \frac{1}{3} \quad i = 0, 1, 2$

Compute:

- i) $P(X_2 = 2, X_1 = 1 / X_0 = 2)$
- ii) $P(X_2 = 2, X_1 = 0, X_0 = 2)$

Q3) Attempt any two of the following:

[5 each]

- a) Consider a game of “Ladder Climbing”. There are 5 levels in the game, Level 1 is the lowest (bottom) and level 5 is the highest (top). A player starts at the bottom. Each time, a fair coin is tossed if it turns up head, the player moves up one run. If tails, the player moves down to very bottom once at top level, the player moves to very bottom if a tails turns up and stays at the top if head turns up. Find the transition probability matrix.
- b) Explain periodicity of a state of a M.C. having state space $S = \{1, 2, 3\}$

$$P = \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}$$

Show that state 2 is not a periodic.

- c) Define compound Poisson process and states its mean and variance.

Q4) Attempt any one of the following:

- a) i) Explain Poisson Process with suitable example. **[2]**
- ii) Discuss Gambler’s ruin problem with an illustration. **[5]**
- iii) Let $\{X_n, n \geq 0\}$ be a Markov Chain with three states 0, 1, 2 and one step transition probability matrix P as

$$P = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{3}{4} & 0 & \frac{1}{4} \\ 0 & 1 & 0 \end{bmatrix}$$

Show that state 0 is ergodic in given Markov Chain.

[3]

- b) i) A plant species has red, pink, or white flowers according to the genotypes RR, RW, and WW, respectively. If each of these genotypes is crossed with a pink (R W) plant then the offspring fractions are:

$$P = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ 0 & \frac{1}{2} & \frac{1}{2} \end{bmatrix}$$

What is the long run fraction of plants of the three types? [5]

- ii) The no. of accidents in a town follows Poisson process with mean of 2 per week. Find the probability that there will be at most 3 accident in week. Also find the interval between 3 consecutive accidents in between 1st week and 2nd week. [3]
- iii) Explain closed set of states in Markov Chain. [2]



Total No. of Questions : 4]

SEAT No. :

P 1692

[Total No. of Pages : 4

[5522]-452

T.Y.B.Sc.

STATISTICS (Principal)

ST - 346 : Statistical Computing Using R - Software
(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) *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 data frame of student roll number and marks obtained in statistics paper I for 2 students, using edit command.
- b) Find mode of the following observations:
103, 101, 108, 105, 109, 115, 117, 103, 104, 103.
- c) Draw box plot of the following observations:
35, 46, 28, 11, 9, 17, 24, 38, 42, 33, 29, 8
- d) Create a vector x of the following observations using scan function:
107, 119, 112, 117, 116, 128, 124, 126, 127, 132.
- e) Let $X \sim B(n = 7, p = 0.8)$, find $P(X < 4)$ and $P(X \geq 2)$.
- f) Compute mean deviation about median of the following observations:
240, 244, 245, 248, 256, 257, 243, 244, 258, 250.

P.T.O

- g) Create a file in MS-EXCEL containing name of the commodity along with its price for three commodities and save it as a text file, further import this file in R.
- h) Write R program script for summing up the numbers 10 to 20 using for loop.
- i) Let $X \sim N(16, 3^2)$, find k such that $P(X > k) = 0.8$.
- j) Draw a random sample of size 15 from a $H(n = 4, M = 8, N = 15)$

Q2) Attempt any two of the following:

[5 each]

- a) Represent the following data by a multiple bar diagram:

Year	2000	2001	2002	2003	2004
Sales	80.5	87.2	91.8	84.6	93.4
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 accidents	0	1	2	3	4	5	6
Number of days	242	184	57	17	8	2	1

- c) compute Pearsonian's coefficient of skewness and coefficient of kurtosis for the following data and comment:

114, 119, 123, 129, 124, 125, 119, 118, 119, 128

Q3) Attempt any two of the following :

[5 each]

- a) Compute geometric mean and harmonic mean for the following data

x : 15 20 25 30 35

f : 12 18 25 15 10

- b) Draw less than and more than ogive curve for the following data:

Wage (in Rs.)	200-300	300-400	400-500	500-600	600-700
No. of workers	12	18	35	19	11

- c) The following are the weights in kgs of 10 persons after a certain weight reducing diet program for 4 weeks:

Person	1	2	3	4	5	6	7	8	9	10
Weight Before	75.8	81.6	78.4	68.5	62.4	71.3	88.4	84.6	79.3	80.6
Weight after	71.4	78.3	72.6	63.1	58.2	67.9	82.6	80.7	75.2	76.1

Use Wilcoxon's signed rank test to test whether the program is effective in reducing weight at 5% l.o.s.

Q4) Attempt any one of the following:

- a) i) Tests were made at short interval on spark plugs of two manufacturers A and B.

The following are the number of hours of service for the two types of plugs.

A	203	210	196	204	194	207	192	188	195	205	210
B	188	214	187	208	198	203	190	194	192	196	

Write R programme script to test the hypothesis that whether there is significant difference between mean length of service of two types of plugs by verifying the assumptions.

- ii) The following table provides data with regard to stature of fathers and their elder sons at the age of 25 years

Stature of sons	Stature of fathers	
	Tall	Short
Tall	28	10
Short	8	32

Test whether the stature of sons depend upon their fathers at 5% l.o.s.

[7+3]

- b) i) Write R program script for carrying out the ANOVA in CRD for the following data of yield (in kgs) obtained from applying 3 types of manures.

	Manures	
A	B	C
25	36	42
31	48	47
28	46	44
37	48	46

Also verify the assumptions.

- ii) Draw a model sample of size 10 from Laplace distribution with parameters (0,4) by drawing random samples of size 10 each from two independent exponential distributions.

[7+3]

✕ ✕ ✕

Total No. of Questions : 4]

SEAT No. :

P1693

[5522]-452(A)

[Total No. of Pages : 3

T.Y.B.Sc.

STATISTICS (Principal)

**ST - 346 : Statistical Computing Using R - Software
(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) *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) Draw a random sample of size 12 from a $H(n = 6, M = 10, N = 20)$.
- b) Draw spike plot of the following data:

x	3	5	8	9	12	15	17	20
f	8	12	17	24	21	16	12	9

- c) Let $X \sim \exp(\text{mean} = 2.6)$, find $P(X < 4)$ and $P(X > 6)$.
- d) Compute mean deviation about mean of the following observations:
140, 144, 145, 152, 148, 156, 135, 143, 154, 158, 140.
- e) Create a file in MS-EXCEL containing roll number along with marks for two students in Statistics practical and save it as a text file, further import this file in R.
- f) Create a vector x of the following observations using scan function:
- g) 12, 14, 18, 21, 24, 28, 32, 27, 19, 25
- h) Create a data frame of name of 3 persons and their age for 4 using edit command.
- i) Write R program script for sum of squares of first 10 natural numbers using for loop.
- j) Plot the graph of $N(12, 3^2)$.

P.T.O.

Q2) Attempt any two of the following:

[5 each]

- a) Represent the following data by a sub-divided bar diagram:

	Year	2014	2015	2016	2017	2018
No. of Students	FY	108	102	98	105	111
	ST	52	58	46	60	62
	TY	15	17	22	23	26

- b) Fit a normal distribution to the following data and find expected frequencies. Also test for the adequacy of the model.

Wage(in Rs.)	200-300	300-400	400-500	500-600	600-700
No. of workers	20	28	42	30	17

- c) Compute Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for the following data and comment:

210, 228, 232, 245, 218, 236, 278, 255, 244, 240, 238, 229

Q3) Attempt any Two of the following:

[5 each]

- a) Compute mean deviation about mean and mean deviation about median for the following data:

x : 23 25 27 29 30
 f : 15 21 25 19 16

- b) Use Kolmogorov Smirnov test, at 5% l.o.s. to test whether the following random sample has been drawn from:

i) $N(18, 3^2)$

12, 15, 19, 27, 17, 21, 16, 18, 24, 22, 13, 28

ii) $U(20, 40)$:

22, 38, 30, 24, 21, 36, 32, 27, 25, 34, 31, 29

- c) Draw histogram and frequency polygon for the following data:

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Freq	12	18	25	29	22	19	16

Q4) Attempt any One of the following:

- a) i) Following data is related to the nicotine content (in mg/gram) of sample of brand A and brand B cigarettes.

A	10	12	15	14	11	10	18	19
	21	18						
B	14	13	16	12	22	17	14	24

Write R program script to test the hypothesis that variance of nicotine content for two brands are same or not at 5% l.o.s., by verifying the assumptions.

- ii) The following table shows that classification of 850 workers in a factory according to the disciplinary action taken by the management and their promotional experience:

Promotional experience	Promoted	Not promoted
Disciplinary action		
Non-offenders	542	48
offenders	24	186

Test whether promotional experience is independent of disciplinary action. [7+3]

- b) i) Write R program script for carrying out the ANOVA for the following data of number of hours for getting cured for the same disease by using drugs of different companies for 12 patients:

Companies		
A	B	C
48	41	45
32	28	37
44	26	28
30	32	
	33	

Also verify the assumptions.

- ii) Draw a model sample of size 15 from standard Cauchy distribution by drawing random samples of size 15 each from two independent standard normal distributions. [7+3]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 4

P1694

[5522]-452 (B)

T.Y.B.Sc. (Vocational)

STATISTICS

ST - 346: Statistical Computing Using R Software

(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) 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 numbers between 1 and 10 with a difference of 0.5.
- b) Let $X \sim N(\mu=100, \sigma^2=64)$. Find $P(90 \leq X \leq 100)$.
- c) Draw a random sample of size 10 from $B(n=8, p=0.25)$. Also find mean of sample so drawn.
- d) Create a file in Ms-Excel containing seat number and faculty for two students and save it as text file. Import this text file in R.
- e) Create a vector x of the following observations by using scan function.
50, 43, 24, 27, 50, 42, 41, 37, 22, 27.
- f) Following data relates to the number of defective items found in 10 boxes, each containing 5 items.
1, 0, 1, 2, 3, 2, 1, 0, 3, 4.
Prepare a frequency distribution of defective items.
- g) What is the probability of drawing 2 queen cards from a well shuffled pack of 52 playing cards?
- h) Using for loop obtain sum of first 10 natural numbers.
- i) From the following data find mean deviation about mean:
35, 32, 41, 36, 52, 29, 30, 30, 26, 31.

P.T.O.

- j) Following is the frequency distribution of number of misprints in a book of 100 pages.

No. of misprints (X)	0	1	2	3	4	5
No. of pages (f)	20	23	31	22	3	1

Draw a spike plot.

Q2) Attempt any two of the following: **[5 each]**

- a) The following frequency distribution relates to the duration (in seconds) of advertisements on television.

Duration(in seconds)	30-35	35-40	40-45	45-50	50-55	55-60
No. of Advertisements	6	18	25	12	5	3

Draw a histogram and frequency polygon for the above data.

- b) The frequency distribution of number of persons according to their weekly expenditure on transport is given below.

Weekly expenditure	300-350	350-400	400-450	450-500	500-550
No. of persons	13	23	38	15	11

Calculate Karl Pearson's coefficient of skewness for the above data.

- c) The following table shows blood group of 1600 persons who were randomly selected from a town.

Gender \ Blood group	Blood group			
	O	A	B	AB
Male	180	255	255	125
Female	185	270	210	120

Is there any association between blood group and gender? Test at 5% level of significance.

Q3) Attempt any two of the following:

[5 each]

- a) Frequency distribution of number of defects on a piece of cloth for the 400 pieces of cloth is given below.

No.of defects (X)	0	1	2	3	4	5	6 and above
No.of pieces of cloths	220	109	52	15	3	1	0

Fit a poisson distribution to the above data and find the expected frequencies. Also obtain a plot of the observed against expected frequencies and comment on the adequacy of model.

- b) Following table gives availability of hydroelectricity (in MW) in Rajasthan for various sources.

Source	Bhakra Nangal	Beas Unit	Gandhi Sagar	Rana Pratap Sagar	Jawahar Sagar
Available Hydroelectricity (in MW)	195	271	58	86	50

Represent the above information using Pie-Chart.

- c) The nicotine contents (in mg) of two brands of cigarettes in two samples of sizes 9 and 7 were as follows.

Brand A	8	14	11	16	5	18	9	10	13
Brand B	17	15	16	13	12	18	14	-	-

Write R-program script to test whether the two brands of cigarettes have equal variances in their nicotine contents by verifying the underlying assumptions. Use 2% level of significance.

Q4) Attempt any One of the following:

- a) i) The data below gives number of books read by 20 students in a month:

4, 12, 7, 24, 32, 18, 9, 19, 21, 14, 27, 16, 8, 20, 12, 15, 7, 2, 6, 11.

Compute arithmetic mean, geometric mean, harmonic mean, median and Mode.

[5]

- ii) Bags of 1 kg salt each are packed by a machine. The weights of 10 bags of salt taken from this machine are found to be as follows:

1.05, 1.01, 1.04, 0.98, 0.96, 0.97, 0.99, 0.98, 0.95, 0.97.

Write R - program script to test whether the sample support the hypothesis that on an average, the machine packs bag with weight of 1 kg by verifying the underlying assumptions. Use 5% level of significance. [5]

OR

- b) i) The following table shows the lives (in '00 hours) of four batches of electric lamps:

Batches	Life of bulbs in '00 hours							
1	16	16.1	16.5	16.8	17	17.2	18	-
2	15.8	16.4	16.4	17	17.5	-	-	-
3	14.6	15.5	16	16.2	16.4	16.6	17.4	18.2
4	15.1	15.2	15.3	15.7	16	16.8	-	-

Write R- program script to perform an analysis of variance (ANOVA) for the above data by verifying the underlying assumptions. [6]

- ii) The following data represent the number of hours that two different types of scientific pocket calculators operate before a recharge is required.

Calculator A:	5.5	5.6	6.3	4.6	5.3	5	6.2	5.8	5.1
Calculator B:	3.8	4.8	4.3	4.2	4	4.9	4.5	5.2	4.5

Use Mann- Whitney test with 1% level of significance to determine if calculator A operates longer then calculator B on a full battery charge. [4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 4

P1695

[5522]-452 (C)

T.Y.B.Sc. (Principal)

STATISTICS

ST - 346: Statistical Computing Using R Software

(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) 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 data frame using edit command of item name and its price for 2 items.
- b) Let $X \sim B(n = 5, p = 0.3)$. Find $P(2 \leq X \leq 4)$.
- c) Draw a random sample of size 10 from a hypergeometric distribution with parameter $N=20, M=9, n=5$. Also find mean of sample so drawn.
- d) Create a file in Ms-Excel containing name and marks in 12th examination for three students and save it as text file. Import this text file in R
- e) Create a vector x of the following observations by using scan function and find first quartile of x.
52, 45, 26, 29, 52, 44, 43, 39, 24, 29.
- f) Following data relates to the number of defective items found in 10 boxes, each containing 5 items.
1, 0, 1, 2, 3, 2, 1, 0, 3, 4.
Prepare a frequency distribution of defective items.
- g) In how many ways can committee of 4 persons be formed from 4 teachers and 10 students so that 2 teachers will be included in the committee?

P.T.O.

- h) Obtain minimum of 5 and 8 using if-else statement.
- i) From the following data find mean deviation about median:
35, 32, 41, 36, 52, 29, 30, 30, 26, 31.
- j) Plot (X, Y) for the following data and also identify particular points on a plot rather than their positions.

X	1	2	3	4	5	6
Y	14	22	27	80	93	11

Q2) Attempt any two of the following: **[5 each]**

- a) The following table shows Hb level in gm% of 265 persons who were randomly selected from a village.

	Hb level (in gm%)		
Gender	7 to 10	10 to 12	> 12
Male	26	50	51
Female	38	66	34

Is there any association between Hb level and gender? Test at 5% level of significance.

- b) A certain brand of tyre has the following frequency distribution for its life (in thousand kms.)

Life	15-20	20-25	25-30	30-35	35-40	35-40
No. of tyres	6	9	14	20	15	6

Draw a less than frequency curve for the above data.

- c) The frequency distribution of number of persons according to their weekly expenditure on transport is given below.

Weekly expenditure	300-350	350-400	400-450	450-500	500-550
No. of persons	13	23	38	15	11

Calculate Bowley's coefficient of skewness. Also find Quartile deviation.

Q3) Attempt any two of the following: **[5 each]**

- a) Following data represent the frequency distribution of number of earthquakes that have taken place in a period of 350 days.

No.of Earthquakes (X)	0	1	2	3	4	5	6 and above
No.of days (f)	175	98	44	25	7	1	0

Fit a Poisson distribution to the above data and find the expected frequencies. Also obtain a plot of the observed against expected frequencies and comment on the adequacy of model.

- b) Following data relates to the capacity of production of electricity (in Crores of Kilowatt):

Year	Thermal	Hydro	Atomic	Total
2001	4300	3400	300	8000
2002	5000	3600	400	9000
2003	5100	4700	200	10000

Represent the above data by sub-divided bar diagram.

- c) Ten computer dealers in different areas of the city were asked the prices of dot matrix printers (in thousands of Rs.) of two companies A and B. The prices recorded are given below:

Dealer	1	2	3	4	5	6	7	8	9	10
Company A	17	18	16	18.5	17.8	16.9	17.6	16.6	20	18.6
Company B	20	19	17	18	18.5	17.2	19	17.5	21	19.3

Write R- program script to test whether the average prices of printers of company A and B equal by verifying the underlying assumptions. Use 5% level of significance.

Q4) Attempt any one of the following:

- a) i) The weekly wages (in Rs.) of 20 unskilled workers are as given below.

950, 920, 1210, 960, 1520, 690, 900, 905, 660, 910,, 690, 920, 1200, 970, 1250, 960, 1820, 1590, 1520, 1210. [5]

Find:

- I) Range
- II) Mean deviation about mean
- III) Mean deviation about median
- IV) Variance
- V) Coefficient of variation.

- ii) A random sample of 10 boys have the following I.Q.

72, 123, 110, 102, 85, 84, 93, 106, 115, 103.

Write R-program script to test whether the population mean I.Q. is 95. Use 5% level of significance. [5]

OR

- b) i) Three different methods of analysis M_1 , M_2 , M_3 are used to determine in parts per million the amount of a certain constituent in the sample. Each method is used by five analysts and results are given in the following table. [6]

	Analyst				
Method	A	B	C	D	E
M_1	7.5	7.4	7.3	7.6	7.4
M_2	7	7.2	7	7.2	7.1
M_3	7.1	6.7	6.9	6.8	6.9

Write R-program script to perform an analysis of variance (ANOVA) for the above data by verifying the underlying assumptions.

- ii) The data in the following table shows the weights (in kgs) of 5 persons before they stopped smoking and after they stopped smoking.

Person	A	B	C	D	E
Weight before	66	80	69	52	72
Weight after	71	82	68	56	73

Use Wilcoxon's signed rank test to test whether the weight of a person increases after stopping smoking. Use 5% level of significance. [4]



Total No. of Questions : 4]

SEAT No. :

P1696

[Total No. of Pages : 4

[5522]-452 (D)

T.Y.B.Sc.

STATISTICS (Principal)

ST - 346: Statistical Computing Using R Software

(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) 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 the following observations by using scan function.
11, 22, 31, 9, 17, 34, 41 51, 62, 97. Also find number of observations between 20 and 51.
- b) Let $X \sim P(\lambda = 3.2)$. Find $P(3 \leq X \leq 5)$.
- c) Draw a random sample of size 15 from normal distribution with mean 10 and variance 8. Also find mean of sample so drawn.
- d) Create a file in Ms-Excel containing item name and its price for three items and save it as text file. Import this text file in R.
- e) Obtain maximum of 5 and 8 using if -else statement.
- f) Following data relates to the number of defective items found in 10 boxes, each containing 5 items.

1, 0, 1, 2, 3, 2, 1, 0, 3, 4.

Prepare a frequency distribution of defective items.

- g) What is the probability of drawing 2 king cards from a well shuffled pack of 52 playing cards?

P.T.O.

- h) Using for loop obtain sum of first 10 natural numbers.
- i) From the following data find mean deviation about mode.
35, 32, 41, 36, 52, 29, 30, 30, 26, 31.
- j) Following is the frequency distribution of number of misprints in a book of 100 pages.

No. of misprints (X)	0	1	2	3	4	5
No. of pages (f)	20	23	31	22	3	1

Draw a spike plot.

Q2) Attempt any two of the following: **[5 each]**

- a) The director of programming of local cable company wants to provide appropriate television shows for different areas of his viewing market. A random sample of 564 viewers in rural and urban areas gave the following information regarding their programming preferences.

	Type of programme preferred			
Area	Education	Movie	Music	News
Urban	82	98	63	97
Rural	62	72	37	53

Test the hypothesis that the type of programme preferred is independent of the area of the residence. Use 5% level of significance (1.o.s.)

- b) The following table gives average approximate yield of rice (in kg.) per acre in different states of India in 2005.

State	Punjab	Haryana	U.P	Gujarat	Bihar	karnataka
Yield	728	943	1460	2000	2150	2270

Represent the above data by simple bar diagram.

- c) The heights (in cms.) of plants of varieties, G-65 and PS-16 of mungbean are given below:

Variety G - 65	25	50	45	30	70	42	36	48	34
Variety PS - 16	10	70	50	20	95	55	42	-	-

Write R-program script to test whether the average prices of printers of company A and B are equal by verifying the underlying assumptions.
Use 5% l.o.s.

Q3) Attempt any two of the following:

[5 each]

- a) Following is the frequency distribution of monthly salary (in thousand Rs.) of 200 workers.

Salary	20-25	25-30	30-35	35-40	40-45	45-50	50-55
No. of workers	6	28	50	68	25	15	8

Fit a normal distribution to the above data and find the expected frequencies. Also obtain a plot of the observed against expected frequencies and comment on the adequacy of model.

- b) A certain brand of tyre has the following frequency distribution for its life (in thousand kms.)

Life	15-20	20-25	25-30	30-35	35-40	40-45
No. of tyres	6	9	14	20	15	6

Draw a more than frequency curve for the above data.

- c) Following is the frequency distribution of length of 150 ear-heads of a certain variety of wheat.

Length of ear-head (in mm.)	80-88	88-96	96-104	104-112	112-120
No. of workers	18	38	40	32	22

Calculate Pearson's coefficient of skewness.

Q4) Attempt any one of the following:

- a) i) Packets of 100 gms. of baking powder are filled by a filling machine. The weights of 8 packets of baking powder taken from this machine are found to be as follows:

102, 101, 98, 95, 103, 99, 104, 102.

Write R-program script to test whether the sample support the hypothesis that on an average, the machine packs bag with weight of 100 gm by verifying the underlying assumptions. Use 5% level of significance.

[5]

- ii) Frequency distribution of number of families according to their monthly medical expenses (in Rs.) is given below. [5]

Expenses	300-400	400-500	500-600	600-700	700-800
No. of families	30	46	58	76	50

Find: Quartile deviation and coefficient of quartile deviation.

OR

- b) i) Three processes A, B, and C are tested to see whether their outputs are equivalent. The following observations of output are made:

A	10	12	13	11	10	14	15	13
B	9	11	10	12	13	-	-	-
C	11	10	15	14	12	13	-	-

Write R-program script to perform an analysis of variance (ANOVA) for the above data by verifying the underlying assumptions. [6]

- ii) The following are the measurements of the breaking strength (X) (in pounds) of certain kind of 2-inch cotton ribbon.

173, 187, 163, 172, 166, 148, 165, 148, 165, 172, 139, 163, 162, 169, 151, 158, 171, 161, 189, 160, 165, 163.

Test the null hypothesis that population median of X is 160 against the alternative that it is greater than 160 at 5% level of significance using Wilcoxon signed rank test. [4]



Total No. of Questions : 4]

SEAT No. :

P1697

[Total No. of Pages : 4

[5522]-452 (E)

T.Y.B.Sc.

STATISTICS (Principal)

ST - 346: Statistical Computing Using R Software

(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) 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) Let $X \sim \text{LN}(\mu = 2.3, \sigma = 4)$. Find $P(|X| > 2)$.
- b) The weights (in kgs.) of 7 persons are given below:
49.54, 64.92, 59.03, 59.33, 73.21, 51.34, 48.04
Compute coefficient of variance for the above data.
- c) Draw a boxplot for the following data related to the money spent by an organization on purchasing certain equipments (in lakhs):
173, 306, 251, 442, 133, 466, 386, 328, 134, 413, 530, 524, 422.
- d) The electricity consumption (in units) per month of 10 families in city are given as:
177.45, 162.68, 126.20, 134.73, 183.68, 170.67, 154.96, 137.96, 138.59, 166.57.
Compute central moment of order three for the above data.
- e) Write R script using for loop, to find sum of cube of numbers from 11 to 20.
- f) Create MS-Excel file of following observations and import it in R using read. Table command:
-22.66, -92.07, 1.27, -15.45, 84.75, -106.23, 24.81, -33.17, 18.81, 124.24.

P.T.O.

- g) Draw a random sample of size 10 from $B(n = 10, p = 0.75)$.
- h) Draw density plot of Gamma distribution for $\alpha = 2.8$ and $\lambda = 2$.
- i) The profit (in crores) earned by a certain pharmaceutical firm in last 12 years is given as:
70.24, 18.85, 38.76, 70.15, -20.02, 44.07, -16.92, -56.29, -29.13, 52.43, 66.75, -79.88. Test the normality of this data using Shapiro test.
- j) Create a data frame using edit command of names of workers and their monthly salaries for 6 workers.

Q2) Attempt any two of the following:

[5 each]

- a) The following data represent the number of hours that two different types of smartphones operate before a recharge is required:

Smartphone 1	6.652	4.649	3.487	7.924	3.019	4.654	5.679	3.791
Smartphone 2	3.956	3.201	3.755	7.355	3.599	6.987	6.563	4.499

Use Mann-Whitney test with 5% level of significance to determine whether smartphone 2 operates longer than smartphone 1 on a full battery charge.

- b) An owner of super market claims that, per sunday a customer spends on an average 300 minutes. The data collected about the number of customers spends time in the super market for last 14 weeks per Sunday are shown below:

371, 498, 301, 287, 414, 292, 411, 540, 400, 517, 287, 261, 387, 524.

Can we regarded the owner of the super market claim to be valid.

- c) Frequency distribution of height (in cms.) of number of farmers living in a village is given below:

Height	140-144	145-149	150-154	155-159	160-164	165-169	170-174
Frequency	18	38	75	49	36	25	19

Fit a normal distribution to the above data and find expected frequencies. Plot observed and expected frequencies and comment on the adequacy of model.

Q3) Attempt any two of the following:

[5 each]

- a) Compute Karl Pearson's coefficient of skewness for the following data:

Class	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80
Frequency	3	18	45	62	51	34	9	2

- b) Following table gives the mode of transport used by employees of a certain company:

Mode of transport	Walk	Bicycle	Train	Bus	Two-wheeler	Four-wheeler
No. of males	45	60	105	200	380	70
No. of females	52	85	60	130	260	140

Represent the data by multiple bar diagrams.

- c) Perform one way analysis of variance (ANOVA) for the following data:

Treatments	Production in tons
1	4371, 2854, 5473, 4482, 3869, 2939, 2835, 5069, 3030, 2610, 3073
2	3150, 2729, 5077, 3771, 4037, 4861, 5513, 4591
3	4115, 4319, 4362, 5063, 3268, 4156, 2665, 4925, 2620, 2883
4	3798, 4008, 3914, 3970, 3808, 4404, 5326, 5347, 4828, 3354, 4144

Write R program script. Also, verify all the assumptions of one way ANOVA.

Q4) Attempt any one of the following:

- a) i) Verify the relation between arithmetic mean, geometric mean and harmonic mean for the following data:

411.720, 497.523, 216.926, 308.962, 155.178, 437.169, 214.305, 557.323, 328.522, 28.489, 206.829, 72.201, 175.441, 238.779, 213.469. **[5]**

- ii) The scores obtained by three methods are given below:

Method I	59	45	35	56	65	43	51
Method II	69	52	48	63	79	74	71
Method III	84	74	81	79	89		

Test whether there is no difference among the average scores of three methods. Use Kruskal-Wallis test at 5% level of significance. [5]

- b) i) A sample of 500 males was selected to find association between their occupation and occupation of their father. It gives the following information:

Fathers occupation	sons occupation			
	Agriculture	Business	Service	Other
Agriculture	50	20	25	39
Business	25	36	25	26
Service	39	20	27	36
Other	41	31	24	36

Test whether son's occupation is independent of father's occupation. [4]

- ii) A producer applies four different types of techniques on four separate products. The figures of productions (in tons) per day are given below:

Techniques	Products			
	1	2	3	4
A	25	39	56	41
B	43	26	34	59
C	19	59	64	34
D	34	46	57	42

Carry out two way analysis of variance using above data by verifying all the assumptions. [6]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1698

[5522]-453

T.Y.B.Sc.

GEOGRAPHY

**Gg - 341 : Fundamentals of Human Geography (Part - II)
(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) *Draw neat sketches & diagrams wherever necessary.*
- 4) *Use of map stencils is allowed*

Q1) Answer the following questions in two or three sentences (Any 10) **[10]**

- a) What is difference between rural & urban settlement?
- b) Define conurbation.
- c) What is shifting cultivation? Give examples.
- d) What is the urbanization?
- e) Define Gini Coefficient.
- f) Write any two characteristics of Umland.
- g) Give names of indicator of urbanization.
- h) What is the food security?
- i) What are the transport nodes?
- j) Features of modern urbanization.
- k) Examples of commercial crops in India.
- l) What is meant by International trade?
- m) Define balance of payments.

P.T.O.

Q2) Write short notes (Any 2) [10]

- a) Composition of population.
- b) Origin & growth of Urbanization.
- c) Regional characteristics of rural settlements.
- d) Crisis of Agriculture.

Q3) Answer the following questions in 100 words (Any 2) [10]

- a) World trade organisation and International trade.
- b) Write types of Agriculture.
- c) Hunger and Malnutrition.
- d) Explain criticism of Malthusian population theory.

Q4) Answer the following in 200 words (Any One) [10]

- a) Explain the demographic transition theory.
- b) Explain how availabilities of resources affects trade?



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1699

[5522]-454

T.Y. B. Sc.

GEOGRAPHY

Gg - 342 : Geography of Travel and Tourism

(2013 Pattern) (Paper - IV) (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) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencils is allowed.*

Q1) Answer the following questions in one or two sentences (Any ten) : **[10]**

- a) What is eco-tourism?
- b) In which state the great Himalayan National Park located?
- c) Name any two hill stations in Uttarakhand.
- d) Name any two beaches in Kerala?
- e) What do you mean by agro-tourism?
- f) Name any two places in India known for sport tourism.
- g) What do you mean by induced expenditure?
- h) State any two environment impact of tourism.
- i) Define employment multiplier.
- j) State any two modern means used for tourism development.
- k) Name any two National Parks in India.
- l) What are Yatri Bhavan?
- m) What is adventure tourism?

P.T.O.

Q2) Write short notes (any two) :

[10]

- a) Impacts of recreation on wildlife
- b) Online booking hospitality management in tourism
- c) Caravan tourism
- d) Sustainable tourism development

Q3) Answer the following questions in 100 words (any two) :

[10]

- a) Explain tourism impacts on pollution emissions.
- b) Discuss different types of expenditure.
- c) Discuss the merits and demerits of sports tourism.
- d) Explain the importance road transport in development of tourism in India.

Q4) Answer the following questions in 200 words. (any one) :

[10]

- a) Elaborate different types of accommodations used by tourists.
- b) Explain the social and cultural impacts of tourism by giving suitable examples.



Total No. of Questions : 4]

SEAT No. :

P1700

[5522]-455

[Total No. of Pages : 2

T.Y.B.Sc.

GEOGRAPHY

**Gg-343: Fundamentals of Geoinformatics
(2013 Pattern) (Semester - IV) (Paper-VI) (Part-II)**

Time : 2Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following questions in two or three sentences.(Any 10) **[10]**

- a) What is TIN?
- b) When is merge operation used in GIS?
- c) What is an entity?
- d) Mention any four techniques of spatial analysis.
- e) What is DEM?
- f) Define contiguity.
- g) Define foreign key.
- h) Mention any two types of digital data sources in GIS.
- i) What does GNSS stand for?
- j) Mention any two methods of digitization.
- k) What is ground segment of GPS?
- l) Mention any two topological errors.
- m) What is multicriteria analysis.

Q2) Write short notes. (Any 2) **[10]**

- a) Locational errors
- b) Buffer analysis
- c) Accuracy factor of GPS.
- d) Non spatial analysis.

P.T.O.

Q3) Answer the following questions in 100 words (Any 2)

[10]

- a) Topographical analysis
- b) What is Topology?
- c) Explain overlay analysis
- d) Difference between spatial & non spatial query.

Q4) Answer the following in 200 words. (Any 1)

[10]

- a) What are the recent trends in GIS & GPS technologies?
- b) Discuss the techniques in spatial analysis in detail.



Total No. of Questions :4]

SEAT No. :

P1701

[5522]-456

[Total No. of Pages : 2

T.Y. B.Sc.

GEOGRAPHY

Gg - 344 : Geography of India

(2013 Pattern) (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) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencils is allowed.*

Q1) Answer the following questions in one or two sentences (any ten). **[10]**

- a) Define conventional resources.
- b) State any two types of iron are in India.
- c) Name any two type of crops benefited by green revolution.
- d) What is blue revolution?
- e) Give the significance of tissue culture.
- f) State any two benefits of green revolution in India.
- g) Define density of population.
- h) Name any two states with highest density of population according to 2011 census.
- i) Name the union territory with highest density of population according to 2011 census.
- j) State any two objectives of regional planning.
- k) Give any two effects of cloud burst.
- l) State any two physical causes of landslides in India
- m) List any two areas of highest suicides of farmers in India.

Q2) Write short notes (any two): **[10]**

- a) Coal reserves in India
- b) Polyhouse agriculture.
- c) Ecological and agricultural impacts of green revolution.
- d) Flood-hit areas of India.

P.T.O.

Q3) Answer the following in 100 words (any two).

[10]

- a) Describe the causes and effects of hailstorms.
- b) Explain the merits and demerits of atomic energy.
- c) Discuss the objectives of regional planning.
- d) Write about the distribution of bauxite in India.

Q4) Answer the following in 200 words (any one):

[10]

- a) What is over population? Discuss the problems and remedies of overpopulation in india.
- b) Discuss the causes and effects of droughts in India.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1702

[5522]-457

T.Y.B.Sc.

GEOGRAPHY

**Gg - 345: Geography of Soils (Part - II)
(2013 Pattern) (Semester - IV) (Paper - X)**

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 or three sentences (any two). **[10]**

- a) Define decalcification.
- b) Name any two soil nutrients.
- c) Write two characteristics of organic soil.
- d) Name two bacteria present in the soil.
- e) What is mountain soil?
- f) Write two characteristics of saline soils.
- g) Write two helping processes of removal of material.
- h) What is saline soil?
- i) What is stabilization process?
- j) What is contour ploughing?

P.T.O.

- k) Define intensive cropping.
- l) Define clay minerals.
- m) Define soil loss.

Q2) Write short notes on (any two): **[10]**

- a) Soil erosion agents.
- b) Importance of organic carbon in the soil.
- c) Humification process.
- d) Soils in Maharashtra.

Q3) Answer the following questions in 100 words (any two).: **[10]**

- a) Write the problems of soils in India.
- b) Explain the factors controlling soil reaction.
- c) Discuss the 'K' factor in USLE.
- d) Do all soil profile have organic horizon's? Explain with examples.

Q4) Answer the following questions in 200 words (any one): **[10]**

- a) Explain soil conservation techniques with suitable examples.
- b) Discuss various alkaline minerals and how they affect on soil fertility.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1703

[5522]-458

T.Y.B.Sc.

GEOGRAPHY

**Gg-346: FUNDAMENTALS OF GEO-INFORMATICS
(2013 Pattern) (Semester - IV) (Paper-XII) (Part-II)**

Time : 2Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat sketches & diagrams 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 sensor?
- b) What is spectral band?
- c) What do you mean by sun-synchronous?
- d) Define temporal resolution?
- e) What is PAN image?
- f) Define multi spectral scanner.
- g) What is the abbreviation IRS stands for?
- h) What is pushbroom scanner?
- i) What is thermal Infrared Image.
- j) What is active sensor?
- k) Define image classification.
- l) What is digital image processing?
- m) What is GSLV?

P.T.O.

Q2) Write short notes (Any Two)

[10]

- a) Thermal infrared image.
- b) Radiometric resolution.
- c) LANDSAT satellite
- d) IRS series of satellites.

Q3) Answer the following questions in 100 words (Any two)

[10]

- a) Characteristics of Radar image.
- b) Characteristics of IOKONOS satellites.
- c) Discuss spatial feature extraction in DIP.
- d) Give an account of spatial resolution.

Q4) Answer the following in 200 words. (Any One)

[10]

- a) Describe the procedure of unsupervised classification.
- b) Give an account of applications of satellite images in disaster management.



Total No. of Questions : 4]

SEAT No. :

P1704

[5522] - 459

[Total No. of Pages : 2

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 and labelled diagram wherever necessary.*

Q1) Attempt the following

- a) Match the pairs **[4]**
 - i) Retrovirus FMD virus
 - ii) Hemorrhagic virus Rabies
 - iii) Veterinary virus HIV
 - iv) Rhabdovirus Dengue
- b) State true or false **[2]**
 - i) Pseudomy celium is characteristic feature of C albicans.
 - ii) Candida albicans is an opportunistic pathogen.
- c) Fill in the blanks **[2]**
 - i) Salk and sabin vaccine is used for prophylaxis of _____
 - ii) _____ is causative agent of cattle plague
- d) Multiple choice questions. **[2]**
 - i) Oral rehydration therapy (ORT) is beneficial for treatment of _____
 - 1) Malaria 2) Giardiasis
 - 3) Entamebiasis 4) None of the above
 - ii) Which of the following can cause malaria.
 - 1) P. Vivax 2) P. Ovale
 - 3) P. falciparum 4) All of the above

P.T.O.

Q2) Write short note on any two.

[10]

- a) Routes of drug administration.
- b) Cultivation of animal viruses.
- c) Antigenic shift and antigenic drift in Influenza A virus.

Q3) Attempt any two.

[10]

- a) Explain the mode of action of Zidovudine.
- b) Describe the mode of transmission of Hepatitis B virus and its treatment and prevention.
- c) Comment on Dermatomycoses.

Q4) Attempt any ONE.

[10]

- a) Describe in detail the mechanisms of drug resistance in bacteria.
- b) Diagrammatically represent the life cycle of E. histolytica. Add a note on its pathogenesis and symptoms of the disease.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1705

[5522]-460

T.Y. B. Sc.

MICROBIOLOGY

MB - 342 : Genetics And Molecular Biology - II

(2013 Pattern) (Paper - II) (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 diagram wherever necessary.*

Q1) Attempt the following :

[10]

- a) Determine the sequence of genes on the basis of 'q' values. $\text{trp- his} = 0.30$, $\text{trp - tyr} = 0.48$, $\text{his-tyr} = 0.10$
- b) In which mechanism of gene transfer, λ db is formed?
- c) State True or False.

In conjugation mapping experiment, Jacob and Wallman had used prototrophic, streptomycin resistant strain of E.coli as a donor and auxotrophic, streptomycin sensitive strain of E.coli as a recipient.

- d) Fill in the blank:

r - type mutants of T_4 phage are not subjected to _____ mechanism.

- e) Name the scientist who developed cis-trans test of genetic function.
- f) Enlist the enzymes essential for base excision repair mechanism.
- g) Enlist various mating types of E.coli
- h) State full form of 'YACs'.
- i) Give any one example of type - II restriction endonuclease with its specific target sequence.
- j) Name the DNA ligase used for ligating cohesive ended DNA fragments.

P.T.O.

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

- a) Comment on factors influencing transformation in bacteria.
- b) With suitable example, explain phage DNA used as a vector.
- c) Diagrammatically represent, generalized transduction in bacteria.

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

- a) With suitable diagram, explain the use of interrupted mating experiment in gene mapping.
- b) Describe use of double linkers for construction of c-DNA library.
- c) How will you identify suitable clones of recombinants using a probe?

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

- a) Explain repair of damaged DNA by photo reactivation and nucleotide excision repair.
- b) Comment on Benzer's spot tests. How deletion mutants were used for fine structure mapping of r-II regions of T₄ phage?



Total No. of Questions : 4]

SEAT No. :

P1706

[5522]-461

[Total No. of Pages : 2

T.Y.B.Sc. (Microbiology)

MB-343: METABOLISM

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

Time : 2Hours]

[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) Give two examples of photosynthetic pigments present in bacteria.
- b) Define system with respect to energy exchange.
- c) Name the two types of linkages present in glycogen.
- d) Define diffusion.
- e) What is the net output of cyclic photophosphorylation?
- f) Give an example of green sulphur bacteria.
- g) Define ionophores.
- h) Give two examples of fatty acids.
- i) Define symport.
- j) Which enzymes break down starch?

Q2) Answer any two :

[10]

- a) Explain various types of passive transport mechanisms.
- b) What are high energy compounds? Explain with reference to enolic phosphates..
- c) Compare and contrast oxygenic and anoxygenic photosynthesis.

P.T.O.

Q3) Answer any two:

[10]

- a) Explain in detail the biosynthesis of starch.
- b) Give an account of inhibitors and uncouplers of Electron Transport chain.
- c) Diagrammatically represent ureacycle.

Q4) Answer any one:

[10]

- a) Explain the role of ATP as high energy compound why ATP is preferred as a high energy compound in cellular metabolism?
- b) Explain β -oxidation of fatty acids.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1707

[5522]-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

a) Match the following **[5]**

- | | |
|-------------------------------|---------------------------------------|
| i) Attenuated Polio vaccine | 1) Horse antitoxin |
| ii) Inactivated Polio vaccine | 2) Capsular polysaccharide as vaccine |
| iii) Botulism | 3) Salk vaccine |
| iv) Hepatitis B | 4) BCG vaccine |
| v) Streptococcus pneumoniae | 5) Sabin vaccine |
| | 6) Recombinant antigen vaccine |

b) State true or false **[2]**

- i) Fathers blood group is 'O'. Mothers blood group is 'A'. Foetus can be 'AB'
- ii) All cells in the body express MHC II antigens.

c) Define : Autoimmunity **[1]**

d) State any one appropriate test for the detection of **[2]**

- i) Rh antigens
- ii) HIV antibodies

P.T.O.

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

- a) Explain the immunopathological mechanism involved in Myasthenia Gravis.
- b) Explain the structure and functions of MHC class I molecule.
- c) Illustrate diagrammatically. Indirect ELISA.

Q3) Write short notes on any two of the following. [10]

- a) Interferons
- b) Ouchterlony technique
- c) Applications of monoclonal antibodies

Q4) Attempt any one of the following. [10]

- a) Describe the classification of hypersensitivity reactions. Explain the mechanism involved in type I hypersensitivity reaction
- b)
 - i) Explain any two tests performed in the blood bank.
 - ii) Explain the inheritance of ABO antigens with the help of two examples.



Total No. of Questions : 4]

SEAT No. :

P1708

[5522] - 463

[Total No. of Pages : 2

T.Y.B.Sc.

MICROBIOLOGY

**MB - 345 : Fermentation Technology - II
(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) *Draw neat and labelled diagram wherever necessary.*

Q1) Do as directed

A) Fill in the blanks. **[5]**

- a) _____ organism is used in riboflavin production.
- b) Glycerol is major component in _____ fermentation media.
- c) Presence of metals is critical in _____ production.
- d) _____ flowers are added in beer fermentation media.
- e) _____ produces streptomycin antibiotic.

B) Match the following. **[5]**

- | I | II |
|---------------------------|-------------------------|
| a) Steroid transformation | i) Increased shelf life |
| b) Dry yeast cells | ii) Improves gut flora |
| c) Yoghurt | iii) Cortisone |
| d) Polio vaccine | iv) Cell lines |
| e) Antisera production | v) Horse |

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

- a) Describe the production of vitamin B12.
- b) Explain production process of composting in button mushroom production.
- c) Describe glutamic acid production with respect to organism used, media and recovery.

P.T.O.

Q3) Attempt any two of the following.

[10]

- a) Explain process of ethanol production.
- b) Describe with example the significance of 6-APA in production of semisynthetic penicillin.
- c) Illustrate production of tetanus vaccine.

Q4) Attempt any one of the following.

[10]

- a) Enlist methods of vinegar production and explain any one in detail.
- b) Describe production of amylase by any suitable method.



Total No. of Questions : 4]

SEAT No. :

P1709

[5522]-464

[Total No. of Pages : 2

T.Y.B.Sc.

MICROBIOLOGY

**MB-346: Agricultural And Environmental Microbiology
(2013 Pattern) (Semester - IV) (Paper-VI)**

Time : 2Hours]

[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) Define : i) Bioplastic ii) Microbial fuel cell
- b) Name two biological agents used as Bioweapons.
- c) Give two applications of biochip.
- d) Name any one strategy used by nitrogen fixing organism to avoid oxygen inhibition of Nitrogenase enzyme.
- e) Match the following:
 - i) Bordeaux mixture a) CHV₁
 - ii) Copper leaching b) CuSO₄
 - iii) Biosorption c) Aspergillus
 - iv) Heterotrophs in bioleaching d) Chalcocite
 - v) Mycovirus e) Metal

Q2) Attempt (Any Two)

[10]

- a) What is integrated pest management in agriculture?
- b) Describe the symbiotic nitrogen fixation in Rhizobium.
- c) Explain the plant disease control using chemicals.

P.T.O.

Q3) Write short notes on (any two)

[10]

- a) Iron chelation
- b) Fe bioleaching
- c) Biosensors

Q4) Attempt (Any One)

[10]

- a) Explain the antisense RNA technology and RNAi in controlling plant diseases.
- b) Describe in detail the bioremediation of industrial waste using suitable examples.



Total No. of Questions : 4]

SEAT No. :

P1710

[5522] - 465

[Total No. of Pages : 2

T.Y.B.Sc.

ELECTRONIC SCIENCE

**EL - 341: Advanced Communication Systems
(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) Neat diagram must be drawn wherever necessary.*

Q1) Attempt all of the following

- a) Give one application of product detector. **[1]**
- b) List active components used in balanced modulator. **[1]**
- c) State one advantage of pulse code modulation. **[1]**
- d) State one advantage of paraboloid reflector. **[1]**
- e) Write two applications of low noise amplifier. **[2]**
- f) Write different blocks of delta modulator. **[2]**
- g) Write operating frequency range for UHF and microwave antenna. **[2]**
- h) What are the problems of F.M. Transmitter without using frequency multiplier. **[2]**

Q2) Attempt any two of the following.

- a) Describe working of simple CW - Doppler Radar. **[4]**
- b) Write advantages and disadvantages of TDM. List applications of TDM. **[4]**
- c) Define following antenna parameters. **[4]**
 - i) Directivity
 - ii) Directive gain
 - iii) Beamwidth
 - iv) Bandwidth

P.T.O.

Q3) Attempt any two of the following.

- a) Explain how to achieve phasemodulation using phase locked loop. [4]
- b) Draw the block diagram of PCM transmitter and explain its working. [4]
- c) Draw the block diagram of frequency stabilized reactance FM transmitter and explain its working. [4]

Q4) Attempt any two of the following.

- a) Describe how SKY wave propagation takes place? With SKY wave propagation, explain virtual height, skip distance, and critical frequency. [6]
- b)
 - i) Write short note on “UHF and microwave antenna.”. [3]
 - ii) Draw radiation pattern for different length of resonant antenna. [3]
- c) Draw simplified block diagram of monochrome television broadcasting transmitter. Explain its working in brief. [6]



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1711

[5522]-466

T.Y. B. Sc.

ELECTRONIC SCIENCE

EL - 342 : Microcontroller And Its Applications

(2013 Pattern) (Paper - II) (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 range of values for signed int data type of 8051 C? [1]
- b) State the role of SBUF register in serial data communication. [1]
- c) Upon power-on reset, which interrupt is assigned the highest priority.[1]
- d) Which register of 8051 is used to double the baud rate? [1]
- e) What is an interrupt? List external hardware interrupts of 8051 μ C. [2]
- f) List any two features of PIC18F4580 microcontroller. [2]
- g) State any two merits of LCD over LED. [2]
- h) Show the result of execution of following instructions of PIC :- [2]
MOVLW 25H
ADDLW 34H

P.T.O.

Q2) Attempt any two of the following :

- a) Explain how checksum byte is calculated in checksum process. [4]
- b) What is MAX232? Draw its connection to 8051 μ C. [4]
- c) Draw a simplified view of a PIC microcontroller. [4]

Q3) Attempt any two of the following :

- a) Explain bitwise logical operators in 8051 C. [4]
- b) Draw a diagram to interface 4 $\times$ 4 matrix keyboard to 8051 μ C. [4]
- c) Explain access bank of PIC18 microcontroller. [4]

Q4) Attempt any two of the following :

- a) State and explain some commonly used C data type for 8051 μ C. [6]
- b) What is an RTC? Draw a diagram to interface RTC DS12887 to 8051 μ C. [6]
- c) What does PIC stand for? Write a simple assembly program for PIC 18 μ C to toggle the SFR of port B continuously. [6]

OR

Q4) Attempt all of the following :

- a) Write an 8051 C program to turn bit P1.5 ON and OFF 50,000 times with some delay. [4]
- b) Write an 8051 C program to convert ASCII digits of '4' and '7' to packed BCD and display them on P1. [4]
- c) Write an 8051 C program to continuously transfer the message "YES" serially at 9600 band, 8-bit data, 1 stop bit. [4]



Total No. of Questions : 4]

SEAT No. :

P1712

[5522]-467

[Total No. of Pages : 2

T.Y.B.Sc.

ELECTRONIC SCIENCE

EL-343: Power Electronics

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

Time : 2Hours]

[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) State the names of power electronic components. [1]
- b) Draw the output wave form of Half bridge inverter with resistive load.[1]
- c) Write the equation for Reverse Recovery time of power diode. [1]
- d) State the names of filter circuits used in Inverter to produce sine wave.[1]
- e) "ON LINE UPS is used for critical load such as computer" comment.[2]
- f) State the classification of choppers according to operations in various quadrants. [2]
- g) "DC to DC converters are used for Isolation of load with power supply." Comment. [2]
- h) Define the terms: Ripple factor and TUF of rectifier. [2]

Q2) Attempt any two of the following:

- a) With the help of two transistor model of SCR explain the generation of EHP after applying gater trigger pulse. [4]
- b) Explain the working of PUT as relaxation oscillator. [4]
- c) Draw the circuit diagram of full Bridge inverter with resistive load and explain the working of circuit. [4]

P.T.O.

Q3) Attempt any two of the following.

- a) Draw the circuit diagram of switching Boost regulator and explain the working of circuit. [4]
- b) With the help of block diagram explain the working of power electronic system. [4]
- c) With the help of circuit diagram explain the working of tap changing of transformer for center tap transformer. [4]

Q4) Attempt any two of the following.

- a) State the different types of SMPS and explain the working of full bridge converter type SMPS. [6]
- b) Draw the block diagram of OFF-LINE UPS and Explain each block in detail state parameters of UPS. [6]
- c) Explain the working of single phase full wave controlled rectifier sketch the wave form accross load resistance and SCR with reference to input signal the 90° firing angle of SCR. [6]

OR

- a) In a step down DC converter the resistive load is $R=100\Omega$ and input source voltage is 240 volt. calculate the average out put voltage accross load and input power feed to load of converter consider chopping frequency as 4 KHz and duty cycle 50%. [4]
- b) If the secondary voltage of transformer is $240 \sin \omega t$ and it is feed to single phase Half wave rectifier having firing angle at SCR at 90° . Calculate average load voltage and RMS load voltage. [4]
- c) Snubber circuit is designed such that source voltage applied to it is 200volt, $R_s=100\Omega$ and $C_s = 0.01 \mu f$. Calculate the Rate of change of voltage. [4]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1713

[5522]-468

T.Y.B.Sc.

ELECTRONIC SCIENCE

**EL-344 : Foundation of Nanoelectronics
(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) *Neat diagram must be drawn wherever necessary.*
- 4) *Use of calculator is allowed.*

- Given: i) Mass of electron, $m_e = 9.1 \times 10^{-31}$ kg.*
ii) Planck's constant, $h = 6.625 \times 10^{-34}$ J.S.
iii) Charge on electron, $e = 1.6 \times 10^{-19}$ C

Q1) Attempt all of the following.

- a) Write an expression of Lorentz force in EM field. [1]
- b) State De-Broglie Hypothesis. [1]
- c) State any two basic characteristics of flash memory. [1]
- d) State different distribution laws in classical statistics. [1]
- e) What is Hall effect? [2]
- f) Define uncertainty principle and write its expression. [2]
- g) What is electron mobility? [2]
- h) What is top down approach in nanoelectronics. [2]

Q2) Attempt any two of the following:

- a) Explain Fermi-Dirac statistics. [4]
- b) Write a note on electron transport in quantum well. [4]
- c) Write the maxwell's equations in integral and differential form. [4]

P.T.O.

Q3) Attempt any two of the following.

- a) Explain length scales of the electrons in solids. [4]
- b) Obtain schrodinger time independent wave equation. [4]
- c) Write the importance of nanoelectronics. [4]

Q4) A) Attempt any two of the following.

- a) Obtain an expression for skin depth. [6]
- b) Derive an expression of energy of electron in infinite potential well. [6]
- c) i) What is density of states? [3]
ii) Write a note on Lithography? [3]

OR

B) Attempt all of the following.

- a) Calculate the minimum uncertainty in the velocity of electron confined to a box of length $10 \text{ \AA}$. [4]
- b) Calculate the value of poynting vector at the surface of sun if the power radiated by the sun is 2×10^{26} watts, while its radius is $7 \times 10^8 \text{ m}$. [4]
- c) An electron moves normal to magnetic field of 0.2 Tesla flux denisty. Find the cyclotron frequency of it. [4]



Total No. of Questions : 4]

SEAT No. :

P1714

[Total No. of Pages : 2

[5522] - 469

T. Y. B. Sc.

ELECTRONIC SCIENCE

EL-345: Mathematical Methods and Circuit Analysis using MATLAB

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

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) Answer all of the following.

- a) Write the MATLAB command to generate column vector y with three elements 1,2 and 3. [1]
- b) Write the MATLAB command to clear the variables x , y and z . [1]
- c) What is meant by periodic function? [1]
- d) What do you mean by fourier analysis of a function. [1]
- e) Write the fourier series expansion for even function. [2]
- f) Find the laplace transform of e^{8t} [2]
- g) Write a MATLAB code to plot $y = x^3$ for $0 \leq x \leq 4$ [2]
- h) Write the MATLAB commands to label x and y axes in graph. [2]

Q2) Answer any two of the following.

- a) Write a script file in MATLAB to plot a circle of unit radius. [4]
- b) Obtain the laplace transform of $\sin^2 4t$. [4]
- c) Define fourier series, state dirichlet conditions. [4]

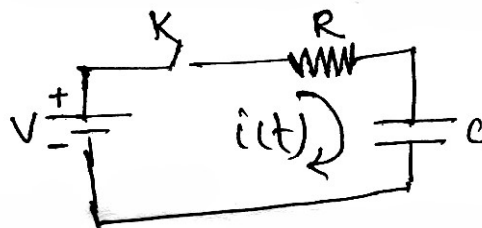
P.T.O.

Q3) Answer any two of the following.

- a) Explain the polyval and polyfit function in MATLAB. [4]
- b) State the advantages of solving differential equations using laplace transform. [4]
- c) Using partial fraction find the inverse laplace transform of $\frac{3s+7}{s^2-2s-3}$. [4]

Q4) Answer any two of the following.

- a) Write the MATLAB code to plot I-V characteristics of semiconductor junction diode. Give appropriate label to the axis. [6]
- b) Consider series RC circuit as shown in figure [6]



Let the switch K is closed at time $t=0$, find current $i(t)$ using laplace transform.

- c) Obtain fourier series for $f(x) = 0$ for $-\pi < x < 0$
 $= 1$ for $0 < x < \pi$ [6]

OR

Answer the following.

- a) Find laplace transform of $3e^{2t} + 4e^{-3t}$ [4]
- b) Write the MATLAB code to find roots of the polynomial
 $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$. [4]
- c) Evaluate the fourier coefficient by of a fourier series. [4]



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages :4

P1715

[5522] - 470

T.Y.B.Sc. (Optional)

ELECTRONIC SCIENCE

EL - 346 (A) : Industrial Automation

(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) Attempt all of the following.

- a) What do you mean by passive transducer? [1]
- b) What is multiplexer? [1]
- c) What is control lag? [1]
- d) Write the equation for proportional control mode. [1]
- e) State the advantages of proportional integral control mode. [2]
- f) Explain the concept of grounding technique. [2]
- g) Explain the term self regulation. [2]
- h) List the parameters of thermistor. [2]

Q2) Attempt any two of the following.

- a) Draw the block diagram of functional elements of an instrumentation system. Explain each block in brief. [4]
- b) Describe continuous control mode with neat diagram. [4]
- c) Explain multichannel Data Acquisition system using single A/D converter. [4]

P.T.O.

Q3) Attempt any two of the following.

- a) What is first order system? Explain step response of first order system. [4]
- b) Describe two position mode of controller system. State its applications. [4]
- c) Explain control system parameters. [4]
 - i) Error
 - ii) Variable range

Q4) Attempt any two of the following.

- a) Explain the terms: [6]
 - i) Dead time element.
 - ii) Explain the working principle of LVDT with neat diagram.
- b) i) Explain an isolation amplifier with suitable diagram [3]
 - ii) Explain the term 'Process equation' [3]
- c) Explain proportional derivative control mode with suitable example. [6]



Total No. of Questions :4]

P1715

[5522] - 470

T.Y.B.Sc. (Optional)

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) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following.

- a) State the importance of Hybrid used in telephone set. [1]
- b) What do you mean by CATV. [1]
- c) State different types at printers. [1]
- d) Why microphone is called as transducer. [1]
- e) What do you mean by SECAM used in colour TV transmission. [2]
- f) State any two specifications of washing machine. [2]
- g) “Mobile phones are called as cell phones” comment. [2]
- h) “Digital camera is very important block of Home security system” comment. [2]

Q2) Attempt any two of the following.

- a) List the names of any four Television standerds used in CCIR-B and also write their standard value. [4]
- b) Draw the block diagram of basic tax machine and explain each block in detail. [4]
- c) With the help of setup diagram explain the working of condenser microphone. [4]

Q3) Attempt any two of the following.

- a) Draw the block diagram of base unit of cordless phone. Explain the function at each block in detail. [4]
- b) With the help of neat sketch diagram explain the working at Ribbon Microphone. [4]
- c) Write a short note on CATV. [4]

Q4) Attempt any two of the following.

- a) Draw the block diagram of Dot matrix Printer and explain each block in detail state the advantages of DMP over other printer. [6]
- b) With the help of functional Block diagram explain the working of Microwave oven. [6]
- c) Draw the block diagram of Digital weighing system and explain the working of each block state importance of DPM. [6]



Total No. of Questions : 4]

SEAT No. :

P2388

[Total No. of Pages : 2

[5522]-471

T.Y. B.Sc. (Semester - IV)

DEFENCE AND STRATEGIC STUDIES

DS - 401 : Internal Security of India

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 are the elements of state?
- b) Define comprehensive security.
- c) What do you mean by social security?
- d) What do you mean by SEZ?
- e) Define insurgency.
- f) Define ethnicity.
- g) Illustrate the concept of sustainable development.
- h) State the concept of cross border terrorism.

Q2) Answer in 8 to 10 Sentences each (any two) :

[8]

- a) Explain India- Pakistan relations with reference to cross border terrorism.
- b) Discuss roles of Governance in internal security.
- c) Discuss external abetment and internal security.

P.T.O.

Q3) Write short notes on (any two) :

[8]

- a) Pulwama attack.
- b) Ethnic Conflict in NER.
- c) India's stand in dealing with world terrorism.

Q4) Answer in 18 to 20 sentences (Any one) :

[8]

- a) What are the challenges to India's North-west border security? Discuss
- b) Write a note on present security scenario in Northeast region of India.



Total No. of Questions : 5]

SEAT No. :

P2387

[Total No. of Pages : 2

[5522]-472

T.Y. B.Sc. (Semester - IV)

DEFENCE AND STRATEGIC STUDIES

DS - 402 : Trend's in India's Defence Expenditure

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) State the concept of under employment.
- b) Write any two functions of Defence Minister.
- c) Define peace time economy.
- d) Define Zero Budget.
- e) Define performance Budget.
- f) Define Mixed Economy.
- g) What do you mean by actual cost of war?
- h) Write full form of DPSU.

Q2) Answer in 8 to 10 Sentences each (any two) :

[8]

- a) Explain organization of Ministry of Defence.
- b) Discuss role of foreign collaboration in India's Defence production.
- c) Analyses India's defence expenditure from 1991-2019.

P.T.O.

Q3) Write short notes on (any two) :

[8]

- a) Role of parliament in Defence Budget.
- b) Organizations of DRDO.
- c) Characteristics of Indian economy.

Q4) Answer in 18 to 20 sentences (Any one) :

[8]

- a) Describe economic mobilization of national defence.
- b) Discuss organization and functions of ministry of defence.



Total No. of Questions : 4]

SEAT No. :

P2391

[Total No. of Pages : 2

[5522]-473

T. Y. B.Sc. (Semester - IV)

DEFENCE AND STRATEGIC STUDIES

**DS : - 404 : Information Warfare and Cyber Security
(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.***

Q1) Answer in 2 to 4 Sentences each :

[16]

- a) State the concept of “Airborne Early Warning System”
- b) Define information Warfare
- c) Define sea warfare
- d) Define war gaming
- e) Define surveillance
- f) What do you mean by information system?
- g) Define Internet security
- h) What do you mean by Early Warning and response?

Q2) Answer in 8 to 10 Sentences each (any two)

[8]

- a) Explain roles of effective communication in national defence.
- b) Discuss about the need for Information Security.
- c) Explain role of computers in information systems.

P.T.O.

Q3) Write short notes on (any two)

[8]

- a) Challenges to Digital Information system
- b) IT and Air- warfare
- c) Information warfare as a Force Multiplier

Q4) Answer in 18 to 20 sentences (Any one)

[8]

- a) Explain problems and prospects of Information warfare
- b) Discuss strategic significance of information warfare



Total No. of Questions : 4]

SEAT No. :

P2392

[Total No. of Pages : 2

[5522]-474

T. Y. B.Sc. (Semester - IV)

DEFENCE AND STRATEGIC STUDIES

DS : - 405 : Defence Production and Logistics in India

Time : 2 Hour]

[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 war potential.
- b) What do you mean by integrated Defence?
- c) State the concept of Just in time.
- d) Write any two principles of Logistics.
- e) Write full form of DRDO.
- f) How many Ordnance factories are there in India?
- g) What do you mean by 'Battle field command and control?'
- h) Illustrate the concept of make in India.

Q2) Answer in 8 to 10 Sentences each (any two)

[8]

- a) What do you mean by military industrial complex? Explain.
- b) Illustrate supply chain management.
- c) Explain mobilization of logistics.

P.T.O.

Q3) Write short notes on (any two)

[8]

- a) Defence management in India
- b) Role of Computers in Logistics Management
- c) Evolution of Information Warfare

Q4) Answer in 18 to 20 sentences (Any one)

[8]

- a) Explain role and functions of Department of Defence production and DRDO.
- b) Discuss scope and importance of logistics elements for war.



Total No. of Questions : 4]

SEAT No. :

P2393

[Total No. of Pages : 4

[5522]-475

T. Y. B.Sc. (Semester - IV)

DEFENCE AND STRATEGIC STUDIES

DS : - 406 (A) : Defence Journalism and National Security

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 journalism.
- b) Write any two responsibilities of Media.
- c) Define Conflict Management.
- d) Define investigative journalism.
- e) Define mass communication.
- f) Write any two merits of Defence journalism.
- g) Define Media Ethics.
- h) Write any two sources of Defence journalism.

Q2) Answer in 8 to 10 Sentences each (any two)

[8]

- a) Explain roles of Defence journalism in conflict management.
- b) Describe difficulties of Defence Journalism.
- c) Discuss relationship between Media and Armed forces.

P.T.O.

Q3) Write short notes on (any two)

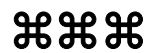
[8]

- a) Role of Media in peace building
- b) Current trends in Defence journalism
- c) Evolution of the study of Defence Journalism

Q4) Answer in 18 to 20 sentences (Any one)

[8]

- a) Explain role of Defence journalism in International Affairs
- b) Discuss essential Knowledge for Defence Journalism



Total No. of Questions : 4]

P2393

[5522]-475

T. Y. B.Sc. (Semester - IV)

DEFENCE AND STRATEGIC STUDIES

DS : - 406 (B) : Gender Based Conflicts and Human Rights

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 comprehensive security
- b) Define 'Active peace'
- c) Define Sustainable development
- d) State the meaning of Geographical contiguity
- e) Define Feminist Perspectives
- f) What do mean by violations of children rights?
- g) State the meaning of gender discrimination
- h) What are the pacific methods of conflict resolution?

Q2) Answer in 8 to 10 Sentences each (any two)

[8]

- a) Explain Universal declaration of Human Rights
- b) Discuss Gender Based Violence in Africa
- c) Discuss phenomenon of Gender discrimination

Q3) Write short notes on (any two)

[8]

- a) Feminism for Peace
- b) Democracy without women
- c) Measurement of violence

Q4) Answer in 18 to 20 sentences (Any one)

[8]

- a) Explain approaches to the study of Conflicts and Human rights
- b) Discuss causes for gender discrimination in India



Total No. of Questions : 4]

SEAT No. :

P2472

[Total No. of Pages : 2

[5522]-477

T.Y. B.Sc. (Semester - IV)

DEFENCE AND STRATEGIC STUDIES

DS - 408 (A) : Indian Military Strategy (1947-2014)

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 do you know about Domel post?
- b) What was the aim of Pakistan during Indo-Pak War of 1947-48?
- c) What was the basic interest of Raje Harisingh?
- d) On which sector Pakistan attacked on India during 1965 war?
- e) State the date & year of Chinese aggression.
- f) Who was the Indias PM during Indo-Pak War of 1965.
- g) When & between whom the Mcmohan line it was delimited?
- h) Which agreement it was signed between India & Pakistan at the end of war of 1965.

Q2) Answer in 8 to 10 sentences (any two) :

[8]

- a) Explain the concept of “ceasefire”.
- b) Highlight on “Role of U.S.S.R” during Indo-Pak War of 1971.
- c) Explain in brief nature of India-China border dispute.

Q3) Write short notes on (any two) :

[8]

- a) Role of U.S.A during Indo-Pak War of 1965.
- b) Significance of “Instrument of Accession”.
- c) Ceasefire of Indo-Pak War of 1947-48.

Q4) Answer in 16 to 20 sentences (Any one) :

[8]

- a) “Though India won the war of 1965 but practically it was looser” Do you agree? Justify your answer.
- b) What were the implications of Chinese aggression of 1962 on India?

P.T.O.

Total No. of Questions : 4]

P2472

[5522]-477

T.Y. B.Sc. (Semester - IV)

DEFENCE AND STRATEGIC STUDIES

DS - 408 (B) : Indian Military Strategy (1680-1818)

[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) Why Shivaji introduced Guerrilla Tactics?
- b) Why Mughals gave a sanad to Maratha?
- c) Between whom the third battle of panipat it was fought?
- d) What do you know about Bapu Gokhale?
- e) Why Sambhaji was killed by Auragzeb?
- f) At which fort Rajaram took asylum?
- g) State any two demerits of Sambhaji.
- h) Write any two causes of downfall of Marataha.

Q2) Answer in 8 to 10 sentences (any two) : **[8]**

- a) Write a few lines on leadership of Tarabai.
- b) Explain in brief Battle of Bhopal.
- c) Write in short Maratha Navy under Kanhoji Angre.

Q3) Write short notes on (any two) : **[8]**

- a) Impact of third battle of panipat.
- b) Concept of Peshwa.
- c) Nature of Anglo-Maratha Conflict.

Q4) Answer in 16 to 20 sentences (Any one) : **[8]**

- a) Describe the role of Santaji & Dhanaji with special reference to Guerrilla warfare.
- b) Assess “First Bajirao Peshwa” as a “Military General”.



Total No. of Questions : 4]

SEAT No. :

P1716

[5522] - 479

[Total No. of Pages : 2

T.Y.B.Sc.

ENVIRONMENTAL SCIENCE

**ENV - 341 : Aquatic Ecosystems & Management
(2008-2013 Pattern) (Semester - IV) (Paper - I)**

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 right indicate full marks.*

Q1) Attempt following questions in 1-2 sentences each.

[10]

- a) Define BOD.
- b) Define Hardness.
- c) What is meant by plankten?
- d) What are Diatoms?
- e) What is an Estuary?
- f) Role of Phosphates in Aquatic Ecosystem - Comment.
- g) Name two RAMSAR sites in India.
- h) Define Biozenation.
- i) What are lotic systems.
- j) What is Limnology.

Q2) Answer in brief any 2 of the following.

[10]

- a) Differentiate between lotic and leutic systems.
- b) Discuss the causes of degradation of chilka Lake, Odisha.
- c) Describe ecotone & edge effect in aquatic ecosystem.

P.T.O.

Q3) Write short notes on any 2 of the following.

[10]

- a) Ecological classification of freshwater organisms.
- b) Ecological importance of mangroves.
- c) Tourism and recreational value of riverine ecosystems.

Q4) Answer any one of the following:

[10]

- a) Write a brief about the various biotic & abiotic factors in the marine ecosystem.
- b) Describe the role of local governance & people's participation in conservation & management of aquatic ecosystems.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1717

[5522]-480

T.Y. B. Sc.

ENVIRONMENTAL SCIENCE

ENV - 302 : Nature Conservation

(2008 & 2013 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory and carry euqal 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 CBD?
- b) Give any two examples of endangered species.
- c) Explain the role of NGO.
- d) Write the criteria for 'Hotspots of Biodiversity'.
- e) Enlist any two protected areas in India.
- f) How gene banks are important in conservation?
- g) What do you mean by 'In-situ conservation'?
- h) Provide any two examples of sustainable efforts of conservation.
- i) Wha is objectives of WWF?
- j) Explain the concept of landscape.

P.T.O.

Q2) Write a short note on ANY TWO of the following : **[10]**

- a) Habitat approach of conservation.
- b) Population Genetics.
- c) Merits and Limitations of Ex-situ conservation.

Q3) Answer ANY TWO questions of the following : **[10]**

- a) Give recent PAN updates in Maharashtra.
- b) Explain social challenges of nature conservation.
- c) Discuss IUCN categories for conservation status.

Q4) Attempt ANY ONE of the following : **[10]**

- a) Explain community conservation with suitable example. Enumerate its challenges, merits and demerits.
- b) Discuss in detail various national initiatives for nature conservation.



Total No. of Questions : 4]

SEAT No. :

P1718

[5522]-481

[Total No. of Pages : 2

T.Y.B.Sc.

ENVIRONMENTAL SCIENCES

Air and Soil Quality

(2008-2013 Pattern) (Semester - IV) (Paper - III)

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 or 2 questions each:

[10]

- a) Write name of method used for estimation of potassium from the soil.
- b) What is the role of biological agents in soil?
- c) Define agroecosystems.
- d) List any two methods used for soil conservation.
- e) Give standard limits of any two air pollutants.
- f) Which historical movement in India is affected by acid rain?
- g) What is the basic cause of ozone hole?
- h) Write full forms of PM10 and PM2.5
- i) Define bioremediation
- j) What are the contents of 'O' horizon of soil?

Q2) Write short notes on any two of the following.

[10]

- a) La Nina phenomenon
- b) Nitrogen cycle
- c) Acid Rain

P.T.O.

Q3) Answer any two of the following:

[10]

- a) What are the effects sulphurdioxide and nitrogen dioxide on human health and environment.
- b) Give an account of a case study of Industrial pollution in India.
- c) Explain in detail phyto remediation of contaminated soil.

Q4) Attempt any one of the following questions:-

[10]

- a) Explain in detail sampling of particulate matter Add a note on effects of PM10 and PM2.5 on human health.
- b) Discuss in detail soil composition. Write a detailed note on analysis of pesticides from soil samples.



Total No. of Questions : 4]

SEAT No. :

P1719

[Total No. of Pages : 2

[5522]-482

T.Y.B.Sc.

ENVIRONMENTAL SCIENCE

Issues in Environmental Science - II

(2013 Pattern) (Semester - IV) (Paper - 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) Explain any two issues associated with slum areas.
- b) What are alkaline soils?
- c) Mention any two merits of compressed natural gas.
- d) Write any two effects of global warming on human health?
- e) What was the reason behind Tehri dam conflict?
- f) What are environmental objectives for urban planning?
- g) Mention any two ways for management of natural disasters.
- h) Write any two functions of wetlands.
- i) What is objective of occupational health and safety?
- h) What is Ganga Action plan?

Q2) Write a short note on ANY TWO of the following.

[10]

- a) Narmada Bachao Andolan
- b) Problems of Tribal Communities in India.
- c) Desertification.

P.T.O.

Q3) Answer ANY TWO questions of the following. **[10]**

- a) What is eutrophication? Explain the ways for restoration of lakes.
- b) Write an account on vehicular pollution in India.
- c) What are the criteria for rural planning in view of environment?

Q4) Attempt ANY ONE of the following. **[10]**

- a) Discuss in detail ecological conflicts associated with Chipko Movement and Silent Valley Movement.
- b) What are important pillars of sustainable development? Also add a note on issues associated with sustainable development in India.



Total No. of Questions : 4]

SEAT No. :

P1720

[5522] - 483

[Total No. of Pages : 2

T.Y.B.Sc.

ENVIRONMENTAL SCIENCE

**ENV:345- Environmental Governance and Equity : EMS and ISO 14000
(2013 Pattern) (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) Attempt the following in 1-2 lines each.

[10]

- a) What is ISO14000 series?
- b) Which are three pillars of sustainability?
- c) What is responsibility of ISO/TC/207?
- d) What is the benefit of being ISO certified?
- e) What is importance of 'Plan' under PDCA cycle?
- f) What is importance of environmental audit?
- g) What is the need for environmental policy?
- h) What is the standard effluent discharge limit for COD as per CPCB?
- i) Write any two functions of Bureau of Indian standards?
- j) What does the Article 51A(g) says under constitution?

Q2) Write a short note on Any Two of the following.

[10]

- a) Water quality standards.
- b) Role of Judiciary in protection of Environment.
- c) Environmental Benefits of Energy conservation.

P.T.O.

Q3) Answer any two questions of the following.

[10]

- a) Write an account on various strategies included under NEP, 2006.
- b) Which are the requirements under environmental impact assessment studies?
- c) Discuss importance of NGO's in environment protection.

Q4) Attempt Any One of the following.

[10]

- a) What are the important considerations under PDCA cycle? Also add a note benefits of ISO14000.
- b) Explain the need for environmental governance. Also add a note on working of environmental regulations in India.



Total No. of Questions : 4]

SEAT No. :

P1721

[Total No. of Pages : 2

[5522] - 484

T. Y. B. Sc. (Environmental Sciences)
ENVIRONMENTAL BIOTECHNOLOGY -II
(2013 Pattern) (Semester - IV) (Paper - VI)

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) Name 2 plants suitable for phytoremediation
- b) Enlist benefits of aerobic wastewater treatment process
- c) What is meant by biomethanation?
- d) What are benefits of bioleaching process?
- e) Which water pollutants causes eutrophication?
- f) What is meant by xenobiotic material
- g) Write examples of raw material suitable for alcohol production
- h) What is zooglyphic film or biofilm?
- i) Explain concept of hazardous waste
- j) What is meant immobilized enzymes?

P.T.O.

Q2) Write short note on ANY TWO of the following. **[10]**

- a) Ex-situ methods of bioremediation.
- b) Biological methods of municipal solid waste treatment.
- c) Microbial metabolism of pesticides.

Q3) Answer ANY TWO questions of the following. **[10]**

- a) Describe activated sludge treatment with suitable diagram.
- b) Explain VASB treatment with suitable diagram.
- c) Discuss factors affecting process of biomethanation.

Q4) Attempt ANY ONE of the following. **[10]**

- a) Discuss biological treatment methods useful for treatment of gaseous air pollutants.
- b) Describe various methods of bioleaching. Write its merits and demerits.



Total No. of Questions : 4]

SEAT No. :

P1722

[5522]-486

[Total No. of Pages : 2

T.Y.B.Sc. (Vocational)

BIOTECHNOLOGY

345: Environmental Biotechnology and Bioinformatics

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

Time : 2Hours]

[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) Enlist any two bioreactors used in waste-water treatment.
- c) What is NCBI?
- d) Name any two methanogens involved in biogas production.
- e) Define In- situ bioremediation.
- f) What is prosite?
- g) Give any one advantage of biogas production.
- h) Define orthologs Give an example.
- i) What are biofuels?
- j) What is sequence file format for biomolecular sequence? Give one example.

Q2) Answer any two of the following:

[10]

- a) Explain ethanol production in detail.
- b) Describe BLAST in detail.
- c) Describe in detail the micro-organisms involved in waste-water treatment.

P.T.O.

Q3) Write short notes on any two of the following.

[10]

- a) TrEMBL
- b) Herbicide degradation by microbes.
- c) SCOP

Q4) What are biofertilizers? Explain nitrogen-fixers, phosphate solubilizers and PGPR in detail.

[10]

OR

What are literature databases? Explain any two in detail.



Total No. of Questions : 4]

SEAT No. :

P1724

[5522]-488

[Total No. of Pages : 2

T.Y.B.Sc. (Voc-EEM)

ELECTRONIC EQUIPMENT MAINTENANCE

Entrepreneurship Development

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

Time : 2Hours]

[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, calculator is allowed.*

Q1) Answer the following:

- a) Why entrepreneurship is important in the society? [1]
- b) What is Break even point? [1]
- c) Define term Innovation [1]
- d) Give the difference between Income Tax and VAT. [1]
- e) State the role of pollution control board. [2]
- f) What are the legal liabilities of employee? [2]
- g) How does an entrepreneur contributes to the economy? [2]
- h) What is the difference between an entrepreneur and a small business owner? [2]

Q2) Answer any two of the following:

[2×4=8]

- a) State and explain some useful guidelines for the aspiring entrepreneurs.
- b) What is a project report? State its important elements.
- c) What is working capital? Explain it with example.

P.T.O.

Q3) Answer any two of the following.

[2×4=8]

- a) What are the common characteristics of successful entrepreneurs?
- b) Discuss the various sources of finance available to an entrepreneur.
- c) What skills do you need to be an entrepreneur?

Q4) Answer the following.

[2×6=12]

- a) Define partnership. State its advantages and disadvantages.
- b) State and explain the types of small scale industries found in India.

OR

- a) SWOT analysis
- b) Soft skills in entrepreneurship



Total No. of Questions : 4]

SEAT No. :

P1725

[5522]-489

[Total No. of Pages : 2

T.Y.B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

**VOC IND-MIC-345: Molecular Biology and Recombinant DNA
Technology**

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

Time : 2Hours]

[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.*

Q1) Answer the following:

[10]

- a) What do you mean by insertional inactivation?
- b) State application of Human Genome Project.
- c) Maximum size of DNA that can be inserted in BAC vector is _____ kb.
- d) Give an example of heat resistant DNA polymerase.
- e) What is the role of alkaline phosphatase in RDT?
- f) Kary Mullis developed _____ technique.
- g) What is the application of site directed mutagenesis?
- h) What is the difference between c DNA library and genomic library?
- i) Which is the first licensed drug made by using RDT?
- j) Define DNA polymorphism.

Q2) Attempt any two of the following:

[10]

- a) What is meant by shotgun cloning?
- b) What is the need for sequencing genome?
- c) What are non-vector mediated methods for gene transfer?

P.T.O.

Q3) Write a short note on: (Any two of the following)

[10]

- a) Polymerase Chain Reaction
- b) Cosmid as a vector
- c) Pyrosequencing

Q4) Attempt any one of the following.

[10]

- a) What are the steps in recombinant DNA technology? Explain each step in detail.
- b) What is site-directed mutagenesis? Discuss Kunkels method of inducing such mutations and its applications.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1726

[5522]-490

T.Y.B.Sc. (Vocational)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Network Concepts-II

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

Time : 2Hours]

[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 Router?
- c) What is Email Spoofing?
- d) What is a IPS?
- e) What is a Shared Drive on a Network?
- f) What is an Access Point?
- g) Why do we need a VLAN?
- 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 applications of a UTM Device.
- b) Explain the steps to Install a Printer in Windows Network.
- c) What are Passive 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 Email server? Explain its need?
- 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.



Total No. of Questions : 4]

SEAT No. :

P1727

[5522]-491

[Total No. of Pages : 2

T.Y.B.Sc. (Vocational)
SEED TECHNOLOGY
ENTREPRENEURSHIP DEVELOPMENT
(2013 Pattern) (Semester - IV) (Paper-V)

Time : 2Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Attempt the following:

[10×1=10]

- a) Give the concept of entrepreneurship.
- b) What is patent rule?
- c) Give the full form of MIDC.
- d) Name any one funding agency.
- e) Define service tax.
- f) Mention one merit in the partnership business?
- g) What is meant by marketing mix?
- h) What is meant by break even point?
- i) What is the demerit in co-operative organization?
- j) What is the main role of consultancy organization?

Q2) Attempt any two of the following:

[2×5=10]

- a) Give the functions of pollution control board.
- b) Give an account on the roles of various funding agencies.
- c) Write an account on any one type of small scale industry.

P.T.O.

Q3) Write notes on: (Any two)

[2×5=10]

- a) Market segmentation
- b) Income tax and sales tax.
- c) Guidance for stress management.

Q4) Give an account on the types and characteristics of entrepreneurs.

[10]

OR

Write a report on the steps for the development of entrepreneurship.

[10]



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1728

[5522]-493

T.Y.B.Sc. (Vocational)

BIOTECHNOLOGY

**VOC-BIOTECH-346 : Entrepreneurship Development
(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) All questions carry equal marks.*

Q1) Answer the following in 1-2 lines.

[10]

- a) What is venture capital?
- b) State two disadvantages of sole proprietorship.
- c) What is Digital marketing?
- d) What are Inter personal skills?
- e) What is marketing mix?
- f) Give full form of VAT.
- g) Explain the term 'Breakeven point'.
- h) State any two types of entrepreneur.
- i) What is the meaning of cash flow?
- h) Give two criteria for selection of new product.

Q2) Answer any two of the following.

[10]

- a) Explain different formes of Business organizations.
- b) Write a note on CGTSME.
- c) Write a note on SIDBI.

P.T.O.

Q3) Answer in short any two of the following.

[10]

- a) SSI
- b) PMRY
- c) Project formulation.

Q4) a) Describe the role of various funding corporations and funding institutes.

[10]

OR

- b) Discuss marketing with reference to marketing mix.



Total No. of Questions :4]

SEAT No. :

P1729

[5522]-494

[Total No. of Pages : 1

T.Y. B.Sc. (Vocational)
PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION
Radio Software
(2018 Pattern) (Semester - IV) (Paper - VI)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) Attempt all questions.*
- 2) Figures to the right indicate full marks.*

Q1) Radio is a medium for those who can't 'see' or can't 'read'. Explain. **[10]**

OR

Production of Radio programme is more challenging than producing TV programme. **[10]**

Q2) What are the different formats of Radio programme? **[10]**

OR

Explain the important factors you will consider while broadcasting a 'Youth programme'. **[10]**

Q3) Write a script for two minute 'talk over' Radio programme on any one of the following. **[10]**

- a) Padmavat
- b) Bhima-Koregaon incident
- c) Pune traffic

Q4) Why the 'Anchor' in a discussion programme an important person? **[10]**

OR

'Listening is learning'-how is this important while anchoring a discussion programme on Radio? **[10]**



Total No. of Questions :4]

SEAT No. :

P1730

[5522]-495

[Total No. of Pages : 2

T.Y. B.Sc. (Vocational)
ELECTRONIC EQUIPMENT MAINTENANCE
Medical Instrumentation
(2018 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 figures wherever necessary.*

Q1) a) Answer the following: **[4×1=4]**

- i) What is nomogram?
- ii) State active component in RBCs.
- iii) What is typical resting potential for excitable cell?
- iv) What is fibrillation?

b) Answer the following: **[2×2=4]**

- i) State 4 types of EEG waves and draw their waveform.
- ii) Give full forms of (a) ECG, (b) CNS.

c) Answer the following: **[2×2=4]**

- i) State 2 major sections of nervous system on human body.
- ii) What is defibrillation?

Q2) Attempt any two. **[2×4=8]**

- a) Write a note on flame photometer.
- b) Explain with neat diagram - microelectrodes.
- c) Discuss the key features of alpha and beta waves.

Q3) Attempt any two: **[2×4=8]**

- a) Explain basic recording system in medical instrumentation.
- b) Discuss the requirement of internal electrodes.
- c) Explain the 'reflex arc'.

P.T.O.

Q4) a) Attempt any two: [2×6=12]

- i) Explain specialized conduction system of heart.
- ii) Discuss physiological effects of electric current on human body.
- iii) Discuss microshock hazards.

OR

b) Answer the following: [3×4=12]

- i) Write a note on spectrophotometer.
- ii) Explain electrodes for stimulation of tissues.
- iii) Discuss blood cell counter.



Total No. of Questions : 4]

SEAT No. :

P1731

[Total No. of Pages : 2

[5522]-496

T.Y.B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

VOC-IND-MIC-346 : Entrepreneurship Development

(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 diagrams wherever necessary.*

Q1) Answer the following.

[10]

- a) What is DIC?
- b) What is Sole proprietorship?
- c) Explain in one or two sentences Break-even point.
- d) Explain in one or two sentences Excise Duty.
- e) Working capital can be calculated by _____ less _____.
- f) SWOT is an acronym for.
- g) Market segmentation reduces promotion cost - State T/F.
- h) Define entrepreneur.
- i) The minimum number of persons of form a public company is _____.

Q2) Attempt any two of the following:

[10]

- a) Write a note on Special Privileges and exceptions available to private companies.
- b) What is “cost”? Explain cost calculation.
- c) Differentiate between Commercial and Co-operative banks.

P.T.O.

Q3) Write a short note on: (Any two of the following)

[10]

- a) Features of Public company.
- b) Role of DIC in entrepreneurship development.
- c) Income tax.

Q4) Attempt any one of the following:

[10]

- a) Explain role of entrepreneurship in economic development of country.
- b) Discuss features merits and demerits of Sole proprietorship.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1732

[5522]-497

T.Y.B.Sc. (Vocational)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Entrepreneurship Development

(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.*

Q1) Attempt all of the following:

[10×1=10]

- a) Who is an Entrepreneur?
- b) What is a project?
- c) Which Tax is applicable for a Service Firm?
- d) Entrepreneurship Development Program of India is carried out under which Ministry?
- e) Explain the term 'Venture Capital'.
- f) What is the role of NSSIDC?
- g) What is a 'Liability'?
- h) Is 'Product' one of the important factors of Marketing Mix.
- i) Why do we go to Pollution Control Board?
- j) Give any one Mode of Digital Marketing.

Q2) Attempt any Two of the following:

[2×5=10]

- a) Explain the main four elements of Marketing Mix.
- b) What are the different forms of Business Organizations?
- c) What are the key elements of Entrepreneurship Development?

P.T.O.

Q3) Attempt any Two of the following:

[2×5=10]

- a) Explain the various Government schemes for an Entrepreneur to start.
- b) Importance of Digital Marketing in Modern World.
- c) What is the role of HRD Department in Entrepreneurship Development Program of India?

Q4) Attempt any One of the following:

[1×10=10]

- a) What are the Merits of a Co-operative Organization? What are the Merits of a Proprietary Firm?

OR

- b) Explain their significance:
 - i) MIDC
 - ii) SIDBI
 - iii) DIC
 - iv) SISI
 - v) Commercial and Co-operative Banks.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1733

[5522]-498

T.Y.B.Sc. (Vocational)

SEED TECHNOLOGY

Biotechnology and Intellectual Property Rights

(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 and labelled diagrams wherever necessary.*

Q1) Attempt the following.

[10×1=10]

- a) Mention one important aspect of Bt. Cotton.
- b) What is patent?
- c) Give any two techniques used for variety Identification.
- d) Define restriction enzymes.
- e) What is denaturation?
- f) Define Hardening of plants.
- g) What is meant by explants?
- h) Write any two applications of Biotechnology.
- i) What are synthetic seeds?
- j) Write any two branches of biotechnology.

Q2) Attempt any two of the following:

[2×5=10]

- a) Explain the production of synthetic seeds.
- b) Explain PCR.
- c) Comment on Intellectual Property Rights.

P.T.O.

Q3) Write notes on (Any two):

[2×5=10]

- a) World Trade organization.
- b) Transgenics.
- c) Seed storage proteins.

Q4) a) What is RAPD? Explain it with reference to varietal Identification. **[10]**

OR

- b) Define micro propagation. Give detail procedure of embryo culture.**[10]**



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1734

[5522]-499

T.Y. B. Sc.

PSYCHOLOGY

**Understanding Counseling Process
(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) Draw neat diagrams wherever necessary.*

Q1) Answer in two or four sentences.

[16]

- a) Define the role of Counselor.
- b) What is non-verbal communication?
- c) What is in-depth-exploration?
- d) State the stages in goal setting.
- e) What is direct intervention?
- f) Define advanced empathy.
- g) What is role playing?
- h) Define the concept of fidelity in ethical principle.

P.T.O.

Q2) Answer in eight or ten sentences (Any Two) : **[8]**

- a) Explain the fundamental percepts of effective counseling.
- b) Explain the goals of in-depth-exploration.
- c) Describe the obstacles of implementing action plan in counseling.

Q3) Write short notes (Any Two) : **[8]**

- a) Immediacy
- b) Genuiness
- c) Respect for autonomy

Q4) a) Explain the stages of counseling process. **[8]**

OR

- b) Describe the core conditions of counseling.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1735

[5522]-500

T.Y. B. Sc.

PSYCHOLOGY

Human Resource Management

(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) Draw neat diagrams wherever necessary.*

Q1) Answer in two or four sentences.

[16]

- a) Define token economy.
- b) What is employee welfare?
- c) State the challenges of job evaluation.
- d) Define HRM.
- e) Name the objectives of HRM.
- f) State the goals of training program.
- g) What is assessment centre?
- h) State the functions of HRM.

P.T.O.

Q2) Answer in eight or ten sentences (Any Two) : **[8]**

- a) Explain the principles of HRM.
- b) Describe the process and goals of training programs.
- c) Discuss the different types of employee services.

Q3) Write short notes on (Any Two) : **[8]**

- a) HRM Model
- b) Types of incentive payments
- c) Letters of recommendation

Q4) a) Describe in detail uses of psychological testing in employee selection process. **[8]**

OR

- b) Explain the any two theories of employee remuneration.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1736

[5522]-500 (A)

T.Y. B. Sc.

PSYCHOLOGY

Consumer Psychology

(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 neat diagrams wherever necessary.*

Q1) Answer in two or four sentences.

[16]

- a) What is marketing analysis?
- b) State the key concepts of webster's model.
- c) Define Consumer Psychology.
- d) Define Consumer imagery.
- e) Explain the value of consumer research.
- f) What is buying behavior?
- g) Define the Sociological model.
- h) What is diversity of consumer behavior?

P.T.O.

Q2) Answer in eight or ten sentences (Any Two) : **[8]**

- a) Explain the external factors of perception.
- b) Describe the psychoanalytical model of consumer psychology.
- c) Explain the need of studying consumer behavior.

Q3) Write short notes on (Any Two) : **[8]**

- a) Value of consumer behavior
- b) Social Stratification
- c) Learning model

Q4) a) Describe the different factors responsible for perceptual distortion. **[8]**

OR

- b) Explain the various factors influencing on consumer behavior.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1737

[5522]-500 (B)

T.Y. B. Sc.

PSYCHOLOGY

Counseling Skill

(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) Draw neat diagrams wherever necessary.*

Q1) Answer in two or four sentences.

[16]

- a) Define Counseling.
- b) What are goals of Counseling?
- c) What is Communication?
- d) Define fidelity.
- e) What is advanced empathy?
- f) Define initial disclosure.
- g) What is concreteness in Counseling?
- h) Define Confrontation.

P.T.O.

Q2) Answer in eight or ten sentences (Any Two) : **[8]**

- a) Explain the various active body postures of Counselor.
- b) Describe the feedback skills method of counseling.
- c) Explain the difference between counseling and helping.

Q3) Write short notes on (Any Two) : **[8]**

- a) Bodily Communication
- b) Good gestures
- c) Self talk

Q4) a) Explain the various creating mind skills of Counselor. **[8]**

OR

- b) Describe the additional counseling skills.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

P1738

[5522]-500 (C)

T.Y. B. Sc.

PSYCHOLOGY

Positive Psychology

(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 wherever necessary.*

Q1) Answer in two or four sentences.

[16]

- a) Define resilience.
- b) What is Self relization?
- c) Define development Psychology.
- d) What are positive emotions?
- e) Define the concept of happiness.
- f) What is clinical Psychology?
- g) Define Well-being.
- h) Define Positive Psychology.

P.T.O.

Q2) Answer in eight or ten sentences (Any Two) : **[8]**

- a) Explain the goals of Positive Psychology.
- b) Describe the eudaimonic views of happiness.
- c) Explain the relationship between positive emotions and well being.

Q3) Write short notes on (Any Two) : **[8]**

- a) Traditional Psychology
- b) The hedonic basis of happiness
- c) Growth through trauma

Q4) a) Explain the developmental and clinical perspective of resilience. **[8]**

OR

- b) Describe the relation between positive emotions and health resources.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

P1739

[5522] - 500 (D)

T.Y.B.Sc.

PSYCOLOGY

Forensic Psychology

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

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in two or four sentences.

[16]

- a) Explain mental health act 1987.
- b) State the full form of IVEO - PI.
- c) What is Psychopath?
- d) Define forensic psychology?
- e) Define Criminal psychopath
- f) What is psychopathology?
- g) State the family law.
- h) What is civil litigation?

Q2) Answer in eight or ten sentences (Any Two).

[8]

- a) Explain the various projective techniques used in forensic psychology.
- b) Describe the nature and meaning of psychopath according to DSM.
- c) Discuss the specialized sex offender evaluation.

P.T.O.

Q3) Write short notes (Any Two).

[8]

- a) Scope of forensic psychology.
- b) Treatment of psychopath.
- c) Psychopathy in law.

Q4) a) Define polygraph screening (lie detection) and explain the its uses. **[8]**

OR

- b) Describe the various civil rights or citizen and national human rights.

