Total No. of Questions :4]

SEAT No. :

P580

[Total No. of Pages :3

[5215] - 401

T.Y.B.Sc.

MATHEMATICS

MT-341: Complex Analysis

(2013 Pattern) (New Course) (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) Solve the equation $z^2 + z + 1 = 0$.

b) Find the principal argument Arg z when $z = \dfrac{i}{-2-2i}$.

c) Use the definition of limit to prove that $\lim\limits_{z\to 0} \dfrac{z^{-2}}{z} = 0$.

d) Show that $\exp\left(\dfrac{2+\pi i}{4}\right) = \sqrt{\dfrac{e}{2}}(1+i)$.

e) State whether true or false with justification: The function $f(z) = |z|^2$ is analytic at $z = 0$.

f) Evaluate the integral $\int_0^{\pi} e^{(1+i)t}\,dt$.

g) Write the Maclaurin series expansion of $\dfrac{\sin z}{z}$ in the domain $|z| < |$.

P.T.O.

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

a) Find all the roots of $(-16)^{\frac{1}{4}}$ in rectangular coordinates and exhibit them as vertices of a certain regular polygon. Identify the principal root.

b) Let the function $f(z) = u(x, y) + iv(x, y)$ be defined throughout some $\in$ neighborhood of a point $z_0 = x_0 + iy_0$ and suppose that the first order partial derivatives of the function *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). Show that $f'(z_0)$ exist.

c) Show that the function $f(z) = e^{-\theta}\cos(\ln r) + i\, e^{-\theta}\sin(\ln r)$ is differentiable at each point in the domain $r > 0, 0 < \theta < 2\pi$ and hence find $f'(z)$ there.

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

a) If a function *f* is analytic at all points interior to and on a simple closed contour < and f' is continuous there, then show that $\int_C f(z)dz = 0$.

b) State and prove Liouville's theorem.

c) Show that, if C is the boundary of the triangle with vertices at the points 0, $3i$ and –4, oriented in the counterclockwise direction, then $\left|\int_C (e^z - \overline{z})dz\right| \leq 60$.

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

a) i) If a function *f* is analytic at a point then show that its derivatives of all orders exist at that point and are moreover all analytic there.

ii) Find all roots of the equation $\cosh z = \frac{1}{2}$

b) i) Give two Laurent series expansions in powers of z for the function $f(z) = \frac{1}{z^2(1-z)}$ and specify the domains in which those expansions are valid.

ii) Prove that, a function f that is analytic at a point z_0 has a zero of order m there if and only if there is a function g, which is analytic and nonzero at z_0, such that $f(z) = (z - z_0)^m g(z)$.

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Total No. of Questions :4]

SEAT No. :

P581

[Total No. of Pages :3

[5215] - 402

T.Y.B.Sc.

MATHEMATICS

MT - 342 : Real Analysis - II

(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 side indicate full marks.***

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

a) Let f be the characteristic function of the set $\left\{0, \frac{1}{10}, \frac{2}{10}, \ldots, 1\right\}$ defined on [0 , 1]. Compute w[f ; x], for all x$\in$ [0 , 1].

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 is continuous on [a, b].

c) Evaluate : $\lim_{n\to\infty} \frac{1}{n}\left[\left(\frac{1}{n}\right)^2+\left(\frac{2}{n}\right)^2+\ldots+\left(\frac{n}{n}\right)^2\right]$.

d) Let $f_n(x) = \frac{x}{1+nx}$ $(0 \leq x < \infty)$.

Find $\lim_{n\to\infty} f_n(x)$ $(0 \leq x < \infty)$.

e) Give an example of a sequence of continuous functions that converges pointwise to a discontinuous function.

f) Test the convergence of $\int_1^\infty \frac{1}{\sqrt{x}}dx$.

g) If f(x) $\geq$ 0 in 1 $\leq$ x $< \infty$, if f is non - increasing on [1, ∞) and if $\int_1^\infty f(x)dx$ converges, then prove that $\lim_{x\to\infty} x\, f(x) = 0$.

P.T.O.

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

a) If f $\in$ R [a, b] and λ is any real number, then prove that $\lambda f \in$ R [a, b]. Also prove that $\int_a^b \lambda f = \lambda \int_a^b f$.

b) Let $f_n(x) = \frac{x^n}{n}$ $(0 \leq x \leq 1)$.

Show that $\{f_n\}_{n=1}^{\infty}$ converges uniformly to 0 on [0, 1]. Does $\{f_n'\}$ converge to 0 on [0, 1] ?

c) Prove that $\int_0^1 \frac{\sin x}{x^2} dx$ is divergent.

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

a) Let f(x) = sinx $(0 \leq x \leq \frac{\pi}{2})$ and $\sigma_n = \left\{0, \frac{\pi}{2n}, \frac{2\pi}{2n}, \ldots, \frac{n\pi}{2n}\right\}$. Then prove that $\lim_{n\to\infty} U[f; \sigma_n] = 1$.

b) Let $\sum_{k=1}^{\infty} u_k$ be a series of real valued functions on a set E. If there exists positive numbers $M_1, M_2, \ldots$ with $\sum_{k=1}^{\infty} M_k < \infty$ such that $\sum_{k=1}^{\infty} u_k(x) << \sum_{k=1}^{\infty} M_k (x \in E)$, then show that $\sum_{k=1}^{\infty} u_k$ converges uniformly on E.

c) Prove that $\int_0^2 \frac{x}{1-x} dx$ is divergent.

Q4) Attempt any one of the following:

a) (i) State and prove second fundamental theorem of calculus. **[5]**

(ii) Prove that $\frac{2\pi^2}{9} \leq \int_{\pi/6}^{\pi/2} \frac{2x}{\sin x} dx \leq \frac{4\pi^2}{9}$. **[5]**

b) (i) Without finding the sum f(x) of the series

$1+\frac{x^2}{2!}+\frac{x^4}{4!}+....+\frac{x^{2n}}{n!}+....$, show that $f'(x) = 2x\, f(x)$ $(-\infty < x < \infty)$

[5]

(ii) If f is continuous in $(-\infty, \infty)$ and if $\int_{-\infty}^{\infty} f(x)\,dx$ converges to A, then prove that C.P.V. $\int_{-\infty}^{\infty} f(x)\,dx = A$. **[5]**

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Total No. of Questions : 4]

SEAT No. :

P582

[Total No. of Pages : 3

[5215]-403
T.Y.B.Sc.
MATHEMATICS
MT-343 : Problem Course Based on MT - 341 and MT - 342
(2013 Pattern) (New Course) (Paper - III) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***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) Evaluate $\int_C \bar{z}\,dz$ where C is the circle $z = e^{i\theta}$ in the positive sense.

iii) Find the residue for the function $f(z)=\frac{z^2-2z+3}{z-2}$ at $z = 2$.

iv) Reduce the quantity $\frac{1+2i}{3-4i}+\frac{2-i}{5i}$ to areal number.

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

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

ii) Show that, $\text{Log}(1 + i)^2 = 2\text{log}(1 + i)$

but $\text{Log}(-1 + i)^2 \neq 2\text{log}(-1 + i)$.

P.T.O.

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

a) Let f denote the function defined by $f(z)=\begin{cases}\dfrac{\overline{z}^2}{z} & \text{when } z\neq 0\\ 0 & \text{when } z=0\end{cases}$

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

b) Let C denote the circle $|z|=3$, described in positive sence. Show that, if

$g(w)=\int_C \dfrac{2z^2-z-2}{z-w}dz\,(|w|\neq 3)$ then $g(2) = 8\pi i$.

What is the value of $g(w)$ when $|w|>3$.

c) Show that, when $0<|z-1|<2$,

$$\frac{z}{(z-1)(z-3)}=-3\sum_{n=0}^{\infty}\frac{(z-1)^n}{2^{n+2}}-\frac{1}{2(z-1)}.$$

SECTION - II

(Real Analysis - II)

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

i) True or false : If f is continuous on [0, 1] and $f(x) = g(x)$ at almost every $x\in[0,1]$, then g is continuous almost every where in [0, 1]. Justify.

ii) Let χ_n denote the characteristic function of $[-n, n]$. Find $\lim_{n\to\infty}\chi_n(x)$ $(x\in\mathbb{R})$.

iii) Prove that $\int_1^{\infty}\sin x\,dx$ oscillates.

iv) Discuss the convergence of $\int_{-\infty}^{0}\dfrac{1}{1+x^2}dx$.

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

i) Let $f(x) = 2x - 3$ $(1 \le x \le 3)$. Show that $f \in R[1,3]$ and hence find $\int_1^3 f(x)\,dx$.

ii) if $\{f_n\}_{n=1}^{\infty}$ and $\{g_n\}_{n=1}^{\infty}$ converges uniformly on E, prove that $\{f_n + g_n\}_{n=1}^{\infty}$ converges uniformly on E.

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

a) If $f(x) = \int_0^x \sqrt{t + t^6}\,dt$ $(x > 0)$, then prove that $f'(x)$ exists on $(0, \infty)$. Hence find $f''(x)$.

b) Discuss the convergence of $\sum_{n=0}^{\infty} x(1-x)^n$ on [0, 1].

c) Show that $\int_0^1 \frac{dx}{\sqrt{x(1-x)}}$ is convergent.

Total No. of Questions : 4]

SEAT No. :

P583

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[5215]-404

T.Y.B.Sc.

MATHEMATICS

MT-344: Ring Theary

(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) Let R be a ring with unity. If N is an ideal of R containing a unit of R, then show that N=R.

b) Determine all units in the ring $\mathbb{Z}\times\mathbb{Z}$.

c) Find all solutions of the congruence $12x \equiv 27 \pmod{18}$.

d) Give an example of a ring R such that $a^2 - b^2 \neq (a+b)(a-b)$ for some $a, b \in R$.

e) State the following statement is true or false with justification. $\{0\}$ is a prime ideal in $\mathbb{Z}_6$.

f) Show that the field $\mathbb{R}[x]/\langle x^2+1\rangle$ is isomorphic to $\mathbb{C}$.

g) Let D be a Euclidean domain with Euclidean norm ν. If a and b are associates in D, then show that $\nu(a) = \nu(b)$.

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

a) Prove that cancellation laws hold in a ring R if and only if R has no divisors of 0.

b) Prove that an element 'a' in a field F is a zero of $f(x) \in F[x]$ if and only if $(x-a)$ is a factor of $f(x)$ in $F[x]$.

c) Let H be a subring of the ring R. Prove that multiplication of additive cozets of H is well defined by the equation $(a+H)(b+H) = ab+H$ if and only if $ah \in H$ and $hb \in H$ for all $a, b \in R$ and $h \in H$.

P.T.O.

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

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

b) Prove directly from the definitions of maximal and prime ideals that every maximal ideal of a commutative ring R with unity is a prime ideal of R.

c) Let ϕ be a homomorphism of a ring R into a ring R'.

i) If S is a subring of R, then prove that $\phi[S]$ is a subring of R'.

ii) If S' is a subring of R', then prove that $\phi^{-1}[S']$ is a subring of R.

Q4) Attempt any one of the following.

a) i) If D is a UFD, prove that the product of two primitive polynomials in D $[x]$ is also primitive in D$[x]$. **[5]**

ii) Prove that every Euclidean domain is PID. **[5]**

b) i) Prove that an ideal $\langle p \rangle$ in a PID is maximal if and only if p is an irreducible. **[6]**

ii) Show that the integral domain $\mathbb{Z}\left[\sqrt{-5}\right] = \left\{a + ib\sqrt{5} \,/\, a, b \in \mathbb{Z}\right\}$ is not a UFD. **[4]**

Total No. of Questions : 4]

SEAT No. :

P584

[Total No. of Pages : 2

[5215]-405

T.Y.B.Sc.

MATHEMATICS

MT- 345 : Partial Differential Equations

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

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

Instructions to the candidates:

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

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

a) Obtain the partial differential equation by eliminating the arbitrary function f from $z = f(x-y)$.

b) Find a complete integral of Clairant's partial differential equation

$pqz = p^2(qx + p) + q^2(py + q)$.

c) Show that the differential equation $yzdx + 2xzdy - 3xydz = 0$ is integrable.

d) Find the general integral of $yzp + xzq = xy$.

e) Find the integral curves of the equations.

$$\frac{dx}{ny - mz} = \frac{dy}{lz - nx} = \frac{dz}{mx - ly}.$$

f) Solve the differential equation $(y^2 + z^2)\,dx + xydy + xzdz = 0$.

g) Reduce the equation $(y + z)\,dx + (z + x)\,dy + (x + y)\,dz = 0$

into one variable seperable form.

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

a) If $\bar{X}$ is a vector such that $\bar{X} \cdot \text{Curl } \bar{X} = 0$ and μ is an arbitrary function of x, y, z then prove that $(\mu\bar{X}) \cdot \text{Curl } (\mu\bar{X}) = 0$.

b) Solve $(y^2 + yz)\,dx + (zx + z^2)\,dy + (y^2 - xy)\,dz = 0$ by Natani's method.

c) Find the orthogonal trajectories on the cone $x^2 + y^2 = z^2 \tan^2\alpha$ of its intersection with the family of planes parallel to $z = 0$.

P.T.O.

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

a) Prove that the general solution of a linear partial differential equation $P_p + Q_q = R$ is $F(u, v) = 0$ where F is arbitrary function of $u(x, y, z) = c_1$ and $v(x, y, z) = c_2$ which forms a solution of the equation $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

b) Find the integral surface of the differential equation $(x-y)p+(y-x-z)q=z$ passing through the circle $z = 1, x^2 + y^2 = 1$.

c) Find the general integral of partial differential equation $(y-z)p+(z-x)q=x-y$.

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

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

ii) Solve by Jacobi's method.

$$u_x x^2 - u_y^2 - \alpha u_z^2 = 0.$$

b) i) Explain Jacobi's method for solving partial differential equation $f(x, y, z, u_x, u_y, u_z) = 0$.

ii) Find complete integral of $p^2x + q^2y = z$ by Charpit's method.

Total No. of Questions : 4]

SEAT No. :

P585

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[5215]-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) ***Answer to the two sections should be written in separate answer books.***
4) ***Tie answer books of both sections together.***

SECTION - I

(Ring Theory)

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

i) Show that $f(x)=1+2x$ is a unit in $\mathbb{Z}_4[x]$ but $f(x)$ is not a unit in $\mathbb{Z}_3[x]$.

ii) Show that the matrix $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$ is a divisor of zero in $M_2(\mathbb{Z})$.

iii) Find all $c \in \mathbb{Z}_3$ such that $\mathbb{Z}_3[x]/\langle x^3+x^2+c \rangle$ is a field.

iv) Consider $\alpha = 7 + 2i$ and $\beta = 3 - 4i$ in $\mathbb{Z}[i]$. Find σ and ρ in $\mathbb{Z}[i]$ such that $\alpha = \beta\sigma + \rho$ with $N(\rho) < N(\beta)$.

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

i) IF p is a prime, then show that $(a+b)^p = a^p+b^p$ for all $a,b \in \mathbb{Z}_p$.

ii) Show that each homomorphism from a field to a ring is either one to one or maps everything onto 0.

P.T.O.

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

a) Let A and B be ideals of a ring R. Define

$AB = \left\{ \sum_{i=1}^{n} a_i b_i \mid a_i \in A,\ b_i \in B,\ n \in \mathbb{Z}^+ \right\}$. Show that AB is an ideal of R.

b) Let D be a Euclidean domain with a Euclidean norm ν. Show that for nonzero $a, b \in D$, $\nu(a) < \nu(a,b)$ if and only if b is not a unit of D.

c) Find the order and characteristic of the field $\mathbb{Z}[i] / \langle 1+i \rangle$.

SECTION-II

(Partial Differential Equations)

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

i) Obtain the partial differential equation by eliminating arbitrary constants a and b from $z = ax+by$.

ii) Solve the differential equation $2xyz\,dx + z\,dy - y\,dz = 0$.

iii) Find the integral curves of the equations

$$\frac{a\,dx}{(b-c)yz} = \frac{b\,dy}{(c-a)zx} = \frac{c\,dz}{(a-b)xy}.$$

iv) Find the general integral of $(y+1)p + (x+1)q = z$.

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

i) Show that the differential equation $zy^2dx + zx^2dy - x^2y^2dz = 0$ is integrable and find its primitive.

ii) Find the complete integral of $p^2+q^2 = x+y$.

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

a) Solve the differential equation
$y(1+z^2)dx - x(1+z^2)dy + (x^2+y^2)dz = 0$ by Natani's method.

b) Find a complete integral of $(p^2+q^2)y - qz = 0$ by Charpit's method.

c) Solve the differential equation $u_x^2 + u_y^2 + u_z = 1$ by Jacobi's method.

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Total No. of Questions :4]

SEAT No. :

P586

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T.Y.B.Sc.

MATHEMATICS

MT - 347 (A) : Optimization Techniques

(2013 Pattern) (Paper - VII (A)) (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 mean by decisions under uncertainty? State the different criterion for making a decision under uncertainty?

b) Give any two characteristics of a two person zero-sum game.

c) Determine the saddle point and the value of game whose payoff matrix is,

Player B

$$\text{Player A} \begin{matrix} \\ A_1 \\ A_2 \\ A_3 \end{matrix} \begin{matrix} B_1 & B_2 & B_3 & B_4 \\ \end{matrix} \begin{bmatrix} 8 & 6 & 2 & 8 \\ 8 & 9 & 4 & 5 \\ 7 & 5 & 3 & 5 \end{bmatrix}$$

d) What are CPM and PERT?

e) State Johson's algorithm condition in three machine sequencing problem.

f) Write the different situations where the replacement of an item are needed.

g) Show that $x = 0$ is an inflection point for the function $f(x) = x^3$.

P.T.O.

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

a) Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information processing time on machines is given in hours and passing is not allowed :

Job	A	B	C	D	E	F	G
Machine M_1 :	3	8	7	4	9	8	7
Machine M_2 :	4	3	2	5	1	4	3
Machine M_3 :	6	7	5	11	5	6	12

Also find total elapsed time & idle time for machine M_1, M_2 & M_3.

b) A firm is considering replacement of a machine of cost Rs.9,000 and annual operating costs are Rs.200 for the first year and then increase by Rs.2,000 every year. Determine the best age at which to replace the machine and average yearly cost of owning and operating the machine.

c) Draw a network diagram for the project :

Activity :	A	B	C	D	E	F	G	H	I	J
Immediate Predecessor	-	-	-	-	A, B	E	F	D	G, H	C, I

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

a) Determine the extreme points of the function

$$f(x_1, x_2) = x_1^3 + x_2^3 - 3x_1x_2.$$

b) Solve the following game by using graphical method :

Player B

$$\text{Player A} \quad \begin{matrix} & B_1 & B_2 \\ A_1 & 1 & 2 \\ A_2 & 5 & 4 \\ A_3 & -7 & 9 \\ A_4 & -4 & -3 \\ A_5 & 2 & 1 \end{matrix}$$

c) Solve the following game

Player B

Player A	B_1	B_2	B_3	B_4
A_1	3	2	4	0
A_2	3	4	2	4
A_3	4	2	4	0
A_4	0	4	0	8

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

a) A small project consists of seven activities, the details of which are given below :

Activity :	A	B	C	D	E	F	G
Immediate Predecessor :	-	A	A	B, C	B	D, E	D
Optimistic time:	1	2	3	4	3	2	4
Most likely time:	3	6	3	10	7	5	4
Pessimistic time:	7	14	3	22	15	14	4

i) Draw the network and find the critical path and project completion time.

ii) What project duration will have 95% confidence of completion?

b) i) Information on the activities required for a project are as follows.

Name :	A	B	C	D	E	F	G	H
Activity Mode :	0-1	0-2	0-3	1-4	2-4	3-5	4-5	5-6
Duration : (days)	2	4	3	1	6	5	7	2

Draw the network and find the project completion time.

ii) Express the following game as L.P.P. only for minimization.

Player B

Player A	B_1	B_2	B_3
A_1	5	3	7
A_2	7	9	1
A_3	10	6	2

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Total No. of Questions :4]

SEAT No. :

P587

[Total No. of Pages :2

[5215] - 408

T.Y.B.Sc.

MATHEMATICS

MT-347 (B) : Differential Geometry

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

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

Instructions to the candidates:

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

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

a) Show that the curve $\gamma(t)=(t,\cosh t)$, for $-\infty < t < \infty$ is regular.

b) Show that , if γ is a unit-speed plane curve, then $\dot{n}_s = K_s t$.

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

d) Show that the curve $\gamma(t)$ = (a cost, b sint), where a and b are positive constants, is a simple closed curve.

e) State isoperimetric inequality.

f) Find the first fundamental form of the surface $\sigma(U,V)$ = (U–V, U+V, U^2+V^2).

g) Show that every isometry is a conformal map.

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

a) Find the curvature of the curve $\gamma(t)$ = ($\cos^3 t$, $\sin^3 t$).

b) Prove that a parametrised curve has a unit-speed reparametrisation if and only if it is regular.

c) Show that the length $l(\gamma)$ and the area A (int (γ)) are unchanged by applying a rigid motion to γ.

P.T.O.

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

a) Show that $\sigma(U,V)=(SechU\ cosV, sechU\ sinV, tanhU)$ is a regular surface patch for the unit sphere.

b) Prove that transition maps of a smooth surface are smooth.

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

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

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

ii) If the second fundamental form of a surface patch σ is zero every where, then prove that σ is a part of a plane.

b) i) Let $f(x)$ be a smooth function and let $\sigma(U,V) = (UcosV, UsinV, f(U))$ be the surface obtained by rotating the curve $z = f(x)$ in the xz – plane around the Z-axis. Find all functions f for which σ is conformal.

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

Total No. of Questions :4]

SEAT No. :

P588

[Total No. of Pages :2

[5215] - 409
T.Y.B.Sc.
MATHEMATICS
MT-347 (C) : C-Programming-II
(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

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

a) Explain the following:

```
double (*f) ();
```

b) Explain in short the use of operator bitwise OR $(|)$.

c) Explain the use of function : fgetc.

d) State the meaning of the following declaration:

```
int *a[10];
```

e) Write a macro MAX (a,b) to find maximum of a and b.

f) Define a structure that contains two members: a 10 element character array called 'name' and an integer quantity called 'roll no.'

g) Write the syntax of Malloc function.

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

a) Explain shift operators.

b) Write a short note on Calloc function.

c) Write a C program to copy a file named source.C to another file target.C using command line arguments.

P.T.O.

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

a) Write a short note on pointers.

b) Write a short note on static and automatic storage classes.

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

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

a) i) Write a structure which will accept 5 points (x_i,y_i,z_i), i = 0,1,2,3,4. Compute distances between each pair of points (10 distances) and find minimum distance, using a C program.

ii) Write a short note on fprintf function.

b) i) Write a C program to implement bubble sort algorithm.

ii) Write a short note on files.

Total No. of Questions : 4]

SEAT No. :

P589

[Total No. of Pages : 3

[5215]-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) Define bipartite graph and complete bipartite graph.

b) Draw a graph having the following matrix as it's adjacency matrix.

$$\begin{bmatrix} 0 & 1 & 2 & 2 \\ 1 & 0 & 3 & 2 \\ 2 & 3 & 0 & 1 \\ 2 & 2 & 1 & 1 \end{bmatrix}$$

c) Draw all non-isomorphic trees with four vertices.

d) If a vertex v of a free T is a cut vertex then show that $d(v) > 1$.

e) Give an example of a graph which is

i) Eulerian but not Hamiltonian.

ii) Hamiltonian but not Eulerian.

f) Let G be a simple K regular graph with 2K-1 vertices. Show that G is Hamiltonian.

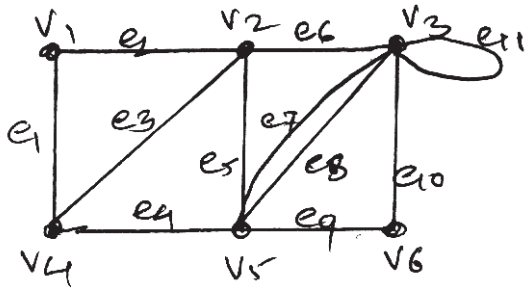
g) Define Tournament. Draw all non-isomorphic tournaments on 3-vertices.

P.T.O.

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

a) Let G be a simple graph. Prove that if G is not connected then its complement $\overline{G}$ is connected.

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

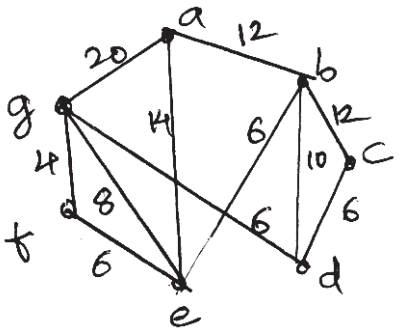


c) Define complete tripartite graph. Draw the graph $K_{1,2,2}$ and $K_{2,3,3}$. How many edges are there in $K_{r,s,t}$?

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

a) Prove that a graph is connected if and only if it has a spanning free.

b) Use Dijkstra's algorithm to find the length of the shortest path from a vertex '*a*' to each other vertex and give example of such paths.

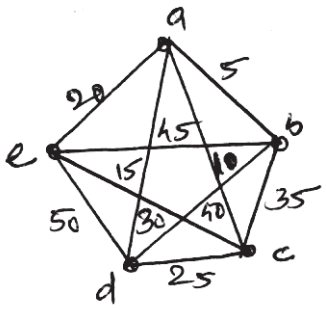


c) Let G be a graph with *n* vertices and *q* edges. Let W(G) denote the number of connected components of G. Prove that G has atleast *n*-*w*(G) edges.

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

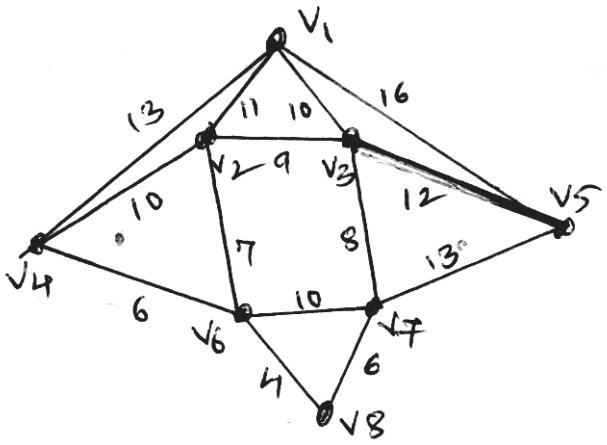
a) i) Let G be a graph in which degree of every vertex is atleast two. Prove that G contains a cycle.

ii) Carry out two optimal method for the Travelling Salesman Problem for the following complete weighted graph.



b) i) Prove that a strongly connected tournament T on *n* vertices contains a directed cycle of length 3, 4, 5, ...n.

ii) Solve the Chinese postman problem for the following graph.



Total No. of Questions :4]

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P590

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[5215] - 411

T.Y.B.Sc.

MATHEMATICS

MT - 347(E) : Lebesgue Integration

(New Course) (2013 Pattern) (Paper - VII) (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 is a closed subset of $[a, b]$ and $|F| = 0$, then $F = \phi$.

b) If c and d are in (a, b) and $c < d$ prove that $[c, d]$ is measurable.

c) Give an example of a function that is discontinuous at every point but still measurable.

d) If E_1 and E_2 are measurable subset of $[a, b]$, prove that the symmetric difference of E_1 and E_2 is also measurable.

e) If f is a measurable function on $[a, b]$ and $c > 0$ is a real number then prove that cf is measurable.

f) State Fatou's lemma.

g) Show that if $f \in L[-\pi, \pi]$ is an even function then

$$\int_{-\pi}^{\pi} f(x)\,dx = 2\int_{0}^{\pi} f(x)\,dx.$$

P.T.O.

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

a) Prove that if, E $\subset [a, b]$ then $\bar{m}\,E + \underline{m}\,E = b - a.$

b) If $\{f_n\}_{n=1}^{\infty}$ is a sequence of measurable function on $[a, b]$ and if $\lim_{n\to\infty} f_n(x) = f(x)$ almost everywhere for $x \in [a, b]$ then prove that f is measurable.

c) Show that E $\subset [a, b]$ is measurable if and only if given $\in > 0$ there exists a closed set F $\subset$ E and an open set G $\supset$ E such that |G| – |F| $< \in$.

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

a) If E_1, E_2 ..... are measurable subsets of $[a, b]$ such that $E_1 \subset E_2 \subset E_3 \subset$ ..... then prove that $\bigcup_{n=1}^{\infty} E_n$ is measurable and $m\left(\bigcup_{n=1}^{\infty} E_n\right) = \lim_{n\to\infty} m\,E_n.$

b) If f is a bounded function in L[a, b] and if $a < c < b$ then prove that $f \in L[a, c], f \in L[c, b]$ and $\int_a^b f = \int_a^c f + \int_c^b f.$

c) If f is a nonnegative valued measurable function on $[a, b]$ and if $f(x) \le g(x)\ \forall\ x \in [a, b]$ and $g \in L[a, b]$ then prove that $f \in L[a, b]$.

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

a) i) Let f and g be non-negative - valued functions on $[a, b]$. If $f, g \in L[a, b]$, then prove that $f + g \in L[a, b]$ and $\int_a^b f + g = \int_a^b f + \int_a^b g.$

ii) If $f(x)=\frac{1}{2}+\sin x \ (0\le x<2\pi)$, find f^+ and f^-.

b) i) Let $f \in L[a, b]$, if $F(x)=\int_a^x f(t)\,dt \ (a\le x\le b)$, prove that F is continuous on $[a, b]$.

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

Total No. of Questions :4]

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P591

[Total No. of Pages : 3

[5215] - 412

T.Y.B.Sc.

MATHEMATICS

MT - 347 : Elective (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.***
3) ***Use of scientific calculator is allowed.***

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

a) If the circle of circumference 14 π is uniformly scaled by 2 - units, what is the area of the transformed circle?

b) Write the transformation matrix for shear in X - coordinate by a factor of 6 units proportional to Y - coordinates and shear in Z - coordinate by a factor of 3 units proportional to X - coordinate.

c) Find the angle through which the $4x + 2y + 1 = 0$ is to be rotated so that it coincide with the X - axis.

d) Find the value of $\delta\theta$ to generate eleven points on the parabolic segment $y^2 = 4x$, $2 \le y \le 4$.

e) Write any two properties of Be'zier curve.

f) If a line AB having slope $\frac{1}{2}$ is transformed to the line A*B* under the transformation matrix [T] = $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ then what is the slope of A*B*?

g) Write the transformation matrix [T] so that the point [P] = [2, 4] is transformed to the origin.

P.T.O.

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

a) Rotate ΔABC about its centroid through an angle 45^o where A (2, –4), B (3, 0) and C (–2, 1).

b) Find the concatenated transformation matrix for the following transformation in order.

i) Translation in x, y, z direction by –2, –2, –2 units respectively.

ii) Rotation about x - axis by an angle 45^o.

c) Write the transformation matrix for the dimetric projection with $f_z = \frac{1}{3}$ and also find the foreshortening factors along x and y direction [Take $\phi > 0$, $\theta > 0$].

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

a) Obtain an algorithm to generate uniformly spaced n points on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

b) Rotate the line segment AB, where A(3, 3, 3), B (5, 5, 5), about the local X - axis passing through the point P(2, 3, 1) through an angle 75^o.

c) Suppose the transformation matrix $\begin{bmatrix} 1 & 5 \\ -2 & 4 \end{bmatrix}$ transforms the line $5x - y + 2 = 0$ to a line. Find the equation of the transformed line.

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

a) i) Find the parametric equation of Be'zier Curve determined by the control points B_0 [0, 2], B_1 [2, 3], B_2 [3, 2] and B_3 [2, 0]. Also, find the position vector of the point on the curve corresponding to parametric value $t = 0.4$.

ii) Find the concatented matrix required to make the plane $x + y + z = 0$ coincident with the $z = 0$ plane.

b) i) Obtain equispaced 6 points of circle $(x - 1)^2 + (y + 2)^2 = 9$.

ii) Find the Cabinet projection of the object represented by the following position vector matrix [x] with a horizontal inclination angle $\alpha = 25^o$, where $[x] = \begin{bmatrix} -1 & -2 & 1 \\ 3 & 4 & -1 \end{bmatrix}$.

Total No. of Questions :4]

SEAT No. :

P592

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T.Y.B.Sc.

PHYSICS

PH - 341 : Classical Electrodynamics

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

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

Instructions to the candidates:

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

Q1) Attempt all of the following (1 mark each): **[10]**

a) What is meant by dielectric constant?

b) Define the term : Magnetic Susceptibility.

c) State Gauss's law in electrostatics.

d) State Biot - Savart's law.

e) Define : Magnetic dipole moment.

f) State any two similarities between electric and magnetic fields.

g) What is paramagnetism?

h) Define Poynting vector.

i) What do you mean by mutual induction?

j) Write microscopic form of Ohm's Law.

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

a) What is electrical image? Write the procedural steps to solve the electrostatic problems using the method of electrical images.

b) State Ampere's circuital law. Obtain the relation : $\vec{\nabla} \times \vec{B} = \mu_0 I$.

c) State Faradays law of electromagnetic induction. Show that $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$.

P.T.O.

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

a) Find the magnitudes of $\vec{D}$ and $\vec{P}$ for a dielectric material if $\vec{E} = 0.20$ MV/m, $\chi_e = 4$ and $\varepsilon_0 = 8.85 \times 10^{-12}$ C^2/Nm^2.

b) Sunlight strikes the earth outside its atmosphere with intensity 2 cal/cm^2.min. Calculate the average value of Poynting vector and amplitude of electric vector.

(Given : $\varepsilon_0 = 8.85 \times 10^{-12}$ C^2/Nm^2, $\mu_0 = 4\pi \times 10^{-7}$ Wb/Am).

c) A material having $\sigma = 10^{-2}/\Omega m$ and $\varepsilon = 2\varepsilon_0$ is exposed to sinusoidally varying electric field. The ratio of displacement current density (J_d) to the current density (J_c) is given by $\frac{J_d}{J_c} = \frac{\omega E}{\sigma}$. Determine the frequency (f) at which the two current densities will be equal.

(Given : $\varepsilon_0 = 8.85 \times 10^{-12}$ C^2/Nm^2).

Q4) a) Attempt any one of the following (Eight Marks) **[8]**

i) What is meant by Hysteresis? Draw hysteresis loop and explain the terms remenance and coercivity.

ii) State and prove Poynting theorem.

b) Attempt any one of the following (Two marks) **[2]**

i) Find the loss of energy/hour at a frequency of 25 Hz if the energy dissipated in iron per cycle is 3×10^6 erg.

ii) State Maxwell's equations in integral form.

Total No. of Questions : 4]

SEAT No. :

P593

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[5215]-414
T.Y.B.Sc.
PHYSICS
PH - 342: Quantum Mechanics
(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 & log-table is allowed.***

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

a) A proton of mass 1.67×10^{-27} kg is moving with 1.38×10^{4} m/s, determine wavelength of it. h = 6.63×10^{-34} Js.

b) State requirements of wave function.

c) What is rigid rotator?

d) State two uses of tunneling effect.

e) What is free particle?

f) State parity of function $f(x) = x^4 + 2$.

g) Consider $\frac{d^2}{dx^2}$ operator & check $\sin^2 x$ is eigen function or not. If yes find eigen value.

h) State expressions of ladder operators L+ & L–.

i) Show that $[A,B^{-1}] = B^{-1}[B,A]B^{-1}$.

j) State two phenomena where classical theory fails to explain.

P.T.O.

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

a) Prove that $V_g = V_p + K\frac{dV_p}{dK}$ & $V_g = V_p - \lambda\frac{dV_p}{d\lambda}$.

b) Wave function $\psi = A\left(1-\frac{x}{a}\right)$ for $\frac{a}{z} < x < a,$ then find normalisation constant A.

c) State uncertainty principle & from it obtain other two forms of it.

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

a) Obtain Schrodinger's time dependent equation.

b) For free axis rigid rotator obtain the relation $I = \frac{m_1 m_2}{m_1 + m_2} r^2$.

c) A proton is confined to move in one dimensional box of width 0.2 nm. Find lowest possible energy of proton.

$m_p = 1.67 \times 10^{-27}$ kg, $\hbar = 1.055 \times 10^{-34}$ Js.

Q4) A) Attempt any one of the following.

a) i) Explain Davison & Germer experiment to prove wave nature of moving electron. **[4]**

ii) Show that $-i\hbar\frac{\partial}{\partial x}$ is Hermitian operator. **[4]**

b) Show that particle in one dimensional infinite well will have discrete energy states. Plot first three eigen functions. **[8]**

B) Attempt any one of the following.

a) Calculate de Broglie wavelength of neutron whose energy is 1e V

$m_n = 1.67 \times 10^{-27}$ kg **[2]**

$h = 6.63 \times 10^{-34}$ Js.

b) Define operator in quantum mechanics & explain it with simple example. **[2]**

Total No. of Questions : 4]

SEAT No. :

P594

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[5215]-415

T.Y.B.Sc.

PHYSICS

PH-343 : Thermodynamics and Statistical Physics

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

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

Instructions to the candidates:

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

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

a) Define 'Temperature of inversion'.

b) Define Boyle temperature.

c) Define the Gibb's potential function.

d) In random walk problem. What is the root mean square deviation?

e) What is Binomial distribution?

f) Define phase space.

g) Define constraints.

h) What do you mean by inaccessible states?

i) What is Barometric formula?

j) Define Grand Canonical ensemble.

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

a) Define coefficient of thermal conductivity of a gas. Derive an expression for thermal conductivity (k) of a gas on the basis of kinetic theory of gases.

b) Derive Gaussian probability distribution equation.

c) Show that entropy, $S = K\left(l\text{n}Z + \beta\overline{E}\right)$.

P.T.O.

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

a) The diameter of the molecule of a gas is 2×10^{-8} cm and Boltzmann's constant is 1.38×10^{-23} J/°K. Calculate the mean free path at NTP.

b) Find mean number $(\bar{n}_1)$, mean displacement and RMS deviation, if N = 100 steps and $p = q = ½$.

c) Two states with difference of energy 4.8×10^{-14} erg occur with relative probability e^2. Calculate the temperature.

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

i) Derive Maxwell's four thermodynamic relation and hence find first and second Tds equation.

ii) Distinguish between Maxwell Boltzmann and Fermi-Dirac statistics. Obtain the expression for the distribution law of Maxwell and Boltzmann $\overline{n}_r = \frac{Ne^{-\beta E_r}}{\sum_r e^{-\beta E_r}}$.

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

i) Write short note on "Thermodynamic potentials".

ii) State basic postulates of statistical mechanics.

Total No. of Questions : 4]

SEAT No. : ____

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[5215]-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 logtable and calculator is allowed.***

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

a) What is G.M. counter?

b) Draw any two Feynman diagrams.

c) What is mean life of radioactive substance?

d) Define packing fraction.

e) State any two applications of counters.

f) What is chain reaction?

g) State law of radioactive decay.

h) What is meant by compound nucleus?

i) State any two conservation laws in nuclear reaction.

j) What are isobars? Give example.

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

a) Discuss binding energy and packing fraction curves.

b) What are deuterons? State and explain properties of ground state of deuteron.

c) What is threshold energy in nuclear reaction? Obtain an expression for threshold energy.

P.T.O.

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

a) Which conservation laws are violeted in the reaction.

$$\pi^{+} + n \longrightarrow \pi^{-} + p \ ?$$

b) A self quenched G.M. counter operates at 1000 volts and has anode diameter 0.2 mm. The radius of cathode is 2cm. What is the maximum radial field?

c) Find Q-value for following reaction

$$_{83}\mathrm{Bi}^{209} + p \longrightarrow {}_{83}\mathrm{Bi}^{208} + {}_{1}\mathrm{H}^{2}$$

Given: Mass of $_{83}Bi^{209}$=208.980394 a.m.u

Mass of P =1.007825 a.m.u

Mass of $_{83}Bi^{208}$= 207.979731 a.m.u

Mass of $_{1}H^{2}$= 2.014102 a.m.u

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

a) What is successive disintegration? Discuss the case of transient equilibrium between parent and daughter.

b) What is stellar energy? State types of nuclear reactions in the stars. Discuss in detail proton-proton cycle.

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

a) Calculate the energy equivalent to 1amu in joules.

b) State and define units of activity.

Total No. of Questions : 4]

SEAT No. :

P596

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[5215]-417
T.Y.B.Sc.
PHYSICS
PH - 345 (A) : Electronics
(2013 Pattern) (Paper - V) (Semester - IV)

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

Instructions to the candidates:

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

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

a) State any two advantages of LED.

b) Enlist four classes of amplifier.

c) What is current gain?

d) A JFET has V_p = 5 V and I_{DSS} = 100 mA. What is the ohmic resistance?

e) What is an instrumentation amplifier?

f) Find the value of capacitor for monostable multivibrator

Given: pulse width (t) = 101 ms and R_A = 1 kΩ.

g) What is meant by ripple?

h) Convert $Y = AB+A\bar{B}C$ into standard SOP form.

i) What are the types of detector?

j) What is up counter?

P.T.O.

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

a) Explain the construction of n-channel JFET. Draw its transfer characteristics curves.

b) Explain the working of an op-amp as an integrator, derive the formula for output.

c) Explain the designing of high voltage regulator using IC723. Draw the suitable circuit diagram.

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

a) Find the duty cycle of astable multivibrator using IC555 when $R_A = R_B = R$.

b) Design and construct Half adder using K-map.

c) Differentiate between synchronous and asynchronous counters.

Q4) a) Attempt any one (Eight marks): **[8]**

i) What is a register? State various types of registor. Draw a circuit diagram of 4-bit SISO shift register. Explain its working.

ii) What are multiplexers and de-multiplexers? Draw the diagram for 4:1 demultiplexer.

b) Attempt any one (Two marks): **[2]**

i) What is LED? Explain principle of aperation of LED.

ii) Find the gray code for binary 1110.

Total No. of Questions : 4]

P596

[5215]-417
T.Y.B.Sc.
PHYSICS
PH - 345 (B) : Advanced Electronics
(2013 Pattern) (Paper - V) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Attempt all of the following (1 mark each): **[10]**

a) A material has a temperature of 144.5°C. Express it in °k.

b) What is the principle of thermocouple?

c) State the advantage of photomultiplier cell.

d) What is signal conditioning?

e) Define the term CMRR.

f) What is De-multiplexer?

g) What do you mean by input offset voltage of op-amp?

h) State the types of motion.

i) Give any one objective of control system.

j) Find the wavelength in meters of a EM radiations of frequency 10^6 Hz.

Q2) Attempt any two of the following:

a) Explain the principle and working of photovoltaic detectors. **[5]**

b) Explain in brief the linearization technique used for non linear output of a sensor in signal conditioning. **[5]**

c) What is pyrometry? Explain the narrowband pyrometers. **[5]**

Q3) Solve any two of the following:

a) An accelerometer has a seismic mass of 0.05 kg and a spring constant of 3×10^3 N/m. Calculate the maximum measurable acceleration in g and the natural frequency if maximum mass displacement is $\pm$ 0.02 m. **[5]**

b) What is loading effect? Explain how it affects the output of a process variable. **[5]**

c) Explain the simple process control loop with the help of a block diagram. **[5]**

Q4) A) Attempt any one of the following:

a) Draw a neat diagram of data acquistion system and explain in brief. **[8]**

b) What do you mean by Filter? Give the classification of filters and explain various types of filters. **[8]**

B) Attempt any one of the following:

a) Give the difference between controlled variable and manipulated variable. **[2]**

b) State the applications of DAC converter. **[2]**

Total No. of Questions : 4]

SEAT No. :

P597

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[5215]-418
T.Y.B.Sc.
PHYSICS
PH - 346 (G) : Medical Electronics
(2013 Pattern) (Paper - VI) (Semester - IV) (Elective-II) (New)

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

Instructions to the candidates:

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

Q1) Attempt all of the following(1 mark each): **[10]**

a) Define Electrode.

b) What is sensor?

c) What is the normal value of blood pressure?

d) What is systolic pressure?

e) What is calorimeter?

f) Define common mode rejection ratio.

g) What are the specification of medical instrumentation system?

h) State the frequency range of ECG and EMG.

i) What are the different bioelectric signals?

j) What are the properties of bioelectrodes?

Q2) Attempt any two of the following:

a) What is polarization? Explain polarizable and non polarizable electrodes in brief. **[5]**

b) Explain in detail phonocardiography with suitable examples. **[5]**

c) Explain spectrophotometer in detail with suitable examples. **[5]**

P.T.O.

Q3) Attempt any two of the following:

a) The intracellular K^+ concentration of a group of cells averages 160×10^{-6} moles/cm^3. The extracellular concentration of K^+ averages 6.5×10^{-6} moles/cm^3. Calculate **[5]**

i) The concentration ratio

ii) Diffusion potential for K^+

b) Describe in detail Basic Medical instrumentation system. **[5]**

c) Write a short note on piezoelectric sensor. **[5]**

Q4) A) Attempt any one of the following:

a) Draw diagram of instrumentation amplifier. Describe in detail construction and working of instrumentation amplifier. **[8]**

b) Draw diagram of Direct blood pressure measurements. Explain in detail direct blood pressure measurements with suitable examples. **[8]**

B) Attempt any one of the following

a) Explain limb electrodes of ECG. **[2]**

b) What is flame photometer. **[2]**

♦ ♦ ♦

Total No. of Questions : 4]

P597

[5215]-418
T.Y.B.Sc.
PHYSICS
PH - 346 (H) : Physics of Nanomaterials
(2013 Pattern) (Paper - VI) (Semester - IV) (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 tables and calculators is allowed.***

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

a) Define term 'nanotechnology'.

b) State the classes of nanomaterials on the basis of structural configurations.

c) What is bottom-up approach?

d) Give the names of chemical methods of preparation of nanomaterial.

e) What is gel?

f) What is Bragg's Diffraction condition?

g) Which detectors are used in spectrometers?

h) Give the hardness vs particle size graph for nanomaterial.

i) Define term 'nanocrystal'.

j) State any two applications of nanomaterials in medical field.

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

a) Write detailed note on the nanomaterials classification on the basis of their origin.

b) Write a note on UV-Visible spectroscopy.

c) Explain different types of carbon nanotubes.

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

a) Write a note on 0-D, 1-D, 2-D and 3-D nanomaterials.

b) State the difference between SEM and TEM.

c) Describe the structural properties of nanoparticles.

Q4) A) Attempt any one(eight marks):

a) Describe the sol-gel method for the preparation of nanomaterials. **[8]**

b) i) What are the advantages and disadvantages of physical vapour deposition process. **[4]**

ii) Write a note on the use of nanomaterials in defense. **[4]**

B) Attempt any one(two marks) **[2]**

a) Draw the block diagram of SEM.

b) State the uses of nanocrystalline ZnO and TiO_2.

♦ ♦ ♦

Total No. of Questions : 4]

P597

[5215]-418
T.Y.B.Sc.
PHYSICS
PH - 346 (I) : Microcontroller
(2013 Pattern) (Paper - VI) (Semester - IV) (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 tables and calculators is allowed.***

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

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

b) What is the largest hex value that can be moved into an 8-bit registers?

c) Which port in 8051 needs pull up resistors?

d) What do the mnemonic DJNZ stands for?

e) What is the function of SCON register?

f) Give any two interrupts in the 8051.

g) What is the function of 'enable' pin of LCD?

h) At what ROM location do we store the first opcode of an 8051 program?

i) Which register bank is default register bank in 8051?

j) In the 8051, what is size of the stack pointer?

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

a) Explain the difference between microprocessor and microcontroller.

b) Describe the addressing modes of 8051 with one example.

c) Describe memory structure of the 8051 microcontroller.

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

a) Write assembly language program to add first ten natural numbers.

b) Write assembly language program to convert hex number GCH to decimal.

c) How 8051 is interfaced to PC using RS 232 standard.

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

a) List the timers of 8051 and their associated registers. Explain different modes of 8051 timer.

b) Draw the internal block diagram of 8051. Explain PSW register.

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

a) If crystal frequency is 11.0592 MHz, then find the period of machine cycle of 8051.

b) Distinguish between LCALL and ACALL instruction.

♦ ♦ ♦

Total No. of Questions : 4]

P597

[5215]-418
T.Y.B.Sc.
PHYSICS
PH - 346 (J) : Electroacoustics and Entertainment Electronics
(2013 Pattern) (Paper - VI) (Semester - IV) (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 tables and calculators is allowed.***

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

a) Give place theory of hearing.

b) What is an articulation test?

c) Draw a diagram showing construction of condensor microphone. Give its equivalent circuit.

d) What is meant by Hi-fi?

e) Explain the loudness of sound.

f) What is an equalizer?

g) What is meant by dynamic range?

h) What is a folded horn?

i) What is coefficient of reflection?

j) What is a volume compressor?

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

a) Write a note on Digital Audio Tape.

b) Give strengths of medical ultrasonography.

c) Compare polar response characteristics of cardioid and bidirectional microphones.

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

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 40ºC.

b) A direct radiator dynamic loud speaker has a radiation resistance of 2 kg/s. Its voice coil is 7.5m in length and suspended in a magnetic field of 1.0 wb/m^2. Determine the acoustic power output for a current of 2A, if the mechanical impedance is 13.3 kg/s.

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

Q4) a) Attempt any one(Eight mark): **[8]**

i) Discuss the voice mechanism in humans.

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

b) Attempt any one (Two marks): **[2]**

i) Write a note on audio delay.

ii) Sketch the super-cardioid and hyper cardioid polar response of microphones

♦ ♦ ♦

Total No. of Questions : 4]

P597

[5215]-418
T.Y.B.Sc.
PHYSICS
PH - 346 (K) : Lasers
(2013 Pattern) (Paper - VI) (Semester - IV) (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(1 mark each): **[10]**

a) Define population density.

b) Who and when investigated First MASER?

c) Define metastable state in LASER.

d) What are the various techniques of pumping in LASER?

e) What is an optical feedback?

f) State the condition for critical population inversion.

g) What is beam radiance?

h) Define FWHM.

i) State any two types of gas lasers.

j) What is hologram?

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

a) What do you understand by coherence? Explain Temporal and spatial coherence?

b) What is Lineshape broadening? Explain collision broadening.

c) Explain basic three process of LASER with neat diagram.

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

a) Calculate the wavelength of beam at which rate of spontaneous emitted is equal to rate stimulated emission for the temperature of 300ºK.

b) What will be the reflectivity of first cavity mirror if the reflectance of second mirror is 97%. The length of the cavity is 15cm and gain factor of laser material is 0.0005 per cm.

c) Calculate intensity of He-Ne laser beam having emissive power 1-mw and wavelength 6328Aº and intensity of ruby laser beam having emissive power 5-mw and wavelength 6943Aº.

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

i) State various uses of LASER beam. Explain range finder applications of Laser in defense.

ii) Describe construction and working of He-Ne Laser. Also give its applications.

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

i) Draw diagram for 4-level energy optical pumping.

ii) Define gain bandwidth.

♦ ♦ ♦

Total No. of Questions : 4]

P597

[5215]-418
T.Y.B.Sc.
PHYSICS
PH - 346 (L) : Radiation Physics
(2013 Pattern) (Paper - VI) (Semester - IV) (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.***

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

a) Define one curie activity of radioactive substance.

b) Define : particle accelerator.

c) What is RBE factor?

d) What are X-rays?

e) What are gamma radiations?

f) Define 1 Gray absorbed dose.

g) State names of any two dosimeters.

h) What are cosmic radiations?

i) Give the names of any two focussing methods for electrons and ion beams.

j) Define 1 eV energy.

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

a) Discuss the medical applications of X-rays.

b) Explain absorbed radiation dose and define one rad radiation dose.

c) Discuss the interactions of electrons and ions with matter.

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

a) Calculate the absorbed dose in air for 1 Roentgen of gamma radiation. Assume that for electrons, average energy needed to create one electron-ion pair in air is 33.7eV. (Given : 1 Roentgen = 2.58×10^{-4} c/kg charge)

b) Explain the applications of radioactive isotopes in medical field.

c) Discuss the sources of Infrared and Ultra-violet radiations.

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

a) Discuss the different methods for mesurement of electrons and ion beam current and flux.

b) Discuss the different laboratory sources of Infrared, visible and ultra-violet radiations with details of energy spectrum.

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

a) Define half life and activity of radioactive substance.

b) Explain photo-electric effect for gamma radiations.

♦ ♦ ♦

Total No. of Questions :4]

SEAT No. :

P598

[Total No. of Pages : 3

[5215] - 419

T.Y.B.Sc.

CHEMISTRY

CH-341 : Physical Chemistry

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates 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) Assuming the element exists as fcc lattice and the cell length is 10.67 $\mathring{A}$, determine the distance between 100 plane.

b) Define De-Brogle wavelength.

c) $^{231}P_a$ has a half life of 3.2×10^4 years, calculate its decay constant.

d) Find Miller indices of a crystal planes which cuts the three axes at multiple unit distance $\frac{1}{2}, \frac{1}{3}$ and ∞.

e) Write the cell reaction for the following cell $Pb|PbSO_{4(s)}|H_2SO_4(2M)||CuSO_4\ (0.1M)|Cu_{(s)}$.

f) Define average life.

g) Define : EMF of a cell.

h) Define centre of symmetry.

i) If the EMF of the cell at 20°C and 30°C are 0.6973 and 0.6998 volt respectively, calculate its temperature coefficient.

j) What is plateau voltage?

P.T.O.

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

a) State and explain Heisenberg's uncertainty principle.

b) Write briefly on metal-metal insoluble salt electrode w.r.t. its

i) Construction

ii) Representation and

iii) Working

c) What is crystallography? Explain the law of constancy of interfacial angles.

B) Answer Any One of the following: **[4]**

a) The EMF of a cell

$Ag|AgCl_{(s)}|HCl_{(aq.)}|Cl_{2(g)}|Pt$ at 25°C is 1.42 volt. Find ΔH and ΔS of the cell reaction [Given : Temp. Coeffi. $\left(\frac{dE}{dT}\right)_p = 4.82\times10^{-4}$ volt k^{-1}].

b) A radio element has a half life period of 1600 years. Its atomic weight is 226. Find its mass, if its activity is 1 curie

[Given 1Curie = 3.7×10^{10} disintegration Sec^{-1}]

$N = 6.023 \times 10^{23}$

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

a) Give the principle of Laue-Method and describe the method of determination of crystal structure. What are the disadvantages of the method.

b) What are the conditions of the saturated cell? Explain the construction and working of saturated weston standard cell.

c) Derive the expression of decay constant of a radioactive substance. What are the characteristics of decay constant.

Q4) a) Determine the degeneracy of the energy state for which the total energy is **[6]**

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

Give energy level diagram.

OR

Explain electrolytic concentration cell with transference.

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

i) The crystal has first order reflections from (100), (110), and (111) planes using palladium anticathode are 5.9^o, 8.4^o and 5.2^o respectively. What type of cubic lattice of the substance has, if the wavelength is 0.71 $\mathring{A}$.

ii) Calculate the solubility product of AgBr in water at 25^oC for the following cell

$$Ag\left|AgBr_{(s)} \rightleftharpoons Ag^{+}_{(aq)} + Cl^{-}_{(aq)}\right|AgBr\left|Ag\right.$$

Given :

$$E^{o}_{Ag|Ag^{+}(oxi)} = -0.799 \text{ volt}$$

$$E^{o}_{Ag|AgBr(Red)} = 0.071 \text{ volt.}$$

Total No. of Questions : 4]

SEAT No. :

P599

[Total No. of Pages : 2

[5215]-420
T.Y.B.Sc.
CHEMISTRY
CH - 342: Inorganic Chemistry
(2013 Pattern) (Paper - II) (Semester - IV)

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

Instructions to the candidates:

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

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

a) Give general electronic configuration of lanthanides.

b) What is IUPAC name of the element having atomic number 107?

c) Define, 'metalloproteins'.

d) Which metal ion is present in Ferritin?

e) What are solid acid catalysts?

f) Which of the following metal show highest conductivity?

K, Ca, Al

g) What is intrinsic semiconductor?

h) Define, 'unit cell'.

i) Write down the formula of Wilkinson's catalyst.

j) Define, 'lattice energy'.

Q2) A) Write note on any two of the following: **[6]**

a) Misch metal.

b) Haemoglobin.

c) Non stoichiometry and semiconductivity.

P.T.O.

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

a) Complete the following reactions.

i) $_{92}U^{235} \xrightarrow{(\alpha,n)} ?$

ii) $_{92}U^{238} \xrightarrow{^{12}C,4n} ?$

b) What is Fe - S protein? Give it's functions.

c) What is the effect of temperature on conductivity of metals?

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

a) Discuss catalytic cycle for synthesis of acetic acid by monsanto process.

b) What is radius ratio? Calculate limiting radius ratio for coordination number six.

c) Why separation of lanthanide is difficult? Describe ion-exchange method for separation of lanthanide elements.

Q4) a) Explain band theory with respect to sodium metal. Draw N(E) v/s E diagrams for univalent, divalent and trivalent metals. **[6]**

OR

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

i) Give reaction path of hydrogenation of alkene to alkane by heterogeneous catalyst.

ii) Give essential properties of homogeneous catalysts.

b) Give synthesis of terephthalic acid (PTA) by heterogeneous catalysis and give its uses. **[4]**

OR

b) Calculate lattice energy of NaI from following data: **[4]**

ΔH_f (NaI) = – 289 KJ/mole

S_{Na} = + 108.8 KJ/mole

I_{Na} = + 493.8 KJ/mole

$\frac{1}{2}D(I_2) = +106.6\,KJ/mole$

E.A. (I) = – 305.9 KJ/mole

Total No. of Questions : 4]

SEAT No. :

P600

[Total No. of Pages : 4

[5215]-421

T.Y.B.Sc.

CHEMISTRY

CH-343 : Organic Chemistry

(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 structure and 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 vibration for ethane.

b) How will you prove presence of secondary alcoholic –OH group in ephedrine.

c) Express the λmax = 9150 Å unit in nm.

d) What is spectroscopy?

e) Define the term FGI.

f) What is rearrangement?

g) State 'Isoprene rule'.

h) How many sets of protons present in  ?

i) Arrange the following carbanions in increasing order of their stability.

$\overset{\ominus}{C}H_3$, $R-\overset{\ominus}{C}H_2$, $R-\overset{\ominus}{C}H-R$, $R-\overset{\ominus}{C}H-NO_2$.

j) Define chromophore.

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

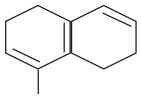
i) Write the synthesis of cyclopentane carboxylic acid starting from Diethyl malonate.

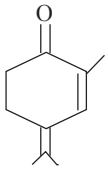
ii) Write retrosynthesis and synthesis for benzyl benzoate.

iii) Write a noteo on 'Beckmann' rearrangement.

P.T.O.

b) Calculate λmax for the following :

i) 

ii) 

OR

b) i) Write a note on Perkin reaction. **[2]**

ii) TMS is used as internal standard in NMR spectroscopy. Why? **[2]**

Q3) Attempt any two of the following :

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

ii) How will you distinguish the following pair by IR spectroscopy? **[2]**

$CH_3 - CH_2 - \underset{\underset{O}{\|}}{C} - OH$ and $CH_3 - CH_2 - \underset{\underset{O}{\|}}{C} - H$

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

ii) Give general properties of alkaloids. **[2]**

c) i) What are the applications of IR spectroscopy? **[3]**

ii) Write note on intramolecular Aldol condensation. **[2]**

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

i) M.F. – $CgH_{10}O$

IR : 1700 cm^{-1}

NMR : a) Triplet, J = 8Hz, 1.2 δ(3H)

b) Quartet, J = 8Hz, 2.5 δ(2H)

c) Singlet, 6.9 δ(5H)

ii) M.F. – C_8H_{10}

UV : 255 nm

IR : 1600, 1500, 750 cm^{-1}

NMR : a) Triplet, 1.1 δ(3H)

b) Quartet, 2.7 δ(2H)

c) Singlet, 6.5 δ(5H)

iii) M.F. – $C_3H_5ClF_2$

NMR : a) Triplet, 1.78 δ(3H)

b) Quartet, 3.63 δ(2H)

b) i) Aniline shows blue shift in acidic medium. Explain. **[2]**

ii) Write note on Wittig Reaction. **[2]**

OR

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

i) Explain synthon and target molecule.

ii) Types of coupling.

iii) What are terpenoids? Give classification of terpenoids.

TABLE – 1

Characteristic Infrared Absorptions of Functional Groups

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

TABLE – 2

Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT, DELTA, PPM (δ)
1° Alkyl, RCH_3	0.8 – 1.0
2° Alkyl, RCH_2R	1.2 – 1.4
3° Alkyl R_3CH	1.4 – 1.7
Allylic, $R_2C=C(R)-CH_3$	1.6 – 1.9
Benzylic, $ArCH_3$	2.2 – 2.5
Alkyl chloride RCH_2Cl	3.6 – 3.8
Alkyl bromide, RCH_2Br	3.4 – 3.6
Alkyl iodide, RCH_2I	3.1 – 3.3
Ether, $ROCH_2R$	3.3 – 3.9
Alcohol, $HOCH_2R$	3.3 – 4.0
Ketone, $RCCH_3$ (O)	2.1 – 2.6
Aldehyde, RCH (O)	9.5 – 9.6
Vinylic, $R_2C=CH_2$	4.6 – 5.0
Vinylic $R_2C=CH$ (R)	5.2 – 5.7
Aromatic, ArH	6.0 – 9.5
Acetylenic, $RC\equiv CH$	2.5 – 3.1
Alcohol hydroxyl, ROH	0.5 – 6.0*
Carboxylic, RCOH (O)	10 – 13*
Phenolic, ArOH	4.5 – 7.7*
Amino R– NH_2	1.0 – 5.0
Ester R–C(=O)–O–CH_2–R	4 to 4.5
R–C(=O)–CH_2–	2.4 δ
R–C(=O)–CH–	2.5 δ

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

TABLE – 3

U.V. Absorption rules for diene chromosphores

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

U.V. Absorption rules for Enone System

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

Total No. of Questions : 4]

SEAT No. : ____

P601

[Total No. of Pages : 2

[5215]-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 table and calculator is allowed.***

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

a) State Nernst distribution law.

b) Define isoelectric point.

c) What do you mean by term retention time?

d) Name stationary and mobile phase used in paper chromatography.

e) Name the detectors used in GC.

f) Why is carbon dioxide is preferred: as mobile phase in SFC?

g) Define electrophoresis.

h) Define the term 'migration velocity' in electrophoresis.

i) Give the principle of Nephelometry.

j) Give the equation for turbimetric coefficient.

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

i) Explain the method of purification of water with ion-exchange resins.

ii) Write a note on detectors used in HPLC.

iii) Mention the components of Gas chromatography.

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

i) What are the advantages of HPLC.

ii) Calculate the distribution ration when a concentration of solute in organic layer is 0.52M and in aqueous layer is 0.062M.

iii) Calculate the turbidance of sulphate ion at 355nm gave a transmittance of 0.7568.

P.T.O.

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

a) Derive the relation between distribution coefficient and distribution ratio.

b) Give the principle of gas chromatography. Sketch schematic diagrame of GC.

c) Explain the SFC. How it is superior than HPLC.

Q4) a) Write a note on Match-Box. Model. **[6]**

OR

i) What do you understand by zone electrophoresis. **[3]**

ii) Mention any two applications of turbidimetry. **[3]**

b) Two grams of solute is dissolved in 100ml of aqueous solution. Calculate the amount of solute remaining in aqueous phase after four successive extraction with 20ml of an organic solvent. The distribution ratio for extraction is '5'. **[4]**

OR

Calculate R_f values of a compound 'X' which migrates 3.4cm from base line and the solvent front migrates 25.4cm. Also calculate the distance from base line if solvent front migrates 29.2cm instead of 25.4cm. **[4]**

Total No. of Questions : 4]

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P602

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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 diagrams and flowsheet wherever necessary.***

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

a) Write the structure of indigo.

b) Define the term Massecuite.

c) What is whisky?

d) Define the term thermoplastics.

e) What are antibiotics?

f) What are anionic surfactant.

g) Define the term preservatives.

h) What are paints?

i) Define the term degree of polymerization.

j) Explain the term recycling.

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

a) What are advantages and disadvantages of detergents?

b) Give the preparation of teflon.

c) Write note on multiple effect evaporation.

P.T.O.

B) Answer Any Two of the following: **[4]**

a) What are auxochromes? Explain with one example.

b) What are antagonist drugs? Explain.

c) Write note on biological treatment for industrial waste.

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

a) What are paints? Give classification of paints.

b) Discuss the manufacture, properties and uses of rubber.

c) Give the synthesis and uses of sulphanil amide.

Q4) a) Discuss the manufacturing of ethyl alcohol from molasses with special reference to Coffey's still. **[6]**

OR

a) What are soaps? Discuss in brief the raw material required for manufacture of soap. **[6]**

b) Give synthesis and application of chrysoidin azo dye. **[4]**

OR

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

i) Organic process waste

ii) Free radical polymerization

Total No. of Questions :4]

SEAT No. :

P603

[Total No. of Pages : 3

[5215] - 424

T.Y.B.Sc.

CHEMISTRY

CH-346(A) : Nuclear Chemistry

(2013 Pattern) (Paper - VI) (Semester - IV) (Elective - II) (613A4)

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 logtables and calculator is allowed.***

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

a) State Fermi's experiment on the discovery of Nuclear fission.

b) Which are the moderators used in Nuclear reactors?

c) State the principle of Vande Graft accelerator.

d) State the principle of Neutron detector.

e) Which radioisotope is used to determine age of wooden sample?

f) The theory of Nuclear fission is based on

i) Shell model

ii) Thompson model

iii) Liquid-drop model

iv) Fermi model

g) What is the importance of Reproduction factor K in nuclear reactor?

h) Give one example of Radiometric titration with suitable indicators.

i) State different types of Scintillators.

j) Which are the two safety precautions taken while handling Redioactive substance?

P.T.O.

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

i) Write short notes on fission energy.

ii) Explain the principle and working of Breeder reactor.

iii) State the principle and two applications of Isotope dilution analysis method.

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

i) Write a short note on thyroidisis (goitre).

ii) What are the biological effects of radiations.

iii) Explain India's nuclear energy programme.

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

a) Explain the principle and working of cyclotron with a neat diagram.

b) Discuss the four factor formula.

c) What are semiconductors? Explain the principle and working of semiconductor detector.

Q4) a) Explain the process of nuclear fission, mass and charge distribution for the fission of Uranium - 235. **[6]**

OR

Describe the method of preparation of the following radioisotopes. **[6]**

i) Hydrogen - 3

ii) Carbon - 14

iii) Sodium - 22

b) Write short notes on Cow and Milk System. **[4]**

OR

Compute the energy released in the following fission. **[4]**

$^{249}_{99}Es + n \rightarrow {}^{161}_{64}Gd + {}^{87}_{35}Br + 2n$

Given : atomic mass of

$^{249}Es = 249.076$ amu

n = 1.0087 amu

^{161}Gd = 160.928 amu

^{87}Br = 86.022 amu.

Total No. of Questions :4]

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P604

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T.Y.B.Sc.

CHEMISTRY

CH-346(B) : Polymer Chemistry

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

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

Instructions to the candidates:

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

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

a) Define the term : thermoplastic.

b) What is meant by alternating co-polymer?

c) Polyethylene is insoluble in water? Explain.

d) Define the meaning of the term : Dyeing of fibre.

e) Draw the geometrical structure of helical chain polymer.

f) Write the important IR peaks of polyvinyl alcohol.

g) 'Polyvinyl chloride is degradable polymer'. State whether the statement is true or false.

h) Explain : 'Polycarbazole has high glass transition temperature'. (gtt).

i) Give the important applications of nylon polymer.

j) What is Vulcanization?

P.T.O.

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

i) Write a note on : Mechanical degradation of polymers.

ii) Discuss the effect of molecular weight on glass transition temperature (gtt).

iii) Tg of poly-α-methylstyrene is 170°C while polybutadiene is - 102°C. Explain.

b) Answer the following (<u>any two</u>) **[4]**

i) How will you distinguish homochain and heterochain polymers?

ii) Explain the electrical properties of polymers.

iii) Write a brief note on : Crystallizability.

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

a) Give the detailed account of biomedical polymers.

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

i) Polycarbonate

ii) Phenol formaldehyde resin

c) Discuss in detail the Thermo Gravimetric Analysis (TGA) method for testing and analysis of polymeric materials.

Q4) a) Attempt <u>any two</u> of the following: **[6]**

i) Describe the extrusion technique in polymer technology in detail.

ii) Write a note on : Compounding process.

iii) Give an account of foaming technique.

b) What is meant by fibre spinning? Describe the melt spinning process in detail. **[4]**

Total No. of Questions :4]

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P605

[Total No. of Pages : 2

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T.Y.B.Sc.

CHEMISTRY

CH-346(C) : Introduction to Biochemistry and Molecular Biology

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

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

Instructions to the candidates:

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

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

a) Define reverse transcription.

b) What is the significance of Urea Cycle?

c) Draw the structure of a nucleotide.

d) Give two examples of Restriction Endonucleases.

e) How many ATPs are gained when Glucose breaks to Lactate.

f) What is the terminal electron acceptor in mitochondrial ETC?

g) What are termination codons?

h) Give the role of Carnitine in β-oxidation of fatty acids.

i) Name two inhibitors of Transcription.

j) Define Anabolism.

P.T.O.

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

i) Write note on transamination reactions.

ii) What are cosmids? Give their significance.

iii) How is proton gradient formed across mitochondrial membrane?

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

i) Show the fate of pyruvate in anaerobic conditions & aerobic condition.

ii) What are high energy compounds? Give examples.

iii) Write note on tRNA.

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

a) Explain Watson and Crick model of DNA.

b) Discuss the interpretations of Hershey and Chase experiment.

c) Describe steps involved in Urea cycle.

Q4) Answer the following:

a) Elaborate on steps involved in TCA cycle with energetics. **[6]**

OR

Describe the steps involved in Transcription process.

b) Write note on Genetic Code. **[4]**

OR

Write the steps of Ketogenesis.

Total No. of Questions :4]

SEAT No. :

P606

[Total No. of Pages : 2

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T.Y.B.Sc.

CHEMISTRY

CH-346(D) : Environmental and Green Chemistry

(2013 Pattern) (Elective - 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) ***Neat diagrams must be drawn wherever necessary.***

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

a) What is sludge-digestion.

b) Define Incineration.

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

d) What do you meant by fuel cell.

e) Why global warming occurs.

f) Define hydrogen bonding with an example.

g) Define the term hypolimnion.

h) How much energy is stored by C = 0.

i) Explain mobile phase in Gas Chromatography.

j) Define the term self purification.

P.T.O.

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

i) Explain direct and indirect solar energy.

ii) Explain chemical processes in water.

iii) With help of suitable example, explain working of ion selective Electrode (ISE).

b) Write short note on any two **[4]**

i) Domestic sewage water treatment.

ii) Composting and vermicomposting.

iii) Relative contribution of green house gases.

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

a) Explain in detail tertiary or biological-waste treatment.

b) Explain in detail High Performance liquid chromatography.

c) Explain colloidal particles in water.

Q4) a) Explain Green Engineering and Energy - Conversion efficiency. **[6]**

OR

Explain composition of Lithosphere and Soil.

b) Write notes on any one **[4]**

a) Sources and Sinks of CO_2.

b) Natural water contain alkalinity and Calcium.

Total No. of Questions :4]

SEAT No. :

P607

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T.Y.B.Sc.

CHEMISTRY

CH-346(E) : Dairy Chemistry

(2013 Pattern) (Paper - VI) (Elective - 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) ***Neat diagrams must be drawn wherever necessary.***

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

a) What is paraffining of milk?

b) Define 'vitaminised milk'.

c) Give uses of fats in milk.

d) What is meant by clarification of milk?

e) How will you detect the presence of hydrogen peroxide in milk?

f) Define pathogens in milk.

g) What is whey powder?

h) Define churning of milk.

i) Give nutritive value of cheese powder.

j) Give uses of shrikand.

P.T.O.

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

i) What are advantages and disadvantages of homogenised milk?

ii) State the products of microbial growth in milk sample.

iii) Compare glass bottling and paper packaging.

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

i) Comment on 'minerals in milk'.

ii) Draw flowsheet diagram of manufacture of chocolate milk.

iii) Give the importance of vitamins in the milk.

Q3) a) Define cream powder. Give flowsheet diagram for manufacture of cream powder. **[5]**

OR

Comment on 'minor constituents in the milk'.

b) Give importance of proteins. **[5]**

OR

Define cheese. Give flowsheet diagram of manufacture of cheese. Give its food and nutritive value and uses.

Q4) a) Attempt any two: **[6]**

i) Give the uses of lactose in the milk.

ii) Define shrikand powder. Give its flowsheet diagram.

iii) Give advantages of preservation of milk.

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

i) Write properties and uses of Riboflavin.

ii) How adulterants are detected in milk?

iii) Give objectives of standardisation of milk.

Total No. of Questions : 4]

SEAT No. :

P608

[Total No. of Pages : 1

[5215]-429
T.Y. B.Sc.
BOTANY
BO - 341 :Plant Physiology and Biochemistry
(2013 - Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

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

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

a) What are C_3 Plants?
b) Write the total number of ATP molecules produced in Respiration.
c) What is meant by salinity stress?
d) Give any two properties of amino acids.
e) What are Oligosaccharides?
f) Define metabolic pool.
g) What is source and sink?
h) Define glycolysis.
i) Write any two significance of photosynthesis.
j) What are enzymes?

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

a) Write the mechanism of Electron Transport System [ETS] in Respiration.
b) Describe pressure flow theory of organic solutes.
c) Give the Classification of Proteins on the basis of structure.

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

a) Shikimic acid Pathway.
b) Lock and key hypothesis of enzyme action.
c) Effect of stresses on plant growth.

Q4) What are Lipids? Describe mechanism of β-oxidation of fatty acids. **[10]**

OR

Explain C4 Pathway, add a note on it's Significances.

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Total No. of Questions : 4]

SEAT No. :

P609

[Total No. of Pages : 2

[5215]-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 labelled diagram wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) Define soil pollution.

b) Give any one cause of Global warming.

c) Write any two scope of Biodiversity.

d) What is economics?

e) Define Remote sensing.

f) What is environmental Impact Assessment?

g) Define Endemism.

h) Mention the factors causing loss of Genetic diversity.

i) What is biodiversity Inventorying?

j) What are sacred Groves?

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

a) Explain the basic data collection for EIA.

b) Give in detail about environmental audit processing.

c) Discuss the approaches of monitoring biodiversity.

P.T.O.

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

a) Desertification.

b) Endemism.

c) Founder effects.

Q4) Explain the role of Universities and other educational institutions in Biodiversity conservation. **[10]**

OR

Give brief account of interrelationship between the living world and environment. Add a note on Homeostasis. **[10]**

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Total No. of Questions :4]

SEAT No. :

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T.Y.B.Sc.

BOTANY

BO-343: Plant Pathology

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

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

a) Define etiology.

b) What is pathogen?

c) Define endophyte.

d) Who is known as father of modern plant pathology?

e) Give the names of any two non parasitic plant diseases.

f) Give any two control measures for nematodal plant diseases.

g) What is antibody?

h) Define biological control

i) Give any two symptoms of grassy shoot of sugarcane.

j) Give any one importance of plant disease in medicine.

P.T.O.

Q2) Attempt AnyTwo of the following: **[10]**

a) Describe expression of vaccines in plants.

b) Explain any one method of disease measurement.

c) Describe cultural control measures.

Q3) Write notes on Any Two of the following: **[10]**

a) Black arm of cotton.

b) Disease forecasting.

c) Pure culture methods.

Q4) a) What is defence mechanism? Describe induced structural and biochemical defence mechanism. **[10]**

OR

b) Give an account of downy mildew of grapes and TMV disease with reference to causal organism, symptoms and control measures. **[10]**

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Total No. of Questions :4]

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T.Y.B.Sc.

BOTANY - IV

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) Define Ethnobotany.

b) What is Leha.

c) Define Tibi system of medicine.

d) Define maceration technique.

e) Define economic botany.

f) Define pharmacodynamics.

g) Give any two uses of safflower.

h) What is Tridosha.

i) Define crude drug.

j) Give place of origin of Rice.

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

a) Give method of preparation of churna.

b) Give biological system of classification of drugs.

c) Describe microscopic evaluation of drug.

P.T.O.

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

a) Non Wood Forest Products (NWFPs) with reference to paper making.

b) Origin, Evolution and uses of curcuma longa.

c) Factors affecting cultivation of herbal drug.

Q4) Give concept of active principle and metabolic pathway of carbohydrates. **[10]**

OR

Give occurrence, distribution cultivation, microscopic characters constituents and uses of Glycyrrhiza.

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Total No. of Questions : 4]

SEAT No. :

P612

[Total No. of Pages : 2

[5215]-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 diagram whatever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) What do you know by Plant Biotechnology?

b) What are Nif gene?

c) What is Bioin formatics?

d) What are edible vaccines?

e) What is germplasin conservation?

f) Name any two phosphate solubulizing bacteria (PSB).

g) Enlist any two data retrieval tools.

h) What is OMIM?

i) What are Proteomics?

j) Give any two examples of recombinant therapeutic products.

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

a) Write the Applications of Biotechnology in Agriculture.

b) Explain the bioplastics.

c) Discuss the in vitro germplasm conservation.

P.T.O.

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

a) Molecular farming from transgenic plants.

b) ENTREZ.

c) Genomics.

Q4) Describe in detail of symbiotic N_2 fixation.

OR

What is embryo culture? Describe any one method of embryo culture. **[10]**

Total No. of Questions :4]

SEAT No. :

P613

[Total No. of Pages : 2

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T.Y.B.Sc.

BOTANY

BO-346 : Plant Breeding and Seed Technology

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

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

Instructions to the candidates:

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

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

a) Give any two importance of plant breeding.

b) What is biotic stress in plant?

c) Define mutation breeding.

d) Enlist any two names of physical mutagens.

e) What is drought tolerance?

f) Define seed.

g) What is seed certification?

h) Define seed germination testing.

i) What is physical purity analysis?

j) What is seed processing?

P.T.O.

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

a) Give causes of Heterosis.

b) Describe the methods of obtaining polyploids.

c) Give role of seed technology.

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

a) Gamma garden.

b) Moisture testing by air oven method.

c) Organization of seed marketing.

Q4) What is Hybridization? Describe general procedure of hybridization. **[10]**

OR

What is seed sampling? Describe types of seed samples.

Total No. of Questions :4]

SEAT No. :

P614

[Total No. of Pages :2

[5215] - 435
T.Y.B.Sc.
ZOOLOGY
ZY-341 : Biological Techniques
(2013 Pattern) (Paper - I) (Semester - IV)

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

Instructions to the candidates:

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

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

a) Define Osmolality.

b) Define impregnation.

c) What is bone marrow?

d) Define microtome.

e) Name any two dehydrating agent.

f) State Beer's law.

g) What is basic stain?

h) Define histochemistry.

i) What is biological technique?

j) Give two uses of colorimeter.

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

a) Differentiate between compound microscope and electron microscope.

b) Discuss the process of clearing or dealcoholisation.

c) Give the classification of stains.

P.T.O.

Q3) Write notes on Any Two of the following: **[10]**

a) Micrometry.

b) PAS (Periodic acid Schift) Technique.

c) Rotatory Microtome.

Q4) What is chromatography? Describe the ion exchange. Chromatography with its principle, technique and application. **[10]**

OR

What are fixatives? Give its classifications and importance.

Total No. of Questions : 4]

SEAT No. : ____

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T.Y.B.Sc.

ZOOLOGY

ZY-342 Mammalian Physiology & Endocrinology

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

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

Instructions to the candidates:

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

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

a) What is angiography?

b) What is oxyhaemoglobin?

c) Define renal calculi

d) What is rigor mortis?

e) Define impulse.

f) State the reason for gigantism.

g) State the role of liver in physiology of digestion.

h) Define diastole.

i) What is pulmonary respiration?

j) What is tubular secretion?

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

a) Describe the counter current multiplier of urine concentration.

b) What is simple muscle twitch?

c) Describe the characteristics of an individual with acromegaly.

P.T.O.

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

a) Chloride shift

b) Cardiac output

c) BMR

Q4) Describe in detail hormonal control of uterus during pregnancy. **[10]**

OR

What is digestion? Describe in detail physiology of digestion. **[10]**

Total No. of Questions :4]

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P616

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T.Y.B.Sc.

ZOOLOGY

ZY -343: Genetics and Molecular Biology

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

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

Instructions to the candidates:

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

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

a) What is recombination?

b) Define deletion.

c) Define gene frequency.

d) What is meant by chance mating?

e) Elaborate TMV.

f) Define heterochromatin.

g) Define DNA replication.

h) What are thermal cyclers in PCR?

i) What are VNTRs?

j) Define primer.

P.T.O.

Q2) Attempt any Two of the following **[10]**

a) Describe the regulation of Trp operon.

b) Give an account of cloning vectors.

c) Give the significance of gene pool in Mendelian population.

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

a) Mechanism of crossing over.

b) Hardy Weinberg principle.

c) Euchromatin

Q4) What are mutagenic agents? Describe the role of mutagenic agents inmutations. **[10]**

OR

Define transcription. Explain in detail the mechanism of transcription in eukaryotes. **[10]**

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Total No. of Questions :4]

SEAT No. :

P617

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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 wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) What are mitochondria?

b) Give any one biochemical evidance of organic evolution.

c) What is Palaeontology?

d) Who propossed mutation theory?

e) State any one factor affecting distribution.

f) Which era was the golden age of Reptiles?

g) Give two characters of Homo erectus.

h) Define post zygotic isolating mechanism.

i) State any one function of RNA in origin of life.

j) Define coacervate.

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

a) Explain mutation theory of organic evolution.

b) Describe any two zoogeographical realms with reference to fauna.

c) Describe isolating mechanisms.

P.T.O.

Q3) Write short notes on Any Two of the following: **[10]**

a) Kenyapithecus.

b) Geological time scale.

c) Origin of eukayotic cell.

Q4) What is organic evolution? Explain anatomical and embryological evidences supporting it. **[10]**

OR

What is organic evolution? Explain in detail Lamarck's theory of organic evolution.

ℰℰℰ

Total No. of Questions : 4]

SEAT No. :

P618

[Total No. of Pages : 2

[5215]-439

T.Y.B.Sc.

ZOOLOGY

ZY-345 : General Embryology

(2013 Pattern) (New Course) (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) What is embryo?

b) Define dedifferentiation.

c) Define isolecithal egg.

d) What is gastrulation?

e) What is polyspermy?

f) Define bilateral cleavage.

g) What is Hensen's node?

h) Define secondary egg membranes.

i) What is vitellogenesis?

j) What are gynogamones?

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

a) Describe meroblastic cleavage with suitable example.

b) Describe allantois.

c) Explain epigenesis theory of embryonic development.

P.T.O.

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

a) Amphimixis.

b) Discoblastula.

c) Organizer.

Q4) What is gametogenesis? Describe in detail the process of spermatogenesis. **[10]**

OR

Describe the development of heart of chick up to 48 hours of incubation.

Total No. of Questions : 4]

SEAT No. : [ ]

P619

[Total No. of Pages : 4

[5215]-440
T.Y.B.Sc.
ZOOLOGY
ZY - 346 (a) : Public Health and Hygiene (New Course)
(2013 Pattern) (Paper - VI) (Elective - 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 health.

b) Name the disease caused due to Vit-A deficiency.

c) Name any two natural means of ventilation.

d) What is refuse?

e) Mention any two communicable diseases.

f) Give two symptoms of coronary heart disease.

g) Define soil.

h) What is epidemiology?

i) State the mode of transmission of fuberculosis.

j) Give any two methods of food preservation.

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

a) What is who? Give an account of its programmes.

b) What is demographic Biostatistics?

c) Describe the process of water purification on small scale.

P.T.O.

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

a) Causes of accidents in industries.

b) Natural sources of radiation.

c) Animal sources of food.

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

OR

What is sewage? Describe in detail the process of sewage disposal. **[10]**

x x x

Total No. of Questions : 4]

P619

[5215]-440
T.Y.B.Sc.
ZOOLOGY
ZY - 346 (b) : Medical Entomology
(2013 Pattern) (Paper - VI) (Semester - IV) (New Course)

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 medical entomology.

b) Give any two examples of social insects.

c) Write any two methods on the control of carpet beetles.

d) Write any two diseases spread by mite.

e) State the order of louse.

f) Write the names of any two veterinary pests.

g) Write the names of any two mouth parts in insects.

h) Give any two control methods of Flea.

i) State the modification in the wing of house fly.

j) What is pterygota insect?

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

a) Describe the effects of tick on hosts.

b) Give an account of blood sucking flies of veterinary importance.

c) Describe social organisation in wasps.

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

a) Veterinary entomology.

b) Morphology of insect.

c) Intraspecific relationship.

Q4) Describe life cycle of cockroach in brief and add a note on its distribution, damage and control measures. **[10]**

OR

Describe life cycle of Head louse, Add a note on the disease caused by it and its control measures. **[10]**

x x x

Total No. of Questions :4]

SEAT No. :

P620

[Total No. of Pages :2

[5215] - 441

T.Y.B.Sc.

GEOLOGY

GL-341 : Metamorphic Petrology

(2013 Pattern) (New) (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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***

Q1) Answer the following in 2/3 lines. **[10]**

a) What is cataclastic metamorphism?

b) Define metamorphism.

c) What are stress minerals?

d) What are slaty cleavages?

e) What is mosaic structure?

f) What is porphyroblastic structure?

g) Define regional metamorphism.

h) What is lineation?

i) What is plutonic metamorphism?

j) Enlist different types of metasomatism.

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

a) Schistosity.

b) Types of thermal metamorphism.

c) Stress and solubility of minerals.

P.T.O.

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

a) AFM phase diagrams of metamorphic rocks.

b) Domain of metamorphism.

c) Lime metasomatism.

Q4) Describe the effects of regional metamorphism on calcareous sediments.**[10]**

OR

Describe the concept of metamorphic facies. Give the diagrammatic representation of pressure temperature conditions (with depth) of different metamorphic facies.

Total No. of Questions : 4]

SEAT No. : ____

P621

[Total No. of Pages : 2

[5215]-442

T.Y.B.Sc.

GEOLOGY

GL-342: Environmental Geology

(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 labelled diagrams wherever necessary.***

Q1) Define/ Answer the following in 2/3 lines. **[10]**

a) Mine restoration.

b) Biogeochemical cycle.

c) Erosion.

d) Tsunami.

e) Environmental Geology.

f) Renewable resources.

g) Cause of Minamata disease.

h) Soil conservation.

i) Physical Environment.

j) Basic lava.

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

a) Solid waste disposal.

b) Types of mass movements.

c) Causes of desertification.

P.T.O.

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

a) Describe the causes and mitigation of flood.

b) Explain the types of volcanic hazards.

c) Explain mitigation measures for an earthquake.

Q4) Explain the importance of conservation and development of energy resources. Add a note on solar and bio-gas energy resources. **[10]**

OR

Define soil. Describe the causes and effects of soil pollution. **[10]**

Total No. of Questions :4]

SEAT No. :

P622

[Total No. of Pages :2

[5215] - 443
T.Y.B.Sc.
GEOLOGY
GL -343: Economic Geology
(2013 pattern) (Semester - IV) (Paper - III)

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

Instructions to the candidates:

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

Q1) Define / Answer in 2/3 lines **[10]**

a) Economic Geology.

b) Primary minerals.

c) State the ore minerals of iron

d) Hypothermal deposits

e) Coal bed methane (CBM)

f) Fly ash.

g) Name two minerals that form bronze alloy.

h) Name two coal fields of Maharashtra

i) What is the other name of Ruby silver or dark red silver

j) Where is the first oil field in India located ?

P.T.O.

Q2) Answer in short (any two) **[10]**

a) What do you mean by residual liquid segregation?

b) Explain the factors influencing sulphide enrichment

c) Describe the surface indicators of oil?

Q3) Answer in short (any two) **[10]**

a) Give the uses of gold

b) Describe the oil traps

c) Describe mineral deposits from groundwater.

Q4) a) Give the mineralogy, geological & geographical distribution and uses of Uranium and thorium mineral deposits. **[10]**

OR

b) Explain the process of coatification in detail **[10]**

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Total No. of Questions :4]

SEAT No. :

P623

[Total No. of Pages :2

[5215] - 444
T.Y.B.Sc.
GEOLOGY
GL-344: Geotectonics (Paper - IV)
(2013 Pattern) (New) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer the following in 2/3 lines: **[10]**

a) Define back arc basins.

b) Define TRm.

c) What is Asthenosphere?

d) What is meant by polar wandering?

e) Define the term Geodyanamo.

f) Give the names of important classes of meteorites.

g) Define plate boundary.

h) Give the characterstic properties of S-wave.

i) Define the term magnetic anamolies.

j) Name the unconformity present between mantle and core.

P.T.O.

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

a) Explain the term Neotectonics.

b) Explain the origin of meteorites.

c) Explain the Wilson's cycle.

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

a) Formation of the solar system.

b) The concept of mechanics of sea floor spreading.

c) Differenciate Transform & Transcurrent faults.

Q4) What is plate tectonic theory. Give the deficiencies of the plate tectonic theory. **[10]**

OR

Give a brief overview of the tectonic evolution of India. **[10]**

EEE

Total No. of Questions : 4]

SEAT No. :

P624

[Total No. of Pages : 2

[5215]-445
T.Y. B.Sc.
GEOLOGY
GL - 345 :Phanerozoic Stratigraphy of India and Palaeontology
(2013 - Pattern) (Semester - IV) (Paper - V) (New Course)

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

Instructions to the candidates:

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

Q1) Answer the following in 2/3 lines. **[10]**

a) Which Period / System is known as 'Age of Fish'?

b) Name the oldest palaeozoic orogeny.

c) Give three divisions into which Triassic Period/System is classified.

d) Explain the term 'Barren Measures'.

e) Give age of Deccan Traps / Deccan Volcanic province.

f) Which mass extinction is known as 'Great Dyeing'?

g) Give lithology of 'Karewas of Kashmir'.

h) Name the marine intercalations found in Gondwana Sequence.

i) Give the lithostratigraphic subdivisions of Tertiary of Assam.

j) Give classification of Graptolites.

Q2) Write notes on (Any Two). **[10]**

a) Geographic distribution and economic importance of Gondwana Sequence.

b) Mesozoic Era.

c) Geographical distribution and Petrological characters of Deccan Traps/ Deccan volcanic Province.

P.T.O.

Q3) Write notes on (Any two). **[10]**

a) Stratigraphy of Maharashtra.

b) Classification, Characteristics and distribution of Ptyllophylum.

c) Causes of mass extinction.

Q4) Give geographic distribution, stratigraphic succession, lithology and life during Siwaliks. **[10]**

OR

Give geographic distribution, stratigraphic succession, lithology and life during Jurassic of Kachchh.

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Total No. of Questions : 4]

SEAT No. : ____

P625

[Total No. of Pages : 2

[5215]-446
T.Y.B.Sc.
GEOLOGY
GL - 346 : Applied Geology - II
(Engineering Geology, Geohydrology & Prospecting)
(2013 Pattern) (Paper - VI) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in two/three lines:- **[10]**

a) Name any two opencast mines in India.

b) Define the term prospecting.

c) Give uses of rock aggregates.

d) Name any two important tunnels in India.

e) What are geophones?

f) Give Darcy's Law.

g) What is rainwater harvesting?

h) What is juvenile water?

i) Define engineering geology.

j) Define aquifuge.

Q2) Answer the following: (Any 2) **[10]**

a) Write note on hydrological cycle.

b) Explain vertical distribution of groundwater.

c) Write about geological criteria in prospecting.

P.T.O.

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

a) Write a note on gravity dam.

b) Describe any two engineering properties of rocks.

c) Describe confined aquifer.

Q4) What is a tunnel? Describe geotechnical investigations for selecting site for a tunnel. Write a note on tunnelling in faulted area & crushed zones. **[10]**

OR

Explain seismic prospecting with reference to its principle, instruments used & methodology. **[10]**

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Total No. of Questions :4]

SEAT No. :

P626

[Total No. of Pages :3

[5215] - 447

T.Y.B.Sc.

STATISTICS (Principal)

ST-341: Actuarial Statistics

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

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

Instructions to the candidates:

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

Q1) Attempt each of the following :

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

a) Discount function V and instantaneous rate of interest δ is related as :

i) $V = -\log\delta$ ii) $V = \log\delta$

iii) $V = e^{-\delta}$ iv) $V = e^{\delta}$

b) If s(x) is survival function of X then s(0) is

i) 0 ii) ∞

iii) 1 iv) $\frac{1}{2}$

c) The force of mortality μ_x, is defined as the derivative w.r.t. x of

i) log S(x) ii) –log S(x)

iii) log F(x) iv) –log F(x)

P.T.O.

d) The relationship between T_x and L_x is

i) $T_x = L_x + L_{x+1}$ ii) $T_x = L_x - L_{x+1}$

iii) $T_x = L_x - T_{x+1}$ iv) $T_x = L_x + T_{x+1}$

B) State whether each of the following statements is true or false : **[1 each]**

a) Insurance work on the principle of sharing losses and pooling risk.

b) If $F(x) = 0$, for $x < 0$

$= 1 - \frac{1}{x+1}$, for $x \geq 0$

then $x^{P_0} = \frac{1}{x+1}$

C) Explain each of the following concepts : **[1 each]**

a) Loss function

b) Effective rate of discount

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

a) A_x

b) $\ddot{a}_{x:\overline{n}|}$

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

a) Define curtate future lifetime r.v. K(x) and find its probability mass function (p.m.f.)

b) Mortality rates (q_x) for a certain population of insects are as follows :

Age in years (x)	0	1	2	3	4	5	6
q_x	0.1	0.2	0.3	0.5	0.6	0.8	1

construct the columns of life table l_x, L_x and T_x for a cohort of 1,00,000.

c) Explain the concept of utility function U(w). If G is onetime premium and X is loss at issue r.v. with $E(x) = \mu$, then prove that $G \geq \mu$.

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

a) State any two properties of survival function s(x). Derive the expression for s(x) in terms of constant force of mortality.

b) A loan of Rs.50,000 is taken and it has to be repaid in 5 equal installments payable yearly at the begining of the year. Based on 6% annual effective rate of interest. Determine the amount of installments.

c) i) Obtain accumulated value of Rs.40,000 at the end of seventh year with effective rate of interest 6%.

ii) With effective rate of interest 12% per annum, obtain present value of Rs.20,000 due at the end of 4^{th} year.

Q4) Attempt any one of the following :

a) i) Explain the term 'annuity' with an illustration. Also explain

1) annuity certain due.

2) annuity certain immediate. **[5]**

ii) It is known that $q_{28} = 0.135$, $q_{29} = 0.146$, $q_{30} = 0.159$, $q_{31} = 0.173$, $q_{32} = 0.188$ and $i = 0.05$.

Obtain the annual premium paid as a 5 year temporary discrete annuity due for benefit of Rs.1000, payable at the end of year of death in a 5 year term insurance issued to (28). **[5]**

b) i) In annuity certain payments are made regularly at the begining of the year then show that

$$\ddot{S}_{\overline{n}|} = (1+i)^n \,.\, \ddot{a}_{x:\overline{n}|}$$ **[5]**

ii) Explain , with an illustration, each of the following :

1) n year term insurance

2) whole life insurance

State and explain the expression for net single premium in terms of V for each of the above insurance schemes. **[5]**

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Total No. of Questions :4]

SEAT No. :

P627

[Total No. of Pages :3

[5215] - 448

T.Y.B.Sc.

STATISTICS (Principal)

ST-342: Testing of Hypotheses

(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) ***Use of scientific calculator and statistical tables is allowed.***
4) ***Symbols and abbrevations have their usual meaning.***

Q1) Attempt each of the following:

A) In each of the following cases, choose the correct alternative: **[1 each]**

a) Which of the following is not a composite alternative hypothesis?

i) $H_1 : \mu = \mu_0$ ii) $H_1 : \mu > \mu_0$

iii) $H_1 : \mu < \mu_0$ iv) $H_1 : \mu \neq \mu_0$

b) Whcih of the following tests is not a non-parametric test?

i) Sign test ii) Run test

iii) Man-Whitney test iv) S P R T

c) To decide about acceptance of H_0, SPRT involves.

i) one region only ii) two regions only

iii) three regions iv) four regions

d) Size of a test is

i) probability of type I error

ii) probability of type II error

iii) value of test statistic

iv) number of observations

P.T.O.

B) State whether each of the following statements is true or false: **[1 each]**

a) The likelihood ratio test is used for testing composite null against composite alternative hypothesis.

b) Non parametric methods are based an no distributional assumptions.

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

a) Power of a test.

b) Critical region.

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

a) Distribution free statistic.

b) Observed level of significance (p -value)

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

a) It is required to test the null hypothesis $\theta = \frac{1}{2}$ against the alternative hypothesis $\theta = 3$ for the exponential distribution

$$f(x,\theta) = \theta e^{-\theta x},\ 0 \le x < \infty, \theta > 0$$
$$= 0 \quad ,\ \text{Otherwise}$$

Using a single observation X find the best critical region and its power if the level of significance is 0.05.

b) Explain run test for a two sample problem.

c) Construct SPRT of strength (α,β) for testing $H_1 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 (\theta_1 > \theta_0)$ for Bernoulli distribution.

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

a) Construct likelihood ratio test of level of significance α for testing $H_0 : p = p_0$ against $H_1 : p \neq p_0$ based on a sample of size one from B(n, p).

b) Steel rods produced by a certain company have a median length of 10 meters when the process is operating properly. A sample of 10 rods, randomly selected from the production line, yields the following observed lengths:

9.83, 10.09, 9.72, 9.87, 10.04, 9.95, 9.82, 9.73, 9.79, 9.90.

Test whether the process is operating properly using Wilcoxn's signed rank test.

Use $\alpha = 0.05$.

c) Let X be a r.v. with p.m.f. under H_0 and H_1 as given below:

X	0	1	2	3	4	5
p.m.f. under H_0	0.02	0.03	0.05	0.05	0.35	0.50
p.m.f. under H_1	0.04	0.05	0.08	0.12	0.41	0.30

Find critical regions of size 0.05. Also state which one is best? Why?

Q4) Attempt <u>any</u> <u>one</u> of the following:

a) i) Let $X_1, X_2, ..., X_n$ be a random sample from $N(\mu, \sigma^2)$. Construct an UMP test of level α for testing $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 > \sigma_0^2$ where mean μ is known. **[5]**

ii) Define empirical distribution funciton $S_n(X)$. State any three properties of $S_n(X)$ as an estimator of $F_x(.)$. **[5]**

b) i) Construct SPRT of strength (α=0.01, β= 0.01) for testing $H_0 : \sigma^2 = 1$ against $H_1 : \sigma^2 = \frac{1}{2}$ for $N(\mu_0, \sigma^2)$. **[5]**

ii) Following is a sample drawn from the continuous population in the order in which the observations were made:

79, 13, 138, 129, 59, 76, 75, 53, 122, 98, 38, 57, 84, 110, 76, 58, 98, 70, 24, 52. Test the hypothesis of randomness of the sample. Use 5% level of significance. **[5]**

EEE

Total No. of Questions : 4]

SEAT No. :

P628

[Total No. of Pages : 2

[5215]-449
T.Y.B.Sc.
STATISTICS (Principal)
ST-343 : Statistical Quality Control
(2013 Pattern) (Paper - III) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Attempt each of the following :

a) Choose the correct alternative in each of the following : **[1 Each]**

i) Which of the following is not a process control (PC) tool.

A) Check Sheet B) Regression Analysis

C) Histogram D) K - σ limits

ii) For single sampling plan, ATI is given by

A) N B) $nP_a + N(1 - P_a)$

C) $N P_a$ D) $n P_a$

iii) Control limits of C chart are based on

A) Uniform distribution B) Hyper geometric distribution

C) Binomial distribution D) Poisson distribution

iv) In case of double sampling plan N, n_1, n_2, c_1, c_2, let d_1 be number of defectives obtained in the first sample. A second sample of size n_2 is selected if

A) $d_1 \le c_1$ B) $d_1 \le c_2$

C) $c_1 \le d_1 < c_2$ D) $c_1 < d_1 \le c_2$

b) State whether each of the following statements is true or false. **[1 each]**

i) When process standard deviation σ is not known, it is estimated by $\left(\bar{R}/D_2\right)$.

P.T.O.

ii) The nature of operating characteristic curve for a single sampling plan is decreasing.

c) Define the following terms : **[1 each]**

i) Assignable cause.

ii) Acceptable Quality Level (AQL).

d) i) How process shift is determined on control chart? **[1]**

ii) State the rule for shifting to reduced inspection from normal inspection. **[1]**

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

a) Explain the construction of Pareto diagram and interpret it.

b) Distinguish between defect and defective.

c) For a double sampling plan with N = 10000, $n_1 = 60$, $c_1 = 1$, $n_2 = 100$, $c_2 = 3$. Find AOQ of lots of quality P = 0.04 are submitted for inspection.

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

a) Explain in detail the construction of C-chart.

b) Define Natural Tolerance limit and specification limit and compare them.

c) Derive an expression for Average Total Inspection (ATI) for a Double Sampling Plan (DSP).

Q4) Attempt any one of the following :

a) i) For 25 samples of size 4, $\overline{\overline{X}} = 0.43$, $\overline{R} = 0.01$, obtain 3σ control limits. If the process average shifts to 0.435, calculate the probability of catching the shift on

1) First sample after the shift.

2) Second sample after the shift.

ii) Write a note on acceptance sampling with rectification. **[6 + 4]**

b) i) What do you mean by online methods in SPC? Discuss with an illustration.

ii) Draw an OC curve for the single sampling plan N = 2000, n = 100, c = 1 by taking p = 0.01, 0.05, 0.07, 0.09 also explain how you will obtain producers risk for AQL of 2% using OC curve. **[4 + 6]**

Total No. of Questions :4]

SEAT No. :

P629

[Total No. of Pages :4

[5215] - 450

T.Y.B.Sc.

STATISTICS (Principal)

ST-344: Operations Research (Paper - IV)

(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) ***Use of scientific 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) In a Transportation Problem (T.P.), the least cost method is used.

i) to remove degeneracy

ii) to find optimum solution

iii) to find alternate solution

iv) to find initial basic feasible solution

b) In solving Linear Programming Problem (LPP) for maximisation of objective function when all net evaluations $(z_j - c_j)$ are greatar than or equal to zero, it indicates that LPP has

i) unbounded solution ii) degenerate solution

iii) optimum solution iv) infeasible solution

c) In PERT analysis variance of the project is based on

i) critical activities ii) all activities

iii) non-critical activities iv) dummy activities

d) In the general definition of an Assignment Problem (A.P.), X_{ij} is always

i) 1 ii) 1 or –1

iii) 1 or 0 iv) –1

P.T.O.

B) State whether each of the following is True or False. **[1 each]**

a) A T.P. is balanced if it has equal number of rows and columns.

b) Critical Path Method (CPM) is deterministic in nature.

C) Define each of the following in network analysis: **[1 each]**

a) Total float

b) Free float

D) a) Write canonical form LPP. **[1]**

b) Explain the term 'artificial variable' in LPP. **[1]**

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

a) Explain the following terms used in LPP.

i) slack variable

ii) surplus variable

iii) feasible solution

iv) basic solution

v) basic feasible solution

b) Describe Monte Carlo method of simulation. Write its any two applications in statistics.

c) A company produces three products X, Y and Z from three raw materials A, B and C. One unit of product X requires 2 units of B and 5 units of C. One unit of product Y requires 2 units of A, 3 units of B. One unit of product Z requires 3 units of A, 2 units of B and 4 units of C. The company has 80 units of material A, 100 units of material B and 150 units of material C. Profits per unit of products X, Y and Z are ₹30, ₹50 and ₹40 respectively. Formulate it as LPP.

Q3) Attempt any Two questions: **[5 each]**

a) Define a Transportation Problem (T.P.). Discuss the problem of degeneracy in T.P. How it is resolved?

b) Discuss the relationship between Primal LPP and dual LPP.

c) Obtain the dual of the following LPP.

Max $Z = x_1 - x_2 + 3x_3$

Subject to $-2x_1 + x_2 + 3x_3 = 3$

$-2x_1 + 3x_2 + 4x_3 = 5$

$x_1, x_2, x_3 \geq 0$

Q4) Attempt any One of the following:

a) i) The time estimates of activities of a small project are listed below **[7]**

Activity	Time estimates (days)		
	Optimistic	Most Likely	Pessimistic
1 - 2	1	1	7
1 - 3	1	4	7
1 - 4	2	2	8
2 - 5	1	1	1
3 - 5	2	5	14
4 - 6	2	5	8
5 - 6	3	6	15

1) Draw network diagram

2) Find expected duration and variance of the project.

ii) Explain the terms **[3]**

1) Event

2) Activity and

3) Critical path in network analysis.

b) i) Describe Hungarian method of solving Assignment problem (minimisation case). **[4]**

ii) Find initial basic feasible solution of the following TP by Vogel's approximation method. Further, check its optimality. **[6]**

Destination / Source	D_1	D_2	D_3	Supply
S_1	8	16	16	152
S_2	32	48	32	164
S_3	16	32	48	154
Demand	144	204	82	

EEE

Total No. of Questions : 4]

SEAT No. :

P630

[Total No. of Pages : 8

[5215]-451
T.Y.B.Sc.
STATISTICS
ST - 345 (A) : Reliability and Survival Analysis
(2013 Pattern) (Paper - V) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Attempt each of the following:

A) In each of the following cases choose the correct alternative: **[1 each]**

a) Let ϕ be a coherent structure of n independent components then

i) $\prod x_i \le \phi(\underline{x})$ ii) $\prod x_i \ge \phi(\underline{x})$

iii) $\phi(\underline{x}) \le \coprod x_i$ iv) $\prod x_i \le \phi(\underline{x}) \le \coprod x_i$

b) For a series system with n independent components, the number of cut vectors are

i) 1 ii) 2^n

iii) $2^n - 1$ iv) n - 1

c) For failure rate function r (t), which of the following statement is correct.

i) $\int_0^\infty r(t)dt = \infty$ ii) $r(t) < 0$

iii) $0 \le r(t) \le 1$ iv) $\int_0^\infty r(t)dt = 1$

d) For Makeham family of lifetime distributions with $\theta > 0$

i) $r(t) \uparrow t$ ii) $r(t) = \text{constant}$

iii) $r(t) \downarrow t$ iv) $r(t) = 1$

P.T.O.

B) State whether each of the following statements is true or false **[1 each]**

a) If a system consist of only one component having structure function $\phi(x) = 1 - x$ then that component is irrelevant.

b) Let ϕ be a coherent structure of n components then $\phi(\underline{x} \cdot \underline{y}) \geq \phi(\underline{x}) \cdot \phi(\underline{y})$.

C) Define the following terms: **[1 each]**

a) Decreasing Mean Residual Life (DMRL) property of lifetime distributions.

b) New Better than Used in Expectation (NBUE) class of lifetime distributions.

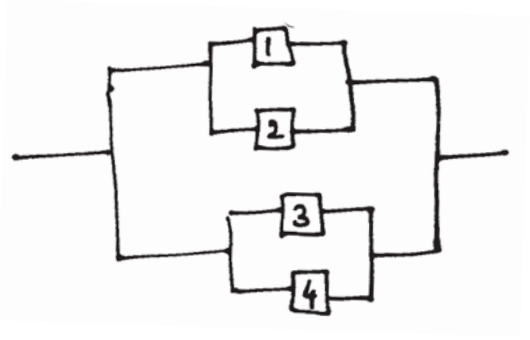
D) Attempt each of the following: **[1 each]**

a) Give an example of type II censoring.

b) Discuss the nature of failure rate function of Gamma distribution for shape parameter lies in (0;1).

Q2) Attempt ANY TWO of the following: **[5 each]**

a) Consider the following Reliability Block Diagram:



Find:

i) Structure function of the system

ii) Minimal path sets

iii) Minimal cut sets

iv) Dual of the system

b) Show that if F belongs to Increasing Failure Rate in Average (IFRA) class of lifetime distributions then it belongs to New Better than Used (NBU) class of lifetime distributions.

c) At the every corner of recreation hall a system of four halogen bulbs is located. Reliability of each component is 0.9. What would be the reliability of the system if the bulbs are connected in

i) Series system

ii) Parallel system

Q3) Attempt ANY TWO of the following: **[5 each]**

a) Suppose the components C_1 and C_2 with lifetimes T_1 and T_2 respectively are connected in series. If T_1 and T_2 are independent exponential random variables with parameters λ_1 and λ_2 then find

i) Reliability of the system

ii) Probability distribution of lifetime of the system

iii) Mean life time of the system

b) Define mean residual lifetime of a unit aged t. State and prove characterisation of no ageing by mean residual lifetime.

c) Following is the data of remission time (in days) of leukemia patients receiving control treatment:

10, 10, 10, 20, 20, 30, 40, 40, 40, 50, 100, 100, 100, 120

Find 95% confidence band for $\bar{F}(t)$ at t = 52.

Q4) Attempt any one of the following:

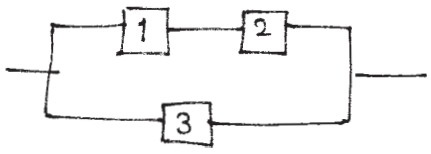
A) a) Show that dual of a k-out-of-n system is n-k+1-out-of-n system. **[6]**

b) Suppose a component has lifetime distribution as Weibull with scale parameter 2 and shape parameter 1 then find **[4]**

i) Median failure time

ii) Probability that the component will operate for 1.5 hrs.

B) a) Consider the following Reliability Block Diagram:



Find P_3 in above system to achieve system reliability 0.76 if $P_1 = 0.8$ and $P_2 = 0.4$. **[3]**

b) State Actuarial estimator of survival function. Also give Greenwood's formula for the estimate of variance of $\hat{\bar{F}}(T_k)$. **[2]**

c) Consider the failure rate function **[5]**

$$r(t)=\begin{cases} \frac{t}{2} & ;o<t<4 \\ 2 & ;4\le t<6 \\ (t-6)+2 & ;t\ge 6 \end{cases}$$

i) Sketch the graph of r(t) against t.

ii) Find cumulative hazard function R(t)

iii) Find survival function $\bar{F}(t)$.

x x x

Total No. of Questions : 4]

P630

[5215]-451
T.Y.B.Sc.
STATISTICS (Principal)
ST - 345 (B) : Introduction to Stochastic Processes
(2013 Pattern) (Paper - V) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific 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) If two states of a Markov chain are accessible from each other, then they are

i) communicating states ii) transient states

iii) absorbing states iv) periodic states

b) Let $\{X_n, n \geq 1\}$ be a Markov chain. If the transition probabilities depend on n then the Markov chain is said to be

i) homogeneous ii) reducible

iii) non-homogeneous iv) finite

c) A persistent state of a Markov chain is said to be null persistent if its mean recurrence time is

i) finite ii) infinite

iii) zero iv) one

d) Let $\{N(t), t \geq 0\}$ be a Poisson process with parameter λ. Mean number of occurrences in an interval of length t is

i) $1/\lambda$ ii) λt

iii) $\lambda^2 t$ iv) $1/\lambda t$

B) State whether each of the following statements is true or false **[1 each]**

a) If a closed set contains only one state then the state is absorbing state.

b) A state is said to be persistent if return to that state is uncertain.

C) Define: **[1 each]**

a) Stochastic matrix.

b) Markov property.

D) a) Explain periodicity of a state of a Markov chain. **[1]**

b) Suppose that customers arrive at a counter in a bank in accordance with Poisson process with mean rate 1.5 per minute

What is the Probability that the interarrival time is less than 2 minutes? **[1]**

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

a) State and prove additive property of Poisson Process.

b) What is state space of a stochastic process? Expalin different types of state spaces with suitable illustrations.

c) Let $\{X_n, n \geq 0\}$ be a Markov chain with state space $S = \{1, 2, 3\}$ and transition probability matrix

$$P = \begin{bmatrix} 0.9 & 0.075 & 0.025 \\ 0.15 & 0.8 & 0.05 \\ 0.25 & 0.25 & 0.5 \end{bmatrix}$$

Show that the Markov chain is irreducible.

Compute:

i) $P[X_2 = 3/X_0 = 1]$

ii) $P[X_3 = 1/X_1 = 2]$

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

a) Discuss gambler's ruin problem.

b) Consider $\{X_n, n \geq 1\}$ is a Markov chain with one step transition probability matrix

$$P = \begin{bmatrix} 1/6 & 1/3 & 1/2 & 0 \\ 1/2 & 1/2 & 0 & 0 \\ 1/6 & 1/3 & 1/2 & 0 \\ 0 & 1/6 & 1/3 & 1/2 \end{bmatrix}$$

Compute $f_{11}^{(2)}$ i.e. probability that it reaches state 1 for first time in two steps.

c) One step transition probability matrix of a Markov chain $\{X_n, n \geq 1\}$ having three states $\{1, 2, 3\}$ is

$$P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$

and initial probability distribution (0.7, 0.2, 0.1) obtain

i) $P[X_2 = 3, X_1 = 1 | X_0 = 2]$

ii) $P[X_3 = 3, X_2 = 1, X_1 = 3, X_0 = 2]$

Q4) Attempt any one of the following:

A) a) State and prove Chapman Kolmogorov equations. **[5]**

b) Consider $\{X_n, n \geq 0\}$ be a Markov chain with state space $S = \{1, 2, 3, 4\}$ and one step transition probability matrix **[5]**

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

Show that state 1 is ergodic.

B) a) Difine compound Poisson process and state its mean and variance. **[4]**

b) Customers arrive at a petrol station according to Poisson process with mean rate of 1 per minute.

What is the probability that in an interval of 2 minutes more than 3 customers arrive in the petrol station? **[3]**

c) Explain closed set of states in case of Markov chain. **[3]**

x x x

Total No. of Questions : 4]

SEAT No. :

P631

[Total No. of Pages : 3

[5215]-452
T.Y. B.Sc.
STATISTICS (Principal)
ST-346 : Statistical Computing Using R-Software (Online Paper)
(2013 Pattern) (Semester-IV) (Theory) (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 10 from a binomial distribution with parameters 8 and 0.4.

b) Create a data frame containing name and income of father for 5 individuals using edit command.

c) Create a vector *x* of observations : 21, 38, 20, 42, 68, 72, 95, 88, 54, 72 using scan function.

d) Let $X \rightarrow N(30, 2^2)$. Compute P(X < 28) and P(20 < X < 32).

e) Draw box-plot for the observations : 72, 88, 62, 44, 58, 49, 62, 74, 39, 44, 56, 68.

f) Write R-program script for summing squares of numbers 1 to 8 using for loop.

g) Compute mode for the observations : 18, 21, 28, 21, 34, 40, 28, 21, 30, 21.

h) Create a file in MS-Excel containing roll number and marks of 2 students in statistics practical. Save it as a text file and import it to R.

i) Find standard deviation of first 10 integers : 1, 2, ----------10.

j) Determine the value of '*a*' for which P(X < *a*) is 0.32, where $X \sim P(5.2)$.

P.T.O.

Q2) Attempt any <u>two</u> of the following: **[5 each]**

a) Draw Histogram and frequency polygon for the data of marks obtained by 80 students:

marks	0-10	10-20	20-30	30-40	40-50	50-60
number of students	8	17	25	13	10	7

b) Fit a binomial distribution to the following data and find the expected frequencies:

x	0	1	2	3	4	5	6
f	12	18	24	30	21	7	3

c) i) Use Kolmogorov-Smirnov test to test whether the following random sample comes from U(10, 30) distribution : 12, 18, 17, 11, 28, 29, 20, 25. Test at 5% level of significance.

ii) Draw the graph of probability curve of $N(12, 2^2)$ distribution.

[3+2]

Q3) Attempt any <u>two</u> of the following: **[5 each]**

a) Carryout one-way ANOVA using the following data:

Fertilizer	Yield in kgs
A	13.5, 12.8, 11.4, 13.8
B	10.3,11.4, 9.8, 10.8
C	15.2, 14.7, 13.4, 12.4

b) Compute Bowley's coefficient of skewness and comment on the nature of data.

x	:	1	3	7	8	9	12
f	:	4	9	12	10	7	5

c) The following are the number of hours of service for a type of spark plug : 198 190 200 188 184 179 182 187 178 177. Can we conclude that population mean of the number of hours of service is 185 at 5% level of significance. Write R-program script for carryingout t-test by verifying assumptions.

Q4) Attempt any <u>one</u> of the following:

a) i) Write R-program script to carryout two-way ANOVA for the following data by verifying the underlying assumptions.

Block / Treatment	I	II	III	IV
A	12	18	19	14
B	14	20	22	17
C	16	21	24	18

ii) The time in minutes that a patient has to wait in a consulting room before being seen by a doctor is recorded for 10 patients as : 15, 17, 18, 20, 22, 12, 16, 23, 21, 19. Use Wilcoxon's signed ranks test to test whether the median waiting time is 18 minutes or not at 5% level of significance. **[7+3]**

b) i) Data on value of import and export in crores of Rs. are given below for an industry:

Year	2013	2014	2015	2016
Import	35	42	38	49
Export	31	48	34	45

Represent the data by multiple bar diagram.

ii) In an experiment of immunization of cattle from tuberculosis, the following results were obtained:

	Affected	Not-affected
Inoculated	23	42
Not inoculated	19	08

Examine the effect of immunization in controlling the disease at 5% level of significance.

[6+4]

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Total No. of Questions :4]

SEAT No. :

P632

[Total No. of Pages :2

[5215] - 453

T.Y.B.Sc.

GEOGRAPHY

Gg-341: Fundamentals of Human Geography (Paper - II)

(2013 Pattern) (Part - 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 sketches and diagrams wherever necessary.***
4) ***Use of Map stencils is allowed.***

Q1) Answer the following questions in two or three sentences (Any ten): **[10]**

a) Define an urban settlement.

b) Define Umland.

c) Which state in India is the most urbanized in India.

d) Define rural urban fringe.

e) According to Weber's theory what are weight losing industries?

f) Give examples of crops grown in plantation agriculture.

g) What is Green Revolution? Who is credited to have brought it to the world?

h) What are the characteristics of the population growth of a country in the early transition stage of demographic transition?

i) Define sex ratio. Which state in India has the highest sex ratio in India?

P.T.O.

j) According to Malthus what are positive and preventive checks?

k) What do you understand by a population pyramid?

l) What is occupational structure of the population?

m) What is multicropping? Give examples.

Q2) Write short notes on the following (Any Two): **[10]**

a) Differentiate between rural and urban settlements.

b) Origin and growth of Urbanization in India.

c) Types of Sex ratio.

d) Characteristics of extensive agriculture.

Q3) Answer the following questions in 100 words each (Any Two): **[10]**

a) Relevance of Von Thunen's theory.

b) Indices of Transport Network Analysis.

c) Plantation Agriculture in India.

d) Food security.

Q4) Answer the following questions in 200 words (Any One): **[10]**

a) Explain the trends of urbanization in the world.

b) Discuss the effect of globalization on agriculture in the world.

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Total No. of Questions : 4]

SEAT No. :

P633

[Total No. of Pages : 2

[5215]-454

T.Y.B.Sc.

GEOGRAPHY

Gg - 342 : Geography of Travel and Tourism (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 diagrams and maps whenever necessary.***
4) ***Use of map-stencils is allowed.***

Q1) Answer the following questions in one or two sentences. **[10]**

a) What is cultural tourism?

b) Define the concept of second homes.

c) What is adventure tourism?

d) What do you mean by balance of payment?

e) What is dharamshala?

f) State any two economic impacts of tourism.

g) What do you mean by Youth hostels?

h) Name any two places of agro-tourism in India.

i) List any two places where houseboats are attraction of tourists in India.

j) State any two places where caves are located in India.

k) In which state is Pench National Park located?

l) What do you mean by income multipliers?

m) Give any two demerits of roadway as a mode of transport in tourism?

P.T.O.

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

a) Eco - tourism.
b) Advantages of air transport
c) Impacts of recreation on wildlife.
d) Online booking hospitality management in tourism.

Q3) Answer the following in 100 words (any two): **[10]**

a) Explain the concept of farm tourism and its significance in India.

b) Discuss various services available in tourism sector.

c) Giving suitable examples, state the impact of tourism on local culture.

d) Discuss the impacts of tourism on national parks in India.

Q4) Answer the following in 200 words (any one): **[10]**

a) Explain various factors that influence the choice of transport.

b) Elaborate different types of accommodations used by tourists.

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Total No. of Questions :4]

SEAT No. :

P634

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[5215] - 455

T.Y.B.Sc.

GEOGRAPHY

Gg-343: Fundamentals of Geo-informatics - (Part - II)

(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 sketches and 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 meant by Geoinformatics?

b) What is attribute data?

c) Define DBMS.

d) What is Topology?

e) What is SQL?

f) Define containment.

g) Define DEM.

h) What is query?

i) Define GPS.

j) Why is GIS used?

k) What is multi- criteria analysis?

l) Mention any two Global navigation satellites system.

m) Write any two uses of GPS.

P.T.O.

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

a) Digital data as input in GIS.

b) Topological errors.

c) DEM.

d) Merge.

Q3) Answer the following question in 100 words (any two) **[10]**

a) What is query analysis?

b) Explain spatial analysis in GIS.

c) Explain uses of GPS technology.

d) Discuss the recent trends in GIS.

Q4) Answer the following question in 200 words (any one) **[10]**

a) Give an account of overlay analysis in GIS.

b) Discuss applications of GIS and GPS in Decision Support system.

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Total No. of Questions :4]

SEAT No. :

P635

[Total No. of Pages :2

[5215] - 456
T.Y.B.Sc.
GEOGRAPHY
Gg-344: Geography of India (Part - II)
(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) ***Diagrams and Maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer in two to three sentences each (Any ten): **[10]**

a) State any two regions in India where bauxite is mined.

b) What is poly-house agriculture?

c) Mention any two non-conventional energy sources used in rural India.

d) State any two benefits of green revolution.

e) What are the disadvantages of dry farming?

f) Mention any two problems of overpopulation.

g) State any two conditions required for developing hydel power.

h) What is regional planning?

i) Name two states from northern India, which are flood-affected.

j) State any two common breeds of milch cattle from India.

k) Why is the period (1901-1921) considered the period of stagnant population?

l) Define a drought-prone area.

m) What is the idea of 'National Water Grid?

P.T.O.

Q2) Write short note (Any two): **[10]**

a) Distribution of manganese in India.

b) Wind energy potential of India.

c) Mineral oil resources of India.

d) Livestock resources in India.

Q3) Answer in 100 words (Any two): **[10]**

a) Horticultural development in India.

b) Thinly populated regions of India.

c) Water policies of India.

d) Suicide of farmers in India.

Q4) Answer in 200 words (Any one): **[10]**

a) Explain with suitable examples, the significance of Agriculture in Indian economy.

b) 'The regional development of Maharashtra is uneven' - Comment on the statement.

EEE

Total No. of Questions : 4]

SEAT No. :

P636

[Total No. of Pages : 2

[5215]-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 to three sentences (**any ten**): **[10]**

a) Mention any two soil forming processes

b) What do you understand by the process of additions?

c) What do you understand by the process of transformations?

d) State two types of the process of leaching

e) What do you understand by the term 'Colluvium'?

f) What is soil organic matter?

g) State the composition

h) What do you understand by the process of nitrification?

i) What is soil humus?

j) What is soil pH?

k) What do you understand by LS factor in USLE?

l) Mention any two types of soil survey methods

m) Mention any two types of soil erosion

P.T.O.

Q2) Write a short notes **(any two)**. **[10]**

a) Factors affecting soil organic matter.

b) Soil reaction affecting availability of soil nutrients.

c) Types of soil erosion.

d) Soil erosion control measures.

Q3) Answer the following questions in 100 words **(any two)**. **[10]**

a) What is C:N ratio?

b) What do you understand by soil acidity?

c) Explain the process of decomposition of soil organic matter.

d) Explain the process of formation of secondary minerals.

Q4) Answer the following questions in 200 words **(any one)**. **[10]**

a) Give an account of soil types in India.

OR

b) Give an account of USDA soil classification.

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Total No. of Questions : 4]

SEAT No. : ____

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[5215]-458
T.Y.B.Sc.
GEOGRAPHY
Gg - 346 : Fundamentals of Geoinformatics (Part - II)
(2013 Pattern) (Paper - XII) (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 sketches and diagrams wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in two to three sentences (any ten) **[10]**

a) Mention the major types of orbit.

b) What do you understand by sensor?

c) What is platform?

d) What is the abbreviation IRS stands for?

e) Mention any two types of optical mechanical scanners.

f) Mention any two types of resolution.

g) What is spatial resolution of SPOT 5 colour images?

h) What do you mean by band?

i) What is spatial resolution?

j) What is PSLV?

k) State the wavelength of visible spectrum.

l) What do you understand by spectral resolution?

m) What is FCC?

P.T.O.

Q2) Write short notes (any two) **[10]**

a) Infrared scanners.

b) Image classification.

c) Uses of Thermal infrared image.

d) Procedure for preprocessing of an image.

Q3) Answer the following questions in 100 words (any two) **[10]**

a) Describe the major characteristics of LANDSAT satellite.

b) What is ISODATA approach?

c) What is band ratioing?

d) How do you distinguish between colour and tone of an image?

Q4) Answer the following questions in 200 words (any one) **[10]**

a) Give an account of IRS series satellites.

b) Give an account of supervised classification.

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Total No. of Questions :4]

SEAT No. :

P638

[Total No. of Pages :2

[5215] - 459
T.Y.B.Sc.
MICROBIOLOGY
MB - 341 : Medical Microbiology - II
(2013 Pattern) (Paper - I) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***

Q1) Attempt the following: **[5]**

a) Match the following:

i)	Trimethoprim	a)	Ionophore
ii)	Tazobactum	b)	DNA gyrase
iii)	Nalidixic acid	c)	Ergosterol synthesis inhibitor
iv)	Voriconazole	d)	Dihydrofolate reductase inhibitor
v)	Monensin	e)	Beta lactamase production

b) Answer the following: **[2]**

i) Enlist the routes of egg inoculation for virus cultivation.

ii) Write any two modes of transmission of HIV.

c) State true or false: **[3]**

i) Dengue is termed breakbone fever.

ii) Quinolones act by inhibiting cell membrane synthesis.

iii) Hepatitis A virus is transmitted by faecal oral route.

P.T.O.

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

a) Describe the mode of action of Griseofulvin and Nystation.

b) Illustrate diagrammatically structure of Hepatitis B virus.

c) Describe the epidemiology and control of candida infections.

Q3) Write short notes (Any two): **[10]**

a) Giardiasis.

b) Oncogenic RNA viruses.

c) Mode of action of Tetracycline.

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

a) What is chemotherapy? Describe different routes of drug administration. Elaborate on mode of action of metronidazole.

b) Describe the pathogenesis and prophylaxis of polio virus.

Total No. of Questions : 4]

SEAT No. :

P639

[Total No. of Pages : 2

[5215]-460

T.Y.B.Sc.

MICROBIOLOGY

MB-342 : Genetics and Molecular Biology-II

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

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

Instructions to the candidates:

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

Q1) A) Attempt the following : **[5]**

a) Define - Conditional lethal mutants.

b) Define - Contransduction frequency.

c) F plasmid integrated with the bacterial chromosome at a specific site is denoted as an_____.

d) In s pneumoniae competence development occurs due to the production of _____factors.

e) State True or false - All phages which mediate generalised transduction are temperate.

B) Match the following : **[5]**

A	B
a) λ dgal	i) rII mutants
b) Benzer	ii) Lytic cycle
c) F' conjugation	iii) Phage with bacterial genes
d) Virulent phage	iv) Specialised transduction
e) Transducing particle	v) Sexduction

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

a) Role of Translesion polymerases in DNA repair.

b) c DNA library.

c) Gene mapping by Transformation experiments.

P.T.O.

Q3) Draw neat labelled diagrams. (Any two). **[10]**

a) Structure of a typical Expression vector.

b) Photoreactivation repair

c) $F^+ \times F^-$ Mating.

Q4) a) What are Phage mutants? Enlist them. Explain in detail conditional lethal mutants. **[10]**

Add a note on Cis-Trans test of Genetic function.

OR

b) What are the different methods to screen and identify recombinant clones from a population. Enlist them.

Elaborate on any four methods in detail.

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Total No. of Questions : 4]

SEAT No. :

P640

[Total No. of Pages : 2

[5215]-461
T.Y.B.Sc.
MICROBIOLOGY
MB-343 : Metabolism
(2013 Pattern) (Paper - III) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

Q1) Attempt the following :

a) Define : **[3]**

i) Ionophores.

ii) High energy compounds.

iii) Symport.

b) State third law of thermodynamics. **[1]**

c) Draw structure of N-acetyl glucosamine (NAG). **[1]**

d) State True or False : **[2]**

i) UDP-Glucose serves as an intermediate donor in glycogen synthesis.

ii) Living cells are closed systems.

e) Give an example of green sulphur bacteria. **[1]**

f) The standard free energy change of 1, 3, di-phosphoglyceric acid hydrolysis at pH 7.0 is _____ Kcal/mol. **[1]**

g) List enzymes of cellulose degradation. **[1]**

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

a) Explain cyclic photophosphorylation with suitable diagram.

b) Describe degradation of glycogen.

c) Explain why enolic phosphates are high energy compounds.

P.T.O.

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

a) Cyclic and Non-cyclic photophosphorylation.

b) Types of active transport with suitable examples.

c) Fatty acid oxidation.

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

a) Explain steps in fatty acid synthesis.

b) Describe structure and function of ATP synthatase.

Total No. of Questions : 4]

SEAT No. :

P641

[Total No. of Pages : 2

[5215]-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 and rewrite: **[5]**

1) Mixed Lymphocyte Reaction	i) Single diffusion
2) FACS	ii) Mast cell
3) Coomb's Test	iii) Mitomycin C
4) Type I Hypersensitivity	iv) Double diffusion
5) Mancini's Test.	v) Rhodamine dye
	vi) Anti-human globulin

b) State true or false: **[2]**

i) Complete type of Rh antibodies are IgM.

ii) Administration of antiserum produces active immunity.

c) Name any two for each of the following: **[3]**

i) Human class I MHC genes.

ii) Live attenuated vaccines.

iii) Examples of type III hypersensitivity.

P.T.O.

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

a) Compare in tabular form - MHC class I and class II molecules.

b) Illustrate diagrammatically - Hybridoma technology for monoclonal antibody production.

c) Comment on-theories of origin of autoimmunity.

Q3) Write short note any two: **[10]**

a) Cytokines.

b) Rocket immunoelectrophoresis.

c) Delayed type of hypersensitivity.

Q4) Attempt any one: **[10]**

a) Describe RIA in detail. Give its applications.

b) Describe inheritance and biochemistry of ABH antigens. Add a note on Bombay blood group.

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Total No. of Questions : 4]

SEAT No. :

P642

[Total No. of Pages : 2

[5215]-463
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 labelled diagrams wherever necessary.***

Q1) Answer following:

a) Define Primary metabolites. **[1]**

b) Enlist types of cheese. **[1]**

c) Match the pairs and write correct pairs. **[4]**

i)	Acetator and cavitator fermenter	1)	Mushroom Production
ii)	Agaricus bisporus	2)	Citric acid fermentation
iii)	Aspergillus niger	3)	Immune sera
iv)	Antivenom	4)	Vinegar production.

d) True or False **[2]**

i) Ashbya gossypii is used in Vit. B12 fermentation.

ii) Fringe generator is used in citric acid fermentation.

e) Fill in the blanks: **[2]**

i) Tetanus toxin is converted to toxoid by the treatment with _____.

ii) _____ flowers are used in beer fermentation.

Q2) Write short notes any two: **[10]**

a) Recovery of Riboflavin and give its application.

b) Explain steroid transformation with suitable example.

c) Comment on concept of submerged fermentation.

P.T.O.

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

a) Explain production medium for penicillin fermentation.

b) Describe production of live attenuated polio vaccine

c) Draw a flow sheet for Baker's yeast production

Q4) Attempt any one: **[10]**

a) Describe in detail 'The making of Wine'

b) Explain the production of citric acid by surface culture process.

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Total No. of Questions : 4]

SEAT No. :

P643

[Total No. of Pages : 2

[5215]-464
T.Y.B.Sc.
MICROBIOLOGY
MB - 346 : Agricultural and Environmental Microbiology
(2013 Pattern) (Paper - VI) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagram wherever necessary.***

Q1) Attempt the following:

a) Define **[3]**

i) Nanobiotechnology.

ii) Biosensors.

iii) Biofertilizers.

b) Enlist **[3]**

i) Two applications of biochips.

ii) Two methods of bioleaching.

iii) Two applications of bioaugmentation.

c) What is RNAi? **[1]**

d) Name two organisms involved in iron bioleaching. **[1]**

e) State true or false **[1]**

Nitrogenase has broad substrate specificity.

f) Give two examples of potassium mobilizing microorganisms. **[1]**

P.T.O.

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

a) Bioremediation of xenobiotics.

b) Biodegradable plastic.

c) Role of nitrogenase.

Q3) Comment on any two: **[10]**

a) Plant breeding for disease resistance.

b) Iron chelation.

c) Bioleaching of Gold.

Q4) Attempt any one **[10]**

a) Explain Integrated pest management with respect to plant disease control.

b) Explain the role of plants and microbes in bioremediation of dyes and paper and pulp industries.

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Total No. of Questions :4]

SEAT No. :

P644

[Total No. of Pages :2

[5215] - 465

T.Y.B.Sc.

ELECTRONIC SCIENCE

EL - 341:Advanced Communication Systems (Paper - I)

(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 diagrams must be drawn wherever necessary.***

Q1) Attempt all of the following:

a) Define directivity of an antenna. **[1]**

b) Write important operating steps in pulse code modulation. **[1]**

c) Give one application of product detector. **[1]**

d) Write two features of low noise amplifier. **[1]**

e) State any two advantages of paraboloid reflector antenna. **[2]**

f) Write different types of filters used in filter method of suppression of side band. **[2]**

g) List applications of Doppler Radar. **[2]**

h) Write different blocks of Delta Modulator. **[2]**

Q2) Attempt any two of the following:

a) Explain construction of rhombic antenna. Draw its radiation pattern. **[4]**

b) Describe working of balanced modulator using diodes. **[4]**

c) Explain working of simple pulse doppler radar with its block diagram. **[4]**

P.T.O.

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

a) For skywave propagation, explain maximum usable frequency and skip distance. **[4]**

b) Draw the block diagram of PCM transmitter and explain its working. **[4]**

c) Explain working of frequency stabilized reactance FM transmitter with suitable block diagram. **[4]**

Q4) Attempt any <u>two</u> of the following:

a) Discuss space wave propagation. Write expression for distance between transmitting and receiving antennas. List applications of space wave propagation. **[6]**

b) Draw the block diagram of FDM system. Write advantages of FDM. List applications of FDM. **[6]**

c) With the help of block diagram, explain working of Armstrong method of FM generation. **[6]**

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Total No. of Questions : 4]

SEAT No. :

P645

[Total No. of Pages : 2

[5215]-466

T.Y.B.Sc.

ELECTRONIC SCIENCE

El - 342 : Microcontroller And its Applications

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

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

Instructions to the candidates:

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

Q1) Attempt all the following.

a) Which is most natural data type used in 'C' for 8051 μC? **[1]**

b) Give the size of code ROM of PIC 18F4580μC. **[1]**

c) Which is highest priority interrupt in 8051 μC? **[1]**

d) If 8051 based system is controlled by crystal Frequency 12 MHz then what is period of clockpulse given to timer unit. **[1]**

e) What are the advantages of 8051 C programming over assembly. **[2]**

f) List the two important registers used with timer. **[2]**

g) What is RTC? Wher it is used? **[2]**

h) What do you mean by PIC Microcontroller? **[2]**

Q2) Attempt any two of the following.

a) Write a short note on factors that affect the delay size. **[4]**

b) Write a 'C' program to 8051 μC, to transfer massage 'SPPUP' serially to 9600 baud, 8 bit data, 1 stop bit continuously. **[4]**

c) Explain in brief LCD interfacing to 8051 μC. **[4]**

P.T.O.

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

a) Write a 'C' program to toggle all bits of port P_2 continuously with some time delay in between, use timer 0 in mode 1. **[4]**

b) Explain how LED is interfaced with Microcontroller 8051? Write 'C' program to make LED on & off. **[4]**

c) Explain difference between CISC & RISC architecture. **[4]**

Q4) Attempt any <u>two</u> of the following.

a) Explain how speed of DC motor is controlled using PWM technique: write 'C' program for it. **[6]**

b) Draw simplified view of PIC 18 microcontroller. Write its features. **[6]**

c) What are the bitwise logical operators in 8051 μC? Explain each with suitable example. **[6]**

OR

Attempt <u>all</u> the following.

a) Write 8051 C program to packed BCD OX79 to ASC II and display reconvert on P_2 & P_3. **[4]**

b) Write an 8051 C program to generate square wave of frequency 2500 Hz (2.5 KHz), using timer 1 mode 2 (Given crystal frequency 11.0592 MHz). **[4]**

c) Write short note on interrupt structure of 8051 μC. **[4]**

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Total No. of Questions : 4]

SEAT No. :

P646

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[5215]-467
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL-343 : Power Electronics
(2013 Pattern) (Paper - III) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Use of calculator is allowed.***

Q1) Attempt all of the following :

a) State two types of microelectronics relays. **[1]**

b) What is the difference between single phase and three phase transformers? **[1]**

c) Define the term reverse recovery time of a diode. **[1]**

d) Draw the IV characteristics of thyristor with labelling different operating regions. **[1]**

e) Write down the general classification of dc drives. **[2]**

f) The buck regulators has an input voltage of V_S = 14V and required average output voltage V_a = 4V. Calculate duty cycle in percentage. **[2]**

g) Define cycloconverter. **[2]**

h) Draw the circuit symbol of IGBT with its characteristics. **[2]**

Q2) Attempt any two of the following :

a) Explain single phase half wave rectifier with circuit diagram. Show its wave forms for input and output. **[4]**

b) Describe two transistor model of thyristor with neat diagram. Draw its equivalent circuit. **[4]**

c) Write a note on working of PUT. **[4]**

P.T.O.

Q3) Attempt any two of the following :

a) Draw and explain the working of boost regulator with its proper waveforms. **[4]**

b) What do you mean by a chopper? Explain the concept of chopper operating in various quadrants. **[4]**

c) Explain the working of flyback converter. **[4]**

Q4) Attempt any two of the following :

a) What is UPS? Explain the working of ON line and OFF line UPS with block diagrams. **[6]**

b) i) What are the different types of dc switches? Explain any one in brief. **[3]**

ii) Define inverter. Explain any one performance parameter of inverter. **[3]**

c) i) Explain the principle of phase controlled converter operation with resistive load. **[3]**

ii) Describe turn on methods of thyristor in brief. **[3]**

OR

Q4) Attempt all of the following :

a) If $R_1 = 1k\Omega$ and $\eta = 0.5$, $C = 0.01\ \mu F$. Calculate the period of oscillations using UJT. **[4]**

b) The capacitance of reverse biased junction J_2 in a thyristor is $C_{j2} = 10$ PF and the limiting value of the charging current to Turn ON the thyristor is 16 mA. Determine the critical value of $d\vartheta/dt$. **[4]**

c) In a stepdown dc converter if resistive load of $R = 10\Omega$ and input voltage is 230V. The chopping frequency is 2kHz and duty cycle is 50%. Determine the average output voltage and rms output voltage. **[4]**

Total No. of Questions : 4]

SEAT No. :

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[Total No. of Pages : 2

[5215]-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 right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Answer all of the following.

a) State Faradays law of electromagnetic induction . **[1]**

b) Write an expression for cyclotron frequency. **[1]**

c) What do you mean by Boson? Give example. **[1]**

d) What is maxwell Boltzman statistics? **[1]**

e) State Heisenberg uncertainty principle. **[2]**

f) State de broglie assumption. **[2]**

g) Write the importance of wavelength in nanoelectronics. **[2]**

h) Define mobility. **[2]**

Q2) Answer any Two.

a) Give Maxwell's equations in differential form. Explain the meaning of them. **[4]**

b) Obtain time dependent schrodinger wave equation. **[4]**

c) Explain electron transport in quantum dol. **[4]**

P.T.O.

Q3) Answer any two.

a) Obtain an expression for electromagnetic wave for H. **[4]**

b) Write note on density of states of electrons. **[4]**

c) Explain time & length scale and its importance in nanostructures. **[4]**

Q4) Answer any two.

a) With neat labeled diagram explain the concept of Hall effect. Derive the expression for Hall coefficient. **[6]**

b) Explain wave particle duality of atom. **[6]**

c) With the help of a suitable example distinguish between Maxwell Boltzman, Bose Einstem and Fermi Diract statistics. **[6]**

OR

Q4) Answer all.

a) Determine skin depth of Cu at 60Hz, 1 MHz and 30 GHz. **[4]**

b) Calculate de Broglie wavelength of an electron moving with the speed of $1/10^{th}$ of velocity of light. **[4]**

c) Determine the probability than an energy level 3kT above Fermi Energy is occupied by an electron, where T=300k. **[4]**

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Total No. of Questions : 4]

SEAT No. :

P648

[Total No. of Pages : 2

[5215]-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) All questions are compulsory:

a) Write an expression for Laplace transform. **[1]**

b) Define fourier series. **[1]**

c) What will be the Laplace transform of e^{-5t}? **[1]**

d) Write fourier series for odd function. **[1]**

e) Explain in brief 'feval' command in MATLAB. **[2]**

f) Find Laplace transform of f(t) = t. **[2]**

g) Explain MATLAB command 'clear' and 'clear XYZ'. **[2]**

h) What is the period of sin 2π $(x+1)$? **[2]**

Q2) Answer any two of the following:

a) Expand the function as partial fraction. **[4]**

$$F(S)=\frac{2(S+1)}{S^2+1}$$

b) Explain curve fitting for straight line. **[4]**

c) Explain 'While-end' loop used in MATLAB with suitable example. **[4]**

Q3) Answer any two of the following:

a) Compare script file and function file. **[4]**

b) Derive the Laplace transform of derivative. **[4]**

c) Using fourier series determine fourier coeff. a_0 **[4]**

P.T.O.

Q4) Answer any two of the following:

a) Write a program to plot the function $y = 4x^4 - 25x^2 + 12,$ and its first & second derivatives for $-5 \le x \le 5,$ all in the same plot. **[6]**

b) Find fourier series for **[6]**

$$f(x) = \begin{cases} 1 & -\pi < x < 0 \\ 0 & 0 < x < \pi \end{cases}$$

c) Write MATLAB program that will find the following expression **[6]**

$$S = \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + ... + \frac{1}{n!}$$

OR

Q4) All questions are compulsory:

a) Explain structure of function file. **[4]**

b) An experiment gave the following table of values for the dependent variable y for set of known values of x. Obtain an appropriate least square fit for the data. **[4]**

x	1	2	4	5	6	8	9
y	2	5	7	10	12	15	19

c) Find Inverse Laplace transform by using partial fraction method. **[4]**

$$F(S) = \frac{S+1}{S(S+2)}$$

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Total No. of Questions : 4]

SEAT No. :

P649

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[5215]-470
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL - 346 (A) : Industrial Automation
(2013 Pattern) (Paper - VI) (Semester - IV) (Optional)

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

Instructions to the candidates:

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

Q1) Attempt all of the following:

a) What is transfer function? **[1]**

b) Define the term CMRR. **[1]**

c) What is transconductance amplifier? **[1]**

d) What is ladder diagram? **[1]**

e) State the applications of thermister. **[2]**

f) Derivative control mode cannot be used alone justify. **[2]**

g) The temperature control system has a range of 300 to 440 K and a set point of 384 K. Find the percent of span error when the temperature is 379 K. **[2]**

h) State the advantages of two position control. **[2]**

Q2) Attempt any two of the following:

a) Explain thermocouple as temperature sensor with neat diagram. **[4]**

b) What is shielding? Explain electrostatic shielding technique with neat diagram. **[4]**

c) Describe proportional-integral (PI) control mode. **[4]**

P.T.O.

Q3) Attempt any two of the following:

a) What is zero order system? Explain zero order system with neat diagram. **[4]**

b) Explain the action of three position controller mode. **[4]**

c) Explain discrete control system with neat diagram. **[4]**

Q4) Attempt any two of the following:

a) What is transducer? Explain the function of **[6]**

i) Pressure thermometer and

ii) Digital revolution counter with neat diagram.

b) Explain the terms **[6]**

i) Process load and

ii) Self regulation.

c) Draw and explain multichannel data acquisition system using single A/D converter. **[6]**

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Total No. of Questions : 4]

P649

[5215]-470
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL - 346 (B) : Consumer Electronics
(2013 Pattern) (Paper - VI) (Semester - IV) (New Course) (Optional)

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

Instructions to the candidates:

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

Q1) Attempt all of the following:

a) Which microphone uses Built-in matching transformer. **[1]**

b) State the names of blocks used in public address system. **[1]**

c) What do you mean by SECAM used in colour TV transmission. **[1]**

d) State the names of switches used in Microwave oven. **[1]**

e) "Array of photo detector used in scanner defines the resolution of scan image" comment. **[2]**

f) State the importance of Hook Switch used in basic land line equipment. **[2]**

g) "Dot matrix printer is also called as Impact printer" comment. **[2]**

h) "Load cell is the first block used in Electronic weighing machine" comment. **[2]**

Q2) Attempt any two of the following:

a) With the help of neat diagram explain the working of Electrodynamic loudspeaker. **[4]**

b) Explain the working of monochrome TV receiver. **[4]**

c) Draw the block diagram of flat bed scanner and explain the working of scanner. **[4]**

Q3) Attempt any two of the following:

a) Draw the block diagram of base unit of cordless phone and explain the working of cordless phone. **[4]**

b) With the help of block diagram explain the working at cellular phone. **[4]**

c) What is the importance of oscillator circuit used in remote control. Explain the working of remote control. **[4]**

Q4) Attempt any two of the following:

a) Draw the Block diagram of Direct to home system and Explain the working. **[6]**

b) With the help of functiond block diagram explain the working of microwave oven. **[6]**

c) Draw the block diagram of Dot Matrix printer and explain each block. State advantages and disadvantages of DMP. **[6]**

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Total No. of Questions :4]

SEAT No. :

P650

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[5215] - 471

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS-401:Internal Security of India

(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 Sentences each: **[16]**

a) Define perspective planning.

b) What are the elements of a state?

c) Define sustainable development.

d) Define organized crime.

e) Write any two characteristics of insurgency.

f) Define human security.

g) State the meaning of SEZ.

h) Define national power.

Q2) Answer in 8 to 10 sentences each (any two): **[8]**

a) Explain social dimensions of internal security.

b) Discuss link between Governance and human security.

c) Discuss relationship between economic development and internal security.

P.T.O.

Q3) Write short notes on (any two): **[8]**

a) External Abetment.

b) Ethnic conflict.

c) Cross Border Terrorism.

Q4) Answer in 18 to 20 sentences (Any one): **[8]**

a) Explain the role of Governance in maintaining internal security.

b) Describe current security challenges to Northeast region of India.

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Total No. of Questions : 4]

SEAT No. :

P651

[Total No. of Pages : 1

[5215]-472
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 402 :Trend's in India's Defence Expenditure
(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 Sentences each. **[16]**

a) Define public good of Defence.

b) Define strategic control.

c) What do you mean by perspectives defence plan?

d) Define Zero budget.

e) Define performance budget.

f) Define operational Research.

g) Define Threat perception.

h) Define Economic Warfare.

Q2) Answer in 8 to 10 Sentences each (any two). **[8]**

a) Explain economic theories of Defence.

b) Discuss role of DPSU in India's defence production.

c) Describe structure of India's defence budget.

Q3) Write short notes on (any two). **[8]**

a) Functions of Ministry of defence.

b) India's defence spending since 1971.

c) DRDO

Q4) Answer in 18 to 20 sentences (Any one) **[8]**

a) Explain problems and prospects of India's Defence production.

b) Discuss characteristics of India's economy.

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Total No. of Questions :4]

SEAT No. :

P652

[Total No. of Pages :2

[5215] - 473

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS-404: Information Warfare and Cyber Security

(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 Sentences each **[16]**

a) Define cyber security

b) Define Information Warfare

c) Define sea warfare

d) Define war gaming

e) Define surveillance

f) Define E-commerce

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 information in defence management

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 Sea warfare

c) Information warfare as a Force Multiplier

Q4) Answer in 18 to 20 sentences (any one) **[8]**

a) Explain prospects of Information warfare

b) Discuss strategic significance of information warfare

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Total No. of Questions : 4]

SEAT No. :

P653

[Total No. of Pages : 1

[5215]-474

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

Ds-No : 405 Defence Production & Logistics in India

(Semester-IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each. **[16]**

a) What do you mean by Defence Production?
b) Write the long form of "MOD".
c) What do you understand by make in India?
d) What do you mean by O.F.?
e) Define "National Development".
f) State any two establishment of DPSU.
g) Define "Foreign collaboration".
h) State the meaning of Logistics.

Q2) Answer in 8 to 10 sentences (Any two). **[8]**

a) Write a few lines on - "Just in time concept".
b) Discuss in short the functions of Department of Defence Production.
c) Explain in brief the concept of "DPSU."

Q3) Write short notes on (Any two). **[8]**

a) Problems of Foreign collaboration.
b) Goaship yard limited goa.
c) Supply Chain Management.

Q4) Answer in 16 to 20 sentences (Any one). **[8]**

a) Write an essay on "Rational of defence Production in India".
b) Explain the role of DRDO in modernisation of Indian Armed Forces.

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Total No. of Questions : 4]

SEAT No. :

P654

[Total No. of Pages : 4

[5215]-475
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 406 (A) : Defence Journalism & National Security
(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full Marks.***

Q1) Answer in 2 to 4 Sentences each. **[16]**

a) 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.

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Total No. of Questions : 4]

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[5215]-475
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 406(B) : Gender Based Conflicts & Human Rights
(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

1) ***All Questions are Compulsory.***
2) ***Figures to the Right indicate full Marks.***

Q1) Answer in 2 to 4 Sentences each. **[16]**

a) Define Human Rights

b) Define 'positive peace'

c) Define Sustainable peace Building

d) State the meaning of Geopolitical Region

e) Define Feminist Perspectives

f) What does childred rights mean?

g) Define Gender Discrimination

h) Define 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.

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Total No. of Questions : 4]

SEAT No. :

P655

[Total No. of Pages : 4

[5215]-476
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 407 (A) : Role of the Armed Forces in Disaster Management
(2013 pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences each: **[16]**

a) Define natural Disaster.

b) What do you mean by Guidelines to Disaster Management?

c) Define Environmental Disaster.

d) Define Nuclear Warfare.

e) Define Global warming.

f) Define Strategic Control.

g) Define sustainable development.

h) What are the difficulties of post - disaster management?

Q2) Answer in 8 to 10 Sentences each (any two) **[8]**

a) Explain challenges to Disaster management.

b) Discuss role of civil population in Disaster Relief.

c) Describe Roles of State Government in Disaster Management.

P.T.O.

Q3) Write short notes on (any two) **[8]**

a) Structure of NDRF.

b) Role of Local Civil Administration in Disaster Relief.

c) Role of Army in Disaster Relief.

Q4) Answer in 18 to 20 sentences (Any one) **[8]**

a) Describe Link between Disaster and National security.

b) Write a note on the Role of State Government in Disaster Relief.

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Total No. of Questions : 4]

P655

[5215]-476
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 407 (B) : Global Security - II
(2013 pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each: **[16]**

a) State the meaning of N.P.T.

b) What do you understand by Nuclear Proliferation.

c) How you would like to define Global Security?

d) What is the right status U.N. or U.N.O.?

e) State the meaning of PM-5.

f) What do you understand by Nuclear club?

g) What do you mean by Nuclear Arsenal?

h) State the meaning of Veto.

Q2) Answer in 8 to 10 Sentences each (any two) **[8]**

a) Discuss in brief an attempts of Non-Nuclear proliferation.

b) How a “Nuclear Arsenal of super power” is a threat to global security?

c) Discuss in short Chinas Indian ocean policy.

Q3) Write short notes on (any two) **[8]**

a) Significance of C.T.B.T.

b) Chinese policy of containment.

c) Peaceful-progressive uses of Nuclear energy.

Q4) Answer in 16 to 20 sentences (Any one) **[8]**

a) Evaluate the chinese policy of “catchment” in South Asia with special reference to power race with India.

b) “At present South China Sea is the “Escalation point” which may lead the third world war” Do you agree? Justify your answer.

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Total No. of Questions :4]

SEAT No. :

P656

[Total No. of Pages :4

[5215] - 477

T.Y.B.Sc.

DEFENCE & STRATEGIC STUDIES

DS - 408 (A) : Indian Military Strategy (1947 - 2014)

(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each: **[16]**

a) Why India intervene in Kashmir during 1947-48?

b) State the meaning of "Ceasefire".

c) Who gave the military assistance to pak during 1965?

d) Why Chinese launched an attack on India during 1962?

e) State the basic reason for Indo-Pak war of 1947-48.

f) What do you know about Tashkand agreement?

g) What do you know about National Conference?

h) Who brought the ceasefire between India-Pakistan during war of 1947-48.

Q2) Answer in 8 or 10 sentences (Any two): **[8]**

a) Write a few lines on India-China Border Dispute.

b) What were the causes of Indo-Pak war of 1947-48.

c) Write few lines on "Unilateral ceasefire by China during 1962 war".

P.T.O.

Q3) Write short notes on (Any two): **[8]**

a) Role of U.S.A during Indo-Pak war of 1965.

b) Role of USSR during India-China war of 1962.

c) Impact of Indo-Pak war of 1947-48 at global level.

Q4) Answer in 16 to 20 sentences (Any one): **[8]**

a) Analyse the causes of Chinese aggression of 1962 against India.

b) Explain in detail the background of Indo-Pak war of 1965.

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Total No. of Questions :4]

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[5215] - 477

T.Y.B.Sc.

DEFENCE & STRATEGIC STUDIES

DS - 408 (B) : Indian Military Strategy (1680 - 1818)

(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each: **[16]**

a) Why Shivaji introduced Guerrilla Tactics?

b) Why Mughals gave a sanad to Maratha?

c) Between whom the battle of Panipat was fought?

d) What do you know about Bapu Gokhale?

e) Why Sambhaji was killed by Auragzeb?

f) Why Rajaram took Asylum at Jinji?

g) State any two demerits of Sambhaji.

h) State any two causes of downfall of Marataha.

Q2) Answer in 8 or 10 sentences (Any two): **[8]**

a) Write a few lines on 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) First Anglo-Maratha war.

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".

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Total No. of Questions : 4]

SEAT No. : ____

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[Total No. of Pages : 4

[5215]-478
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS 409(A) : United Nations Organisation
(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each. **[16]**

a) State the basic aim of U.N.O.

b) What is present status either it is U.N. or U.N.O.?

c) To whom we called world parliament?

d) Define "Human Rights".

e) State the date & year of establishment of UNO.

f) What do you mean peace keeping forces?

g) What do you understand by Veto?

h) State the meaning of disarmament.

Q2) Answer in 8 to 10 sentences(Any Two) **[8]**

a) Write in brief suggestions to strengthen U.N.

b) Explain in short U.N. character.

c) Explain the concept of "PM-5 of U.N.S.C."

P.T.O.

Q3) Write short notes on (Any Two): **[8]**

a) Objectives of U.N.O.

b) Arms control

c) U.N.E.P.K.F.

Q4) Answer in 16 to 20 sentences(Any one) **[8]**

a) Highlight on “Hindrance” for smooth functioning of U.N.

b) Discuss the role of U.N. for preservation of Human Rights.

Total No. of Questions : 4]

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[5215]-478
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS 409(B) : India's Maritime Security
(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 Sentences each. **[16]**

a) Define "National Security".

b) What do you mean by littoral countries?

c) Write the long form of E.E.Z.

d) State any two limitations of coast guard.

e) State any one name of Indias latest Aircraft carrer.

f) What do you know about L.T.T.E.?

g) State the meaning of "Maritime Trade".

h) What do you mean by "Continental Shelf".

Q2) Answer in 8 to 10 sentences(Any Two) **[8]**

a) Explain the concept of Maritime Security.

b) Write in brief characteristics of Indian Navy.

c) Highlight on the linkages between Territorial water and economic development of a country.

Q3) Write short notes on (Any Two): **[8]**

a) Sea Piracy

b) Nature of Maritime Boundaries.

c) Concept of Fixed Assets.

Q4) Answer in 16 to 20 sentences(Any one) **[8]**

a) Write an essay on 26/11 Mumbai attack through Maritime Route.

b) Explain the role of Indian Navy for Maritime vis-a-vis National Security.

Total No. of Questions :4]

SEAT No. :

P658

[Total No. of Pages :2

[5215] - 479

T.Y.B.Sc.

ENVIRONMENTAL SCIENCE

Aquatic Ecosystem and Management (Paper - I)

(2013 Pattern) (Theory) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Attempt the following in 1-2 lines each: **[10]**

a) Give two examples of commensalism in ecosystem.

b) What is edge effect.

c) Define parasitism.

d) Write two types of wetland ecosystem.

e) Give two examples of biotic community of limnetic zone.

f) Write two names of marine biotic comunities from pelagic zone.

g) What is continental drift.

h) Define spatial niche.

i) What is ecotype.

j) Define epilimnion.

Q2) Write a short note on ANY TWO of the following: **[10]**

a) Characteristics of lotic ecosystem.

b) Eco tourism.

c) Zonation of sea (Marine ecosystem).

P.T.O.

Q3) Answer ANY TWO questions from the following: **[10]**

a) Explain the stratification of lake environment.

b) Briefly explain importance of wetlands.

c) How GIS is useful in ecosystem management programme.

Q4) Attempt ANY ONE of the following: **[10]**

a) Briefly explain the importance of conservation and sustainable use of aquatic resource.

b) What is significance and threats to the mangroove ecosystem.

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Total No. of Questions : 4]

SEAT No. :

P659

[Total No. of Pages : 2

[5215]-480
T.Y. B.Sc.
ENVIRONMENTAL SCIENCE
Nature Conservation
(2013 Pattern) (Semester - IV) (Paper - II) (Theory) (New Course)

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

Instructions to the candidates:

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

Q1) Attempt the following in 1-2 lines each. **[10]**

a) Write name of any two authorities constituted under wildlife act.

b) What is meant by natural heritage?

c) How landscape approach is useful in species conservation?

d) What are protected areas?

e) Write name of any two protected areas categories of IUCN.

f) Mention any two functions of CPCB.

g) What are tiger farms?

h) What are the objectives of nature conservation?

i) What is the name of our national flower?

j) Write any two functional areas of Greenpeace.

Q2) Write a short note on ANY TWO of the following. **[10]**

a) Ecotourism.

b) In-situ Conservation.

c) Traditional Conservation Practices.

P.T.O.

Q3) Answer ANY TWO questions of the following. **[10]**

a) Which are the functional areas of various administrative organisations associated with nature conservation?

b) Discuss on the various initiatives taken for nature conservation in India.

c) What are the challenges associated with nature conservation?

Q4) Attempt ANY ONE of the following. **[10]**

a) Explain Ex-situ conservation methods with suitable examples. Also add a note on merits and demerits of these methods.

b) Discuss in detail role of any five international organisations in conservation of nature.

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Total No. of Questions : 4]

SEAT No. :

P660

[Total No. of Pages : 2

[5215]-481
T.Y.B.Sc.
ENVIRONMENTAL SCIENCE
Air and Soil Quality
(2013 Pattern) (Paper - III) (Semester - IV) (Theory) (New)

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

Instructions to the candidates:

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

Q1) Attempt the following in 1-2 lines each : **[10]**

a) Write name of methods used for estimation of nitrogen dioxide and sulphur dioxide.

b) What is meant by soil sickness?

c) Write any two health effects of petroleum pollutants.

d) Mention any two methods for remediation of soil.

e) Mention any two sources of indoor air pollution.

f) What are reasons behind soil erosion?

g) Write name of any two persistent organic pollutants of soil.

h) Mention any two effects of acid rain.

i) What was the reason behind London smog?

j) What is meant by soil texture?

Q2) Write a short note on any two of the following : **[10]**

a) Chernobyl Disaster.

b) Status of Air pollution in India.

c) Factors Influencing Soil structure.

P.T.O.

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

a) Write an account on role of GIS in management of soil resources.

b) Discuss in detail on effects of air pollution on plants and human health.

c) Which are the organic and inorganic pollutants generally available in soil environment?

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

a) Explain the methods used in estimation of any four soil parameters.

b) Discuss in detail methods used in estimation of nitrogen dioxide and sulphur dioxide.

Total No. of Questions : 4]

SEAT No. :

P661

[Total No. of Pages : 1

[5215]-482

T.Y.B.Sc.

ENVIRONMENTAL SCIENCE

Issues in Environmental Science - II

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

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

Instructions to the candidates:

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

Q1) Attempt the following in 1-2 lines each. **[10]**

a) Write full form of "CNG'.
b) What is Global warming?
c) Mention any two examples of Epidemiological diseases.
d) What is wetland?
e) Which is the causetive agent of Bhopal gas tragedy?
f) Enlist causes of desertification.
g) What is SEZ?
h) Write any two applications of Remote sensing.
i) What is cost benefit ratio?
j) Mention benefits of Rain water harvesting.

Q2) Write a short note on ANY TWO of the following. **[10]**

a) Parameters of Urban Land use policy in India.
b) Agenda - 21.
c) Chipko movement.

Q3) Answer ANY TWO questions of the following. **[10]**

a) Discuss Environmental problems associated with poverty.
b) Explain applications of GIS in Environmental Science.
c) Discuss Environmental issues of Eutrophic lakes.

Q4) Attempt ANY ONE of the following. **[10]**

a) What is waste land? Discuss causes & effects of waste land.
b) Define sustainable development. Discuss parameters of sustainable development explain major issues of sustainable growth in India.

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Total No. of Questions : 4]

SEAT No. :

P662

[Total No. of Pages : 2

[5215]-483
T.Y. B.Sc.
ENVIRONMENTAL SCIENCE
Environmental Governance and Equity: EMS & ISO 14000
(2013 Pattern) (Semester - IV) (Paper - V) (New Course) (Theory)

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 EIA?

b) Write a full form of 'CETP'.

c) What is generic standard?

d) Write the statement of article 48(A).

e) Mention important function of technical committee.

f) Write any two applications of ESR.

g) What is Environmental policy?

h) Write any two examples of renewable energy sources.

i) Write standard limit of Cod for inland discharge of effluent.

j) Enlist types of Environmental Audit.

Q2) Write a short note on ANY TWO of the following. **[10]**

a) Stages of EIA.

b) Applications of Environmental Economics.

c) Environmental Audit.

P.T.O.

Q3) Answer ANY TWO questions of the following. **[10]**

a) Discuss objectives of Notional Environmental Policy.

b) Explain guidelines of ISO 14001 standard.

c) Discuss role of NGO in Environmental governance.

Q4) Attempt ANY ONE of the following. **[10]**

a) What is EMS? Discuss role of EMS in implementation of ISO 14001 standard, Add a note on PDCA cycle.

b) Discuss need of Environmental governance in India. Explain issues associated with it.

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Total No. of Questions : 4]

SEAT No. :

P663

[Total No. of Pages : 2

[5215]-484
T.Y.B.Sc.
ENVIRONMENTAL SCIENCE
Environmental Biotechnology - II
(2013 Pattern) (Paper - VI) (Semester - IV) (Theory)

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) Define bioscrubber with suitable example.

b) Enlist the two names of aquatic biomass for biogans.

c) Define photolysis of hydrogen.

d) Define ex-situ bioremediation.

e) What is heap bioleaching process.

f) Define immobilization of enzymes.

g) Define bioagumentation.

h) Give full form of U ASB and FBR.

i) Give any two advantages of phytoremediation.

j) What are facultative anaerobic bacteria.

Q2) Write a short note on ANY TWO of the following: **[10]**

a) Biofiltration.

b) Microbial degradation of xenobiotion.

c) Activated sludge process.

P.T.O.

Q3) Answer ANY TWO questions from the following: **[10]**

a) What are the advantages of biomethanation of MSW.

b) Differentiate between bioleaching and metal precipitation.

c) Explain the merits and demerits of trickling filters.

Q4) Attempt ANY ONE of the following: **[10]**

a) Briefly explain the phytoremediation technique is a viable approach for waste water treatment.

b) Explain the various techniques used for heavy metals remov.

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Total No. of Questions :4]

SEAT No. :

P664

[Total No. of Pages :2

[5215] - 486

T.Y.B.Sc. (Vocational)

BIOTECHNOLOGY

Environmental Biotechnology and Bioinformatics

(2013 Pattern) (Semester - 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 in short : **[10]**

a) Name the bioreactors used in waste water treatment.

b) What is DDBJ?

c) Name two methanogens.

d) Define paralogues.

e) What is bio stimulation?

f) What is BLOSUM?

g) Give the composition of biogas.

h) Define orthologues.

i) Name the microbes used in hydrogen gas production?

j) What is BLAST?

P.T.O.

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

a) Describe the process of bioremediation.

b) What are literature databases? Explain any one literature database in brief.

c) Explain microbial degradation of pesticides.

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

a) NCBI

b) Ethanol production

c) EMBL

Q4) Answer any one in detail **[10]**

a) What are biofertilizers? Describe in detail the role of Nitrogen fixing and Phosphate solubilizing biofertilizers.

b) Describe in detail the protein sequence databases.

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Total No. of Questions :5]

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T.Y.B.Sc. (Vocational)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Entrepreneurship Development (Paper - V)

(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

1) ***Question number one is compulsory.***
2) ***Answer any three questions from the remaining questions.***
3) ***Provide suitable examples wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) What is an entrepreneur? How would analyze. Mr.Mukesh Ambni as an entrepreneur? **[10]**

Q2) What are the problems faced by women entrepreneurs? Are they valid today? **[10]**

Q3) Discuss the role of venture capital in supporting an Entrepreneur. **[10]**

Q4) Explain the various forms of organizations. **[10]**

Q5) Write short notes on any two of the following: **[10]**

a) Corporate culture

b) Sources of Finance

c) Small scale industry

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Total No. of Questions :4]

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[Total No. of Pages :2

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T.Y.B.Sc.

ELECTRONIC EQUIPMENT MAINTENANCE

Entrepreneurship Development (Paper - V)

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

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.***
4) ***Use of calculator is allowed.***

Q1) Answer all of the following:

a) Define the term entrepreneur. **[1]**

b) Define the term price. **[1]**

c) Define the term marketing. **[1]**

d) Define small scale industry (SSI). **[1]**

e) Innovation is a special tool for an entrepreneur. Comment. **[2]**

f) Marketing channels have a vital role to play in distribution of consumer goods. Comment. **[2]**

g) State first four sequential stages of project formulation. **[2]**

h) What is meant by the term fixed capital? **[2]**

Q2) Answer any <u>two</u> of the following:

a) Explain relative merits and demerits of partnership. **[4]**

b) Explain various types of entrepreneurs. **[4]**

c) Discuss payment of wages act. **[4]**

P.T.O.

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

a) Explain the meaning of technical feasibility of a project. **[4]**

b) Discuss SWOT analysis. **[4]**

c) Explain any two pricing strategies. **[4]**

Q4) Answer any <u>two</u> of the following:

a) Explain marketing mix in detail. **[6]**

b) Explain the content of project report. **[6]**

c) Explain different types of small scale industries. **[6]**

OR

Write short notes on the following:

a) Interpersonal relationships and communication skills. **[4]**

b) Angel finance and venture capital. **[4]**

c) Breakeven point analysis. **[4]**

EEE

Total No. of Questions :4]

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T.Y.B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

VOC-IND-MIC-345: Molecular Biology and Recombinant DNA Technology

(2013 Pattern) (Theory) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All question carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***

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

a) Which vector was used in HGP?

b) What is LacZ alpha complementation?

c) Maximum size of DNA that can be inserted in Phage replacement vector is _____.

d) _____ enzyme is required for making cDNA.

e) Dideoxy method of sequencing was developed by _____.

f) Name any two examples of recombinant proteins.

g) What is a primer?

h) The size of human genome is _____ bp.

i) Name any two modifications of PCR.

j) What is VNTR?

P.T.O.

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

a) What is DNA fingerprinting? Comment on its applications.

b) Write a short note on production of various useful molecules by use of Recombinant DNA Technology.

c) What is chain termination method of sequencing?

Q3) Comment on (any two of the following): **[10]**

a) BAC as vectors.

b) Kunkels method of site directed mutagenesis.

c) Steps involved in cloning.

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

a) What are transgenic plants? Explain in detail vector dependent and vector independent methods of gene transfer to plants.

b) What is PCR? Elaborate on its principle, working and applications.

EEE

Total No. of Questions :4]

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T.Y.B.Sc. (Vocational)

SEED TECHNOLOGY

VOC-ST-321: Entrepreneurship Development (Paper-III)

(2013 Pattern) (Semester - IV)

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 labelled diagrams wherever necessary.***

Q1) Answer in one sentence: **[10×1=10]**

a) What is entrepreneurship?

b) Give the full form of VAT.

c) What is co-operative organisation.

d) Define cash flow.

e) What is marketing mix?

f) What is break even point?

g) Give the importance of job skill training.

h) Name any one funding agency.

i) Write the importance of consultancy.

j) Mention any one type of entrepreneur.

P.T.O.

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

a) Explain the role of pollution control board.

b) Give an account on the partnership in business organisation.

c) What is marketing? Give the scope and importance.

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

a) Human resource management.

b) State Industrial Development Bank (SIDBI).

c) Entrepreneurial culture.

Q4) Explain in detail how the placement of skilled personnel is done in business organisation. **[10]**

OR

Write an account on any two funding agencies for the development of entrepreneurship.

EEE

Total No. of Questions : 4]

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T.Y.B.Sc. (Vocational)
BIOTECHNOLOGY
Entrepreneurship Development
(2013 Pattern) (Semester - IV) (Paper-II)

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

Instructions to the candidates:

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

Q1) Answer the following questions in short. **[10]**

a) What is pricing?

b) What is VAT?

c) Enlist any four objectives of HR function.

d) Enlist any four ways to deal with stress.

e) What are co-operative banks?

f) What is meant by WAC?

g) What is break-even point?

h) What is TDS act?

i) What is DIC?

j) What is SISI?

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

a) What are the barriers to entrepreneurship? Explain the means to reduce then.

b) Explain the important points to be mentioned while drafting an appointment letter and an experience certificate.

c) What are the different forms of business organizations? Explain any two forms.

P.T.O.

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

a) Market surrey as a tool.

b) Private sources of finance.

c) Characteristics of an entrepreneur.

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

a) Discuss marketing with reference to marketing strategy, market segmentation and marketing channels.

OR

b) What are the components of a project Report? Discuss in detail.

Total No. of Questions : 6]

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T.Y.B.Sc. (Vocational)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Radio Software

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

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

Instructions to the candidates:

1) ***Attempt any four questions.***
2) ***Figures to the right indicate full marks.***

Q1) What is the difference between ‘ writing for Print’ and ‘writing for Radio’? Discuss important points for radio writing. **[10]**

Q2) What are the critical points to be observed in a live OB programme? **[10]**

Q3) Elaborate important factors you should consider while anchoring a discussion programme. **[10]**

Q4) Write a dialogue for three minutes duration on any one of the following situations. **[10]**

A girl is having her last year BA examination. She is watching a TV serial. Her mother asks her to switch off the TV. The girl argues.

Q5) You are invited to deliver a radio talk on ‘I will help keeping my city clean’. Discuss how will you begin and illustrate. **[10]**

Q6) Select one of the following themes for a special programme on Radio. Suggest three songs and suitable narration. **[10]**

a) One singer
b) Patriotism
c) Moon

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Total No. of Questions : 4]

SEAT No. : ____

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T.Y.B.Sc. (Vocational)

ELECTRONIC EQUIPMENT AND MAINTENANCE

Medical Instrumentation

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

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

Instructions to the candidates:

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

Q1) Answer the following.

a) What is ECG? **[1]**

b) State the function of SA node. **[1]**

c) What is mean by bioelectric potential? **[1]**

d) What is the cause of epilepsy? **[1]**

e) What is surface electrode? Give one example. **[2]**

f) State the components of reflex arc. **[2]**

g) Draw the waveforms of EEG. **[2]**

h) State any two subsystems in human body. **[2]**

Q2) Answer any two of the following:

a) Explain basic recording system is biomedical instrumentation. **[4]**

b) Discuss ion selective electrode. **[4]**

c) Explain 'Fibrillation' and 'Defibrillation'. Which electrodes are used as defibrillators? **[4]**

P.T.O.

Q3) Answer any two of the following:

a) What are the necessary characteristics of micro-electrodes. **[4]**

b) Discuss electrode arrays. **[4]**

c) Write a short note on direct writing recorders. **[4]**

Q4) Answer the following:

a) Discuss macro-shock hazards. **[6]**

b) Discuss the noise and bandwidth considerations for bioelectric recorder amplifier. **[6]**

OR

Q4) Answer the following:

a) Discuss flame photometer. **[4]**

b) Explain physiological effects of electric current. **[4]**

c) Explain blood-cell counter. **[4]**

Total No. of Questions : 4]

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T.Y.B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

VOC - IND - MIC - 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) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

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

a) Answer the following questions in 1-2 lines.

i) What is Service Tax?

ii) Write full form of SISI.

iii) Who is a Sleeping Partner in a partnership firm?

iv) Define Partnership

v) What is Cash Flow Statement?

b) Match the pairs.

Group "A"	Group "B"
Maharashtra State Co-operative Societies Act	1944
The Central Excise Act	1960
Payment of Wages Act	Direct Tax
Service Tax	1936
Income Tax	Finance Act

P.T.O.

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

a) Distinguish between a Company and a Partnership Firm.

b) Explain the Nature of Marketing Strategy.

c) Write a note on Digital Marketing.

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

a) Write a note on Payment of Wages Act.

b) Write a note on key elements of entrepreneur.

c) Write Demerits of Joint Stock Company.

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

a) What is marketing? Explain scope and importance of Marketing.

b) What is a Co-operative Society? Explain its features.

Total No. of Questions : 4]

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T.Y.B.Sc. (Vocational)

SEED TECHNOLOGY

VOC - ST - 322: Biotechnology and Intellectual Property Rights

(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 labelled diagrams wherever necessary.***

Q1) Answer in one sentence each. **[10 × 1 = 10]**

a) Give the scope of Biotechnology.

b) Write full form of RAPD.

c) Define plasmid.

d) What is western Blotting?

e) Define Explant.

f) Give one example of Transgenic plant.

g) Define patent.

h) What is WTO?

i) Define Tissue, culture.

j) Enlist aids to variety identification.

Q2) Answer the following (Any two). **[2 × 5 = 10]**

a) Give the uses of DNA finger printing.

b) Describe in detail Southern Blotting.

c) Give applications of Transgenics.

P.T.O.

Q3) Write Notes on any two of the following. **[2×5= 10]**

a) Cosmid vectors.

b) Anther culture.

c) Protection of IPR.

Q4) Give an account on the production of synthetic seeds. **[10]**

OR

Explain in detail PCR technique for varietal identification.