Total No. of Questions : 4]

SEAT No. :

P384

[Total No. of Pages : 3

[5422]-401
T.Y. B.Sc.
MATHEMATICS
MT-341 : Complex Analysis
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

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

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

a) Use properties of conjugate and moduli to show that $\left|(2\bar{z}+5)\left(\sqrt{2}-i\right)\right|=\sqrt{3}\,|2z+5|$.

b) Suppose that $f(z) = x^2 - y^2 - 2y + i(2x - 2xy)$, where $z = x + iy$. Write $f(z)$ in terms of z and simplify the result.

c) Find $f'(z)$ when $f(z)=\dfrac{z-1}{2z+1}\left(z\neq-\dfrac{1}{2}\right)$.

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

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

f) Let C denote the line segment from $z = i$ to $z = 1$. Without evaluating the integral show that $\left|\int_C \dfrac{dz}{z^4}\right|\leq 4\sqrt{2}$.

g) Find the residue at $z = 0$ of the function $f(z)=\dfrac{z-\sin z}{z}$.

P.T.O.

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

a) 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) then show that $f'(z_0)$ exists.

b) If $f'(z)=0$ everywhere in a domain D then show that $f(z)$ must be constant throughout D.

c) Find the roots of the equation $z^2 + 2z + (1 - i) = 0$.

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

a) Let the function $f(z) = u(r, \theta) + iv(r, \theta)$ be analytic in a domain D that does not include the origin. Using the Cauchy Riemann equations in polar coordinates and assuming continuity of partial derivatives, show that, throughout D, the function $u(r, \theta)$ satisfies the partial differential equation $r^2u_{rr}(r, \theta) + ru_r(r, \theta) + u_{\theta\theta}(r, \theta) = 0$.

b) i) Show that if e^z is real then Im $z = n\pi$ $(n = 0, \pm 1, \pm 2, ...)$.

ii) If e^z is pure imaginary, what restriction is placed on z?

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

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

a) i) Evaluate $\int_C f(z)dz$ where $f(z)$ is defined by the equation

$$f(z)=\begin{cases} 1 & \text{when } y<0 \\ 4y & \text{when } y>0 \end{cases}$$ and C is the arc from $z = -1 - i$ to $z = 1 + i$ along the curve $y = x^3$.

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

b) i) State and prove Cauchy's residue theorem.

ii) Let C be the circle $|z|=3$ described in the positive sense. Show that if $g(w)=\int_C \frac{2z^2-z-2}{z-w}dz$ $(|w|\neq 3)$ then $g(2)=8\pi i$. What is the value of $g(w)$ when $|w|>3$?

Total No. of Questions : 4]

SEAT No : ____

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[Total No. of Pages :3

[5422]-402
T.Y.B.Sc.
MATHEMATICS
MT - 342 : Real Analysis - 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) If A and B are two sets such that A is not of measure zero, $B \subset A$ and B is of measure zero, then prove that A–B is not of measure zero.

b) State whether the function *f* defined by

$$f(x) = \begin{cases} \sin\dfrac{1}{x}, & 0 < x \le 1 \\ 2017, & x = 0 \end{cases}$$ is in $\mathbb{R}[0,1]$? Justify.

c) If $f \in \mathbb{R}[a,b]$ and if $f(x) \ge 0$ almost everywhere $a \le x \le b$, then prove that $\int_a^b f \ge 0$.

d) Define the uniform convergence of a sequence of real valued functions.

e) Show that the series $\sum_{n=1}^{\infty} \frac{1}{n^2 + x^2}$ $(0 \le x < \infty)$. Converges uniformly on $[0, \infty]$.

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

g) Find C.P.V. of $\int_{-\infty}^{\infty} x^3 \, dx$.

P.T.O.

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

a) Evaluate using Riemann integral:

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

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

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

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

a) Let f be a bounded function on the closed bounded interval $[a, b]$. If $f\in\mathbb{R}[a,b]$, then prove that f is continuous at almost every point in $[a, b]$.

b) If $\sum_{n=0}^{\infty}|a_n|<\infty,$ then prove that $\int_0^1\left(\sum_{n=0}^{\infty}a_nx^n\right)dx=\sum_{n=0}^{\infty}\frac{a_n}{n+1}$.

c) If f is continuous on $(-\infty,\infty)$ and if $\int_{-\infty}^{\infty}f(x)dx$ converges to A, then prove that $\mathrm{C.P.V.}\int_{-\infty}^{\infty}f(x)dx=\mathrm{A}$.

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

a) (i) If f is continuous on the closed bounded interval $[a, b]$ and if $F(x) = \int_a^x f(t)dt \ (a \le x \le b)$, then prove that $F'(x) = f(x) \ (a \le x \le b)$.

Further, if $f(x) > 0 \ (a \le x \le b)$, then prove that F is strictly increasing on $[a, b]$.

(ii) Let $f_n(x) = \frac{x^n}{1+x^n} \ (0 \le x \le 1)$. Show that $\{f_n\}_{n=1}^{\infty}$ converges pointwise on [0, 1]. Is it converge uniformly on [0, 1]? Justify.

b) (i) If $\{f_n\}_{n=1}^{\infty}$ is a sequence of functions in $\mathbb{R}[a,b]$ and if $\{f_n\}_{n=1}^{\infty}$ converges uniformly to f on $[a, b]$, then prove that f is also in $\mathbb{R}[a,b]$.

(ii) Prove that μ-test for improper integral of second kind.

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Total No. of Questions : 4]

SEAT No. :

P386

[Total No. of Pages :3

[5422]-403
T.Y.B.Sc.
MATHEMATICS
MT - 343 : Problem Course Based on MT - 341& MT - 342
(2013 Pattern) (Semester - IV) (Paper - III)

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

Instructions to the candidates:

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

SECTION - I
(Complex Analysis)

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

i) Show that $\lim_{z\to 0}\left(\frac{z}{\overline{z}}\right)^2$ does not exist.

ii) Show that $\left|\exp\left(z^2\right)\right| \le \exp\left(\left|z\right|^2\right)$.

iii) Evaluate $\int_C \frac{z+2}{z}dz$, where C is given by $z(t) = 2e^{it}\ (0 \le t \le 2\pi)$.

iv) Obtain the Maclaurin series representation

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

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

i) het C be the arc of the circle $|z| = 2$ from $z = 2$ to $z = 2i$ that lies in the first quadrant. Show that $\left|\int_C \frac{z+4}{z^3-1}dz\right| \le \frac{6\pi}{7}$.

ii) When $0 < |z| < 4$, show that $\frac{1}{4z-z^2} = \frac{1}{4z} + \sum_{n=0}^{\infty}\frac{z^n}{4^{n+2}}$

P.T.O.

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

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

b) Find the value of the integral $\int_C \frac{\cosh \pi z}{z(z^2+1)}dz$ when C is the circle $|z|=2$ described in the positive sense.

c) Show that $Log(-1+i)^2 \neq 2Log(-1+i)$.

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 if $g(x)=f(x)$ at almost every $x\in(0,1)$, then g is continuous almost everywhere in (0,1).

ii) If $f(x)=\int_0^x \sqrt{t+t^6}\,dt$ ($x>0$), find $f'(2)$.

iii) Give an example of a sequence of Riemann integrable functions that convergs to Riemann integrable function, where the convergence is not uniform.

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

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

i) Show that the set of all rational numbers is of measure zero.

ii) Without finding the sum $f(x)$ of the series

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

show that $f'(x)=2\,x\,f(x)$ $(-\infty<x<\infty)$.

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

a) If f is continuous on the closed bounded interval $[a, b]$ such that $f(x) \geq 0$ $(a \leq x \leq b)$ and $f(c)>0$ for some $c \in [a, b]$, prove that $\int_a^b f(x)dx > 0.$

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

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

Total No. of Questions :4]

SEAT No. :

P387

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[5422] - 404

T. Y. B. Sc.

MATHEMATICS

MT- 344: Ring Theory

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

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

Instructions to the candidates:

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

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

a) The set $\{0,2,4\}$ under addition and multiplication modulo 6 has unity element. Find it.

b) List all zero divisors in the ring $\mathbb{Z}_{18}$.

c) Determine whether $f(x) = x^2 + x + 1$ is irreducible over $\mathbb{Z}_5$.

d) Give an example of infinite integral domain that has characteristic 5.

e) Find all maximal ideals in $\mathbb{Z}_{30}$.

f) Show that $2\mathbb{Z} \cup 3\mathbb{Z}$ is not subring of $\mathbb{Z}$.

g) Show that l–i is irreducible in $\mathbb{Z}$[i].

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

a) If p is a prime, then show that $\mathbb{Z}_p$ is a field.

b) Prove that, the cancellation laws hold in a ring R if and only if R has no divisors of zero.

c) Using Fermat's theorem, find the remainder of 37^{49} when it is divided by 7.

P.T.O.

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

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

b) If R is a ring with unity 1, then prove that the map $\phi: \mathbb{Z} \to R$ given by $\phi(n) = n \cdot 1$ for $n \in \mathbb{Z}$ is a homomorphism of $\mathbb{Z}$ into R.

c) If A and B are ideals of a ring R, the sum A+B of A and B is defined by $A+B = \{a+b \mid a \in A, b \in B\}$. Show that A+B is an ideal of R.

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

a) i) State and prove Eisenstein criterion.

ii) If a and b are associates then prove that $\langle a \rangle = \langle b \rangle$.

b) i) Prove that every Euclidean domain is a principal ideal domain.

ii) Determine all units in $\mathbb{Z}[i]$. Justify your answer.

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Total No. of Questions : 4]

SEAT No. :

P388

[Total No. of Pages : 2

[5422]-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) Test the integrability of the following equation:

$$\left(y^2+xz\right)dx+\left(x^2+yz\right)dy+3z^2\,dz=0$$

b) Eliminate the arbitrary function F from the equation Z=F(x/y) and find the corresponding partial differential equation.

c) Define the term : complete integral.

d) Find the integral curves of $\frac{dx}{y-z}=\frac{dy}{z-x}=\frac{dz}{x-y}$.

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

f) Find the complete integral of $p+q-pq=0$

g) Define the term : Exact Pfaffian differential equation.

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

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

b) Verify that the equation $x\left(y^2-1\right)dx+y\left(x^2-z^2\right)dy-z\left(y^2-1\right)dz=0$ is integrable and solve it.

c) Find the orthogonal trajectories on the surface $x^2+y^2+2fyz+d=0$ of its curves of intersection with planes parallel to the plane XOY.

P.T.O.

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

a) Show that if one integrating factor of the Pfaffian differential equation $X_1 dx_1 + X_2\, dx_2 + ... + X_n\, dx_n = 0$ is given then we can find an infinitely many integrating factors.

b) Find integral curves of the equation : $\frac{dx}{x(y-z)} = \frac{dy}{y(z-x)} = \frac{dz}{z(x-y)}$

c) Find complete integral of $pxy + pq + qy = yz$.

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

a) Explain the methods of solving following type of first order partial differential equations:

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

ii) $g(x, p) = h(y, q)$

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

ii) Show that the equations

$f = xp - yq - x = 0$

$g = x^2 p + q - xz = 0$

are compatible and find a one parameter family of common solutions.

Total No. of Questions : 4]

SEAT No. :

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[5422]-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) Give an example of a ring in which some prime ideal is not a maximal ideal. Justify.

ii) Construct a multiplication table for $\mathbb{Z}_2[i]$, the ring of Gaussian integers modulo 2.

iii) Find a subring of $\mathbb{Z} \times \mathbb{Z}$ that is not an ideal of $\mathbb{Z} \times \mathbb{Z}$.

iv) Is $1 + x + x^2 + x^3 + x^4$ reducible over Q? Justify.

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

i) Show that a division ring contains exactly two idempotent elements.

ii) Obtain quotient and remainder when $f(x) = x^4 - 3x^3 + 2x^3 + 4x - 1$ is divided by $g(x) = x^2 - 2x + 3$ in the ring $\mathbb{Z}_5[x]$.

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

a) Find all solutions of the congruence $15x \equiv 27 \pmod{18}$.

b) Prove that if D is an integral domain then D[x] is an integral domain.

c) 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 $N(\rho) < N(\beta)$.

P.T.O.

SECTION - II

(Partial Differential Equations)

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

i) Find the integral curves of the equations $\frac{dx}{y} = \frac{dy}{x} = \frac{dz}{xy\,z^2\left(x^2 - y^2\right)}$.

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

iii) Solve the equation $a^2y^2z^2dx + b^2x^2z^2dy + c^2x^2y^2dz = 0$ by variable separable method.

iv) Show that the differential equation $(2x + y^2 + 2xz)dx + 2xy\,dy + x^2\,dz = 0$ is integrable.

v) Find a complete integral of clairaut's partial differential equation $z = px + qy + pq$.

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

i) Show that the differential equation $(y^2 + z^2)dx + xy\,dy + xz\,dz = 0$ is integrable and find its primitive.

ii) Find the general solution of $y^2p - xyq = x(z - 2y)$.

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

a) Find the complete integral of $p_1^3 + p_2^2 + p_3 = 1$ by using Jacobi's method.

b) Find the complete integral of $p = \left(z + qy\right)^2$ by using Charpit's method.

c) Find the orthogonal trajectories of the straight lines with slope and y-intercept equal.

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Total No. of Questions : 4]

SEAT No. : ____

P390

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[5422] - 407

T.Y.B.Sc.

MATHEMATICS

MT- 347 (A): Optimization Techniques

(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 indicates full marks.***

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

a) Define two person zero sum game and strictly determinable game.

b) What is replacement problem? Describe some important replacement situations.

c) Explain any two assumptions made while dealing with sequencing problem.

d) What is float? What are the different types of floats?

e) What is meant by the term critical activity and why is it necessary to know about this term?

f) Find the stationary points of $f(y) = y^4$ and examine whether the function is maxima or minima.

g) State the rules for determining the saddle points.

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

a) A readymade garments manufacture has to process seven items through two stages of production Viz cutting and sewing. The time taken for each of these items at the different stages are given below in appropriate units.

Item		1	2	3	4	5	6	7
Process	Cutting	5	7	3	4	6	7	12
Time	Sewing	2	6	7	5	9	5	8

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

Also find the idle time for sewing.

P.T.O.

b) A firm is considering the replacement of a machine, whose cost price is Rs. 12,200 and its scrap value is Rs. 200. From experience the running costs are found to be as follows.

Year	1	2	3	4	5	6	7	8
Running cost (Rs.)	200	500	800	1,200	1,800	2,500	3,200	4,000

when should the machine be replaced?

c) Find the extreme points of the function:

$f(x_1, x_2) = x_1^2 + 5x_2^2 + 7x_1x_2^2$.

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

a) Obtain the optimal strategies for both person and the values of game for the two person zero sum game whose payoff matrix is as follows.

Player A	Player B	
	B_1	B_2
A_1	1	–3
A_2	3	5
A_3	–1	6
A_4	4	1
A_5	2	2
A_6	–5	0

b) Solve the following game. The payoff is for player A.

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	2	–2	4	1
	A_2	6	1	12	3
	A_3	–3	2	0	6
	A_4	2	3	7	1

c) Construct the project network for the following project.

Activity	A	B	C	D	E	F	G
Predecessor (s)	-	-	-	A, B	A, B	C, D, E	C, D, E

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

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

Activity	Optimistic	Most likely	Pessimistic
1-2	2	4	6
1-3	6	6	6
1-4	6	12	24
2-3	2	5	8
2-5	11	14	28
3-4	15	24	45
3-6	3	6	9
4-6	9	15	27
5-6	4	10	16

i) Draw the project network.

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

b) A project consists of 9 activities with following constraints. A < D, E; B, D < F; C < G, B < H, F, G < I. The time (in days) for each task is given below.

Tasks	A	B	C	D	E	F	G	H	I
Time	23	8	20	16	24	18	19	4	10

i) Draw a network diagram for the project.

ii) Find a critical path and project completion time.

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Total No. of Questions : 4]

SEAT No :

P391

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[5422]-408
T.Y. B.Sc.
MATHEMATICS
MT-347 (B) Differential Geometry
(Semester - IV) (2013 Pattern) (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 following curve is unit speed $\overline{\gamma}(t)=\left(\frac{1}{3}(1+t)^{\frac{3}{2}},\frac{1}{3}(1-t)^{\frac{3}{2}},\frac{t}{\sqrt{2}}\right)$.

b) Is the curve $\overline{\gamma}(t)=\left(\cos^2 t,\sin^2 t\right),-\infty<t<\infty$ regular? Justify.

c) Define - simple closed curve and given an example of a simple closed curve.

d) Show that every plane in $\mathbb{R}^3$ is a smooth surface.

e) Show that second fundamental form of a plane is zero.

f) Find the equation of the tangent plane of the following surface patch at (1,0,1) $\sigma(\gamma,\theta)=(\gamma\cosh\theta,\gamma\sinh\theta,\gamma^2)$

g) Define geodesics

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

a) State and prove Frenet - serref equations.

b) Let γ be a unit speed curve in $\mathbb{R}^3$ with constant curvature and zero torsion. Prove that γ is a (part of) a circle.

c) Let $\overline{\gamma}(t)$ be a regular curve in $\mathbb{R}^3$. Prove that its curvature is $\kappa=\frac{\left\|\ddot{\overline{\gamma}}\times\dot{\overline{\gamma}}\right\|}{\left\|\dot{\overline{r}}\right\|^3}$, where X indicates the cross product and dot denotes $\frac{d}{dt}$

P.T.O.

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

a) Determine the area of the part of the paraboloid $z = x^2 + y^2$ with $z \leq 1$.

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

c) Find the first fundamental form of the surface

σ(U,V)=(sinhU sinh V, sinh U cosh V, sinh U) .

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

a) i) Show that every isometry is an conformal map. Give an example of a conformal map that is not a isometry.

ii) If $\bar{\gamma}(t) = \sigma(U(t), V(t))$ is a unit speed curve on a surface patch σ, then prove that its normal curvature is given by

$\kappa_n = L\dot{U}^2 + 2M\dot{U}\dot{V} + N\dot{V}^2$, where $LdU^2 + 2MdUdV + NdV^2$ is the second fundamental form of σ.

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

ii) By applying the isoperimetric inequality to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, prove that

$\int_0^{2\Pi} \sqrt{a^2 \sin^2 t + b^2 \cos^2 t}\ dt \geq 2\Pi\sqrt{ab}$ with equality holding iff $a=b$.

Total No. of Questions :4]

SEAT No. :

P392

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[5422] - 409

T.Y.B.Sc.

MATHEMATICS

MT - 347 (C) : C - Programming - II

(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) What is meant by the scope of a variable within a program?

b) What is the relationship between the address of a variable V and the corresponding pointer variable PV?

c) Explain the meaning of the following declaration?

double *x[10];

d) Declare two pointer whose objects are the integer variables i and j.

e) Define a structure consisting of two floating - point members, called 'real' and imaginary'. Include the tag 'complex' within the definition.

f) What is the purpose of fopen() function?

g) Write any three bitwise assignment operatiors.

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

a) Explain the relation between pointers and one dimensional arrays.

b) Explain static and register variables.

P.T.O.

c) Describe the output of the following C program.

```
#include <stdio.h>
main ( )
{
  Static int a[5] = {10, 11, 12, 13, 14};
  int i;
 for (i = 0; i < = 5; ++i)
 Print f ("\n i =%d  x[i] = %d *(x+i) = %d", i, x[i], *(x+i));
}
```

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

a) Write a short note on fscan f() function.

b) Explain structure with an example.

c) Write a C program to generate successive Fibonacci numbers.

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

a) i) Write a C program to count number of characters in a text file.

ii) Trace the output of the following program.

```
# include <stdio.h>
int f(int * p)
 {
    * p = * p+2;
    return *p;
 }
int main ()
 {
   int a = 2, b, c;
   b = f (& a);
   c = f (& b);
   Print f("a = %d, b = %d, c = %d", a, b, c);
 }
```

b) i) Describe the bitwise operators.

ii) A C program contains the following declaration.

int x[10] = {2, 4, 6, 8, 10, 12, 14, 16, 18, 20};

iii) What is the meaning of x and (x+2)?

iv) What are the values of *x + 2, * (x + 2) and * x + 3?

♦ ♦ ♦

Total No. of Questions :4]

SEAT No. :

P393

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[5422] - 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 complete graph and regular graph.

b) Draw the diagram of a complete tripartite graph $K_{2,3,3.}$

c) Draw all trees on 5 vertices.

d) Let G be a connected graph. If G has 17 edges then what is the maximum possible number of vertices in G?

e) Give an example of a graph which is Hamiltonian but not Euterian.

f) For what values of n, the graph K_n, a complete graph on n vertices, is Eulerian as well as Hamiltonian.

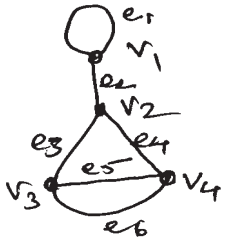
g) Define directed graph. Draw complete directed graph on three vertices.

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

a) Prove that if G is a self complementary graph with n vertices than n is either 4t or 4t+1 for some integer t.

b) What is the smallest number n such that the complete graph K_n has at least 500 edges?

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



P.T.O.

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

a) Let G be a graph with n vertices. Prove that following statements are equivalent.

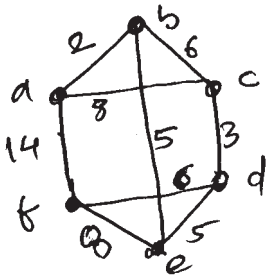
i) G is tree

ii) G is an a cyclic graph with n-1 edges

iii) G is connected graph with n-1 edges.

b) Let G be a graph with n vertices, q edges & W(G) number of connected components. Prove that $q \geq n - w(G)$

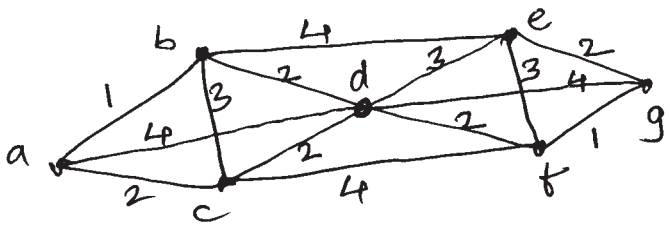
c) Use Dijkstra's algorithm to find the length of the shortest path from the vertex 'a' to each of the other vertex on the following connected weighted graph.



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

a) i) Prove that a connected graph G has an Euler trail if and only if it has at most two odd vertices.

ii) Solve the chinese Postman problem for the following graph.



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

ii) Define Indegree and out degree of a vertex. Prove that, it D is a digraph with n vertices. $v_1, v_2, \ldots v_n$ and q arcs then

$$\sum_{i=1}^{n} id(vi) = \sum_{i=1}^{n} od(vi) = q$$

Total No. of Questions : 4]

SEAT No. :

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[5422]-411
T.Y. B.Sc.
MATHEMATICS
MT – 347(E) : Lebesgue Integration
(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) Define outer and inner measure of a set $E \subset [a, b]$.

b) Does there exist a non measurable function on $[a, b]$? Justify.

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

d) State Fatou's lemma.

e) If $f(x) = x^2 - 1$ $(-2 \le x \le 2)$, find f^+.

f) Let $f(x) = \begin{cases} 1 \text{ if } x \text{ is irrational in } [-4, 4] \\ 2 \text{ if } x \text{ is rational in } [-4, 4] \end{cases}$

Evaluate $\int_{-4}^{4} f(x)dx$.

g) Show that if f is an odd function then $\int_{-\pi}^{\pi} f(x)dx = 0$.

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

a) Let $E \subset [a, b]$. Prove that E is measurable if and only if $\bar{m}E + \bar{m}E' \le b - a$.

b) If E_1, E_2 ------- are pairwise disjoint measurable subsets of $[a, b]$ then prove that $\bigcup_{n=1}^{\infty} E_n$ is measurable $m\left(\bigcup_{n=1}^{\infty} E_n\right) = \sum_{n=1}^{\infty} mE_n$.

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

P.T.O.

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

a) If f and g are functions on $[a, b]$, if $f(x) = g(x)$ almost everywhere and if f is measurable then prove that g is also measurable.

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

c) If E_1 and E_2 are disjoint measurable subsets of $[a, b]$, and if f is bounded function in L $[a, b]$, then prove that $\int_{E_1 \cup E_2} f = \int_{E_1} f + \int_{E_2} f$.

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) Find the Fourier series of $f(x) = 0$ $(-\pi \le x < 0)$
$= 1$ $(0 \le x \le \pi)$.

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

ii) Let $\{f_n\}_{n=1}^{\infty}$ be a sequence of functions in L$[a, b]$ such that $0 \le f_1(x) \le f_2(x) \le \ldots\ldots \le f_n(x) \le \ldots\ldots (a \le x \le b)$. Also let $\lim_{n\to\infty} f_n(x) = f(x)$ $(a \le x \le b)$. If $f \in L[a, b]$, show that $\lim_{n\to\infty} \int_a^b f_n = \int_a^b f$.

Total No. of Questions : 4]

SEAT No. : ____

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[5422]-412
T.Y. B.Sc.
MATHEMATICS
MT − 347(F) : Computational Geometry
(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

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

a) Write the transformation matrix for shearing in x axis by factor C.

b) If the line $y = 2x + 1$ is transformed under $T = \begin{bmatrix} 10 & 2 \\ -1 & 3 \end{bmatrix}$ then find the slope of transformed line.

c) Write the transformation matrix for reflection in the xy plane.

d) Find the value of $\delta\theta$ for generating 33 points on the arc of the ellipse $\frac{x^2}{4} + \frac{y^2}{1} = 1$ in the first quadrant.

e) Determine foreshortening factor f_x and f_z for the matrix

$$[T] = \begin{bmatrix} \sqrt{3}/2 & \sqrt{2}/4 & 0 & 1 \\ 0 & \sqrt{2}/2 & 0 & 1 \\ 1/2 & -\sqrt{6}/4 & 0 & 1 \end{bmatrix}$$

f) If the transformation matrix $[T] = \begin{bmatrix} 3 & 1 \\ -2 & 1 \end{bmatrix}$ is used to transform the intersecting lines $2x + y = 4$ and $x - 2y = 2$ then find the point of intersection of transformed lines.

g) Write the parametric equation of Bézier curve with 3 control points.

P.T.O.

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

a) Prove that, the pair of parallel lines are transformed in a pair of parallel straight lines under any 2×2 transformation matrix [T].

b) Find the concatenated transformation matrix for the following sequence of transformation.

i) Reflection through *x*-axis.

ii) Rotation about origin through angle 270º.

iii) Scaling in *x* and *y* direction by factors 2 and −1 respectively.

c) Obtain the dimetric projection if a fore-shortening factor along z-direction is 3/8 (take $\theta > 0$, $\phi > 0$).

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

a) Develop the cavalier and cabinet projection for $\alpha = 120^{o}$ of the object

$$X = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 0 & 1 & 2 & 1 \end{bmatrix}.$$

b) Rotate the line segment AB where A $\begin{bmatrix} 3 & 3 & 3 \end{bmatrix}$, B $\begin{bmatrix} 5 & 5 & 5 \end{bmatrix}$ about the local axis passing through P $\begin{bmatrix} 2 & 3 & 1 \end{bmatrix}$ about an angle 75º.

c) For the position vectors $P_1[1\ 2]$ and $P_2[4\ 3]$ determine the parametric representation of the line segment between them. Also determine the slope and tangent vector of the line segment.

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

a) i) Find the parametric equation of the Bézier curve determined by the control points $B_0[1\ 1]$, $B_1[2\ 3]$, $B_2[4\ 3]$ and $B_3[3\ 1]$. Find the point on the curve corresponding to the parametric value t = 0.15.

ii) Write an algorithm for reflection of an object through the line $y = mx + c$.

b) Generate uniformly spaced five points on the hyperbolic segment in the first quadrant for $4 \leq x \leq 8$ where the equation of the hyperbola is

$$\frac{x^2}{2} - y^2 = 1.$$

Total No. of Questions : 4]

SEAT No. :

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[5422]-413
T.Y. B.Sc.
PHYSICS
PH-341 : Classical Electrodynamics
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

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

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

a) State Coulomb's law in electrostatics.

b) Write the general solution of Laplace's equation (Cartesian co-ordinate system) in one dimensional problem.

c) Define electrical potential energy of a system of charges.

d) Define surface density of bound charges. Give its S.I. unit.

e) Define electric displacement vector $\left(\bar{D}\right)$. Give its S.I. unit.

f) Define magnetisation. Give its S.I. unit.

g) State Ampere's circuital law.

h) Define the term magnetic susceptibility.

i) Write equation for plane electromagnetic wave in terms of $\bar{E}$ and $\bar{B}$ for a wave propagating along positive *z*-axis.

j) What do you mean by unpolarized wave?

Q2) Attempt any two of the following :

a) A point charge '+q' is placed at a perpendicular distance 'd' from an infinite grounded conducting plane. Using method of electrical images obtain an expression for electric potential at any point near the conducting plane. **[5]**

P.T.O.

b) Define the term electric susceptibility (χ_e). Show that dielectric constant (K) is given by $K = 1 + \chi_e$. **[5]**

c) What do you mean by hysteresis? Draw hysteresis loop and explain the terms remanence and coercivity. **[5]**

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

a) Four point charges q, $2q$, $-3q$ and $4q$ are placed at the corners of a square of length of each side 1.0 m. Calculate the potential at the centre of a square. (Given, $\frac{1}{4\pi \in_0} = 9 \times 10^9 \ Nm^2/C^2$ and assume, $q = 1.6 \times 10^{-6}$ coulomb).

[5]

b) Write expressions for magnetic vector potential $(\vec{A})$ from which the following magnetic field can be derived $\vec{B} = K\left(y\hat{i} + x\hat{j}\right)$, where K is a constant. **[5]**

c) Given an electric field, $\vec{E} = E_0 \sin B_z \cos wt \, \hat{a}_z$, where $\hat{a}_z$ is a unit vector along Z-axis in free space, determine the corresponding volume charge density. **[5]**

Q4) a) Attempt <u>any one</u> of the following :

i) Write wave equations for $\vec{E}$ and $\vec{B}$ in free space. Show that solution of wave equation interms of $\vec{E}$ and $\vec{B}$ satisfy all Maxwell's equations at each instant of time and at each point in free space. **[8]**

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

b) Attempt <u>any one</u> of the following :

i) Compare between ferromagnetic and diamagnetic substances. **[2]**

ii) Write the relation between $\vec{B}$, $\vec{H}$ and $\vec{M}$. Give S.I. units of $\vec{B}$ and $\vec{H}$. **[2]**

Total No. of Questions : 4]

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[5422]-414
T.Y.B.Sc.
PHYSICS
PH - 342 : Quantum Mechanics
(2013 Pattern) (Semester-IV) (Paper-II)

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

Instructions to the candidates:

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

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

a) Define Hermitian operator.

b) Determine parity of $e^{-\alpha\gamma}$.

c) What is free particle?

d) Define phase velocity.

e) State time-energy uncertainity relation.

f) Define probability current density.

g) State equation of continuity.

h) When energy state of particle is said to be degenerate?

i) State different quantum numbers.

j) Define expectation value of any dynamical variable *f* obtained by wave function $\psi(x,t)$.

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

a) A wave function of the free particle in the range $-\infty$ to $+\infty$ is given by $\psi(x) = xe^{-\alpha x^2}$. Normalize the wave function.

b) An electron has speed of 6000 m/s with an accuracy of 0.05%. Calculate the uncertainity with which the position of electron can be located.

Given : mass of electron, m = 9.1×10^{-31}kg, $\hbar = 1.055\times10^{-34}$ J-sec

c) For HCl molecule, if internuclear distance is 1.29×10^{-8}cm, $m_{cl}=35m_H$ and $m_H=1.68\times10^{-24}$gm, calculate the separation of the lines in the far infrared region. Given : h = 6.625×10^{-27}erg-sec, c = 3×10^{8}m/s.

P.T.O.

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

a) State and prove the Ehrenfest first theorem.

b) If x and p are the coordinate and momentum operators, by mathematical induction, show that $[x, p^n] = i\hbar n p^{n-1}$.

c) The wave function for a particle in infinite potential well is given as $\psi_n(x) = \mathrm{A}\sin\left(\frac{n\pi x}{a}\right)$ where $0 \le x \le a$, find $\langle \mathrm{P}_x \rangle$.

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

a) Obtain Schrödinger's time dependent equation.

b) With the help of Schrödinger's time independent equation, obtain the energy eigen values and eigen functions for a particle in one-dimensional deep potential well.

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

a) Prove that $[x, \mathrm{P}_x] = i\hbar$.

b) What is tunneling effect? State any two applications of tunneling effect.

Total No. of Questions : 4]

SEAT No. :

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[5422]-415
T.Y.B.SC.
PHYSICS
PH 343 : Thermodynamics and Statistical Physics
(2013Pattern) (Semester - IV) (Paper - III)

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

Instructions to the candidates:

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

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

a) Define density of states.

b) What are 'Transport phenomena'?

c) Define term probability.

d) What is gamma space?

e) What are anti-symmetric wave function?

f) State the postulate of equal a priori probabilities.

g) Define canonical Ensemble.

h) What are bosons?

i) Calculate the volume of a phase cell in μ-space.

j) What do you mean by Accessible macrostates.

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

a) Obtain Maxwell's expression for mean free path $\lambda = \frac{1}{\sqrt{2}\,\pi\sigma^2 n}$ Where symbols have their usual meanings.

b) Explain the simple random walk problem in one dimension and obtain the probability of finding the particle.

c) Show that in F. D. statistics $\bar{n}_r = \frac{1}{e^{\beta(\epsilon_r - \mu)} - 1}$.

where symbols have their usual meanings.

P.T.O.

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

a) Determine the mean free path of the molecule of hydrogen at NTP. Given that density of hydrogen is 8.96×10^{-5} gcm^{-3} , coefficient of viscosity8.6×10^{-5} C.G.S. units and k=1.38×10^{-16} ergs $^{o}K^{-1}$.

b) If p=q =$\frac{1}{2}$ and total number of possibilities are N=200, find

i) Mean value of n_1 i.e. $\bar{n}_1$

ii) Root mean square deviation

iii) Mean displacement $\bar{m}$.

c) Prove the Tds equations

i) $Tds= C_v dT+T\left(\frac{\partial P}{\partial T}\right)_v dv$

ii) $Tds= C_p dT-T\left(\frac{\partial V}{\partial T}\right)_p dp$

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

a) Establish the clausius - clapeyron's equation $\frac{dP}{dT}=\frac{L}{T(v_2-v_1)}$ and Explain the effect of pressure on boiling point of liquid.

b) Using canonical distribution, find magnetic Susceptibility of a paramagnetic material.

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

a) A bag contain 10 Red balls and 8 White balls. Two balls are drawn at random one after the other. What is the probability that both balls are red.

b) Prove the relation

$$F=U+T\left(\frac{\partial F}{\partial T}\right)_v.$$

Total No. of Questions : 4]

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[5422] - 416

T.Y.B.Sc.

PHYSICS

PH- 344: Nuclear Physics

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

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

Instructions to the candidates:

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

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

a) Define nuclear fission and fusion.

b) Define threshould energy of nuclear reaction.

c) What is the use of dynodes in photomultiplier tube?

d) What are the Hadrons?

e) The half life of radioactive substance is 20 minutes. Calculate its mean life.

f) Calculate the packing fraction of Z_n^{64} nucleus whose mass is 63.9291 amu.

g) Define quadrupole moment of Nucleus.

h) Define the multiplicity of nuclear state.

i) Define the resolving time of G.M. Counter.

j) What is physical significance of cross-section of nuclear reaction.

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

a) Define the mean life of radioactive substance and obtain the relation between mean life and half life.

b) Explain the Yukawa's meson theory of nuclear forces. Draw the feynman diagram.

c) Discuss the construction and working of linear accelerator and obtain an expression for length of n^{th} electrode.

P.T.O.

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

a) Thermal neutron absorption cross-section of cadmium cd^{112} is 2540 barn and density of cadmium is 8.60 gm/cm^3. Calculate the thickness of cadmium sheet which will absorb 95% of thermal neutrons incident of cadmium sheet.

[Given: Avogadro's number = $6.02 \times 10^{23} \frac{\text{atom}}{\text{mole}}$ 1 barn = 10^{-24} cm^2]

b) A G.M. counter is operating at 800 volts. It has anode wire diameter of 0.2 mm and cathode cylinder radius of 3 cm. Calculate the maximum radiation electric field in the G.M. tube.

c) A nuclear power reactor is operating at a thermal power level of 450 m Watt. A reactor fuel last for one year before refueling is needed. Energy released per fission of U^{235} is 210 MeV. Calculate the mass of Uranium needed for one year working of reactor.

[Given: 1 eV = 1.6×10^{-19} J, 1 watt = 1 J/sec]

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

i) What are mass defect and binding energy of nucleus? Draw mean binding energy curve and explain different features of it.

ii) What is successive disintegration? Show that ratio of activities of daughter of parent is given as $R = \frac{\lambda_2}{(\lambda_2 - \lambda_1)}[1 - e^{-(\lambda_2 - \lambda_1)t}]$.

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

i) Explain the structure of proton using quark model.

ii) Explain any two laws of conservation in nuclear reaction with one example of each.

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Total No. of Questions : 4]

SEAT No. : ____

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[Total No. of Pages : 4

[5422]-417

T.Y.B.Sc.

PHYSICS

PH - 345 (A) : Electronics

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

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

Instructions to the candidates:

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

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

a) State materials used for LED.

b) Enlist four classes of amplifier.

c) Define CMRR.

d) What is regulated power supply.

e) What is a shift register?

f) What is photodiode?

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

h) If oscilloscope displays a pulse width of 0.3 μS and a period of 3.0 μS, find the duty cycle.

i) When a change in V_{GS} of a JFET is 0.2 V and change in drain current is 0.4 mA, find the value of transconductance.

j) Find the value of R_A of monostable multi-vibrator if pulse width is 0.825 ms and capacitor is 0.1 μf.

P.T.O.

Q2) Attempt any two:

a) Explain the construction of n-channel JEET. Draw its transfer characteristic curves. **[5]**

b) Discuss the working of Op-amp as an integrator. Show that output voltage is proportional to integral of input voltage. **[5]**

c) Draw the block diagram of IC-723 and explain it. **[5]**

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

a) Design and construct Half adder using k-map. **[5]**

b) A 5-bit asynchronous counter begins with 00000 state. What will be the state of a counter after 144 pulses. **[5]**

c) Determine the frequency of oscillation of astable multivibrator using IC 555 Given: $R_A = R_B = 10\ K\Omega$ and $C = 0.01\mu F$. **[5]**

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

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

b) What is Op - Amp? Draw the symbol. State parameters of an ideal Op -Amp. Determine the value of CMRR in dB if differential voltage gain is 200 and common mode voltage gain is 0.5. **[8]**

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

a) Give four applications of seven segment display. **[2]**

b) What is the difference between combinational and sequential logic? **[2]**

Total No. of Questions : 4]

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[5422]-417

T.Y.B.Sc.

PHYSICS

PH - 345 (B) : Advanced Electronics

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

Time : 2Hour] ***[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) State the working principle of RTD.

b) State types of accelerometer.

c) What is photovoltaic effect?

d) State any two advantages of bimetallic thermometer.

e) Define pyrometry.

f) What is linearization of signal?

g) Draw a circuit diagram of low pass and high pass RC filters.

h) What are the advantages of Instrumentation amplifier?

i) Define De - Multiplexer.

j) What is discrete - state process control?

Q2) Attempt any two:

a) With a neat diagram, explain data acquisition system (DAS). **[5]**

b) State and explain in brief: elements involved in a process control system. **[5]**

c) Explain how a bridge circuit can be used for signal conditioning. **[5]**

Q3) Attempt any two:

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

b) Explain vapour pressure thermometer. **[5]**

c) Draw the circuit diagram for instrumentation amplifier using 3 op - amp. Give its output equation. **[5]**

Q4) A***)*** Attempt any one:

a) Discuss the narrowband pyrometers in detail. **[8]**

b) What is converters? Explain ADC and DAC converters in detail. **[8]**

B) Attempt any one:

a) State main objectives to be fulfilled by control system. **[2]**

b) State any two properties of laser light. **[2]**

Total No. of Questions : 4]

SEAT No. :

P401

[Total No. of Pages : 12

[5422]-418
T.Y. B.Sc.
PHYSICS
PH - 346 (G) : Medical Electronics
(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) ***Draw neat diagrams must be drawn if necessary.***

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

a) What do you mean by EMG?

b) What is sensor?

c) Define CMRR.

d) State applications of calorimeter.

e) What is systolic pressure?

f) State Nernst equation for bio-potential.

g) State principle of resistive sensor.

h) What is function of cardiac monitor?

i) State disadvantages of flame photometer.

j) What is purpose of phono cardiography?

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

a) What do you mean by Electrode-Electrolyte interface? Describe silver-silver-chloride electrode interface.

b) Draw diagram of instrumentation amplifier. Describe in detail construction and working of instrumentation amplifier.

c) Describe different types of spectrophotometers.

P.T.O.

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

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

b) What are basic amplifier requirements? Draw graph for typical ranges for bio-potential.

c) Write a short note on piezoelectric sensor.

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

i) Describe in detail Basic Medical Instrumentation system.

ii) What do you mean by heart sound? Explain variety of heart sound with cardiac cycle.

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

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

ii) What is basic principle of resistive sensor?

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Total No. of Questions : 4]

P401

[5422]-418
T.Y. B.Sc.
PHYSICS
PH - 346 (H) : Physics of Nanomaterials
(2013 Pattern) (Semester - IV) (Elective)

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

Instructions to the candidates:

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

Q1) Attempt all: **[10]**

a) Define nanotechnology.

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

c) What is top down approach?

d) What is gel?

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

f) Give applications of XRD.

g) State different types of luminescence in nanomaterial.

h) What is semiconductor nanoparticle.

i) Enlist the various structures of nanotubes.

j) Define quantum dots.

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

a) Classify nanomaterials according to their dimension.

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

c) Explain the nanoelectronics.

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

a) Describe in detail synthesis of nanomaterial by physical vapour deposition.

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

c) Describe in detail synthesis of nanomaterials by sol-gel.

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

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

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

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

i) Give medical applications of nanomaterials.

ii) What do you mean by nano?

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Total No. of Questions : 4]

P401

[5422]-418
T.Y. B.Sc.
PHYSICS
PH - 346 (I) : Microcontrollers
(2013 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

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

a) How does the 8051 represent the number (–8)?

b) Enlist the flags used in 8051.

c) State two registers used in LCD module.

d) State difference between LJMP and SJMP.

e) What is the size of RAM in 8051?

f) Give ASCII codes for 'O' zero and 'A'.

g) Draw pin configuration of LM35.

h) What is the use of TMOD register?

i) Explain byte framing in serial data communication.

j) What is the function of the bits PSW4?

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

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

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

c) Explain Interrupt priority in 8051.

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

a) Write an Assembly Language program for finding the second compliment of given number.

b) Write an assembly language program to find the largest number from the given set (array) of numbers.

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

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

i) Draw the block diagram of 8051 microcontroller. Explain on-chip memory section in it.

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

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

i) What are Assembler directives?

ii) Compare full duplex and half duplex mode.

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Total No. of Questions : 4]

P401

[5422]-418
T.Y. B.Sc.
PHYSICS
PH - 346 (J) : Electro Acoustics and Entertainment Electronics
(2013 Pattern) (Semester - IV) (Paper - VI) (Elective - II)

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

Instructions to the candidates:

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

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

a) What is volume expander?

b) Define directivity factor for a microphone.

c) What is folded horn?

d) Give the expression for sensitivity of a carbon microphone.

e) Give typical frequency response of an exponential horn speaker.

f) Give the place theory of hearing.

g) Draw a diagram showing construction of condensor microphone.

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

i) What is an articulation test?

j) What is meant by Hi-Fi?

Q2) Attempt any two of the following:

a) Give acoustic characteristics of the outer ear. **[5]**

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

c) Write a note on bass reflex cabinet. **[5]**

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

a) Determine the cut-off frequency of an exponential horn having a flare constant of 4.9 on being used outdoors at a temperature of 40°C. **[5]**

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

c) A direct radiator dynamic loudspeaker has a radiation resistance of 2 kg/s. Its voice coil is 7.5 m 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. **[5]**

Q4) a) Attempt any <u>one</u> of the following:

i) Discuss the voice mechanism in humans. **[8]**

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

b) Attempt any <u>one</u> of the following:

i) Distinguish between a volume compressor and a volume limiter. **[2]**

ii) Give two advantages of folded horns. **[2]**

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Total No. of Questions : 4]

P401

[5422]-418
T.Y. B.Sc.
PHYSICS
PH - 346 (K) : Lasers
(2013 Pattern) (Semester - IV) (Elective - II) (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 electronic calculator and log table is allowed.***

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

a) Define population density.

b) What is pumping?

c) Define round trip gain.

d) What is laser light?

e) Define metastable state in laser.

f) State the condition for steady state oscillations.

g) Write two types of gas lasers.

h) Give two applications of semiconductor lasers.

i) What is hologram?

j) What is range finder?

Q2) Attempt any two of the following:

a) What is difference between ordinary light & laser light? **[5]**

b) What are the properties of laser beam? **[5]**

c) How we can classify lasers in different ways? **[5]**

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

a) The half-width of gain profile of laser material device is 0.003mm, emitted wavelength of 6328 A°. Calculate maximum length of cavity in order to single mode of oscillation having refractive index is 1. **[5]**

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

c) 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/cm. **[5]**

Q4) a) Attempt any <u>one</u> of the following:

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

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

b) Attempt any <u>one</u> of the following:

i) What is optical resonator? **[2]**

ii) Write in brief history of lasers. **[2]**

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Total No. of Questions : 4]

P401

[5422]-418
T.Y. B.Sc.
PHYSICS
PH - 346 (L) : Radiation Physics
(2013 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

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

a) What are cosmic radiations?

b) What are X-rays?

c) Define linear attenuation coefficient of radiation.

d) Give the working principle of ionization chamber.

e) Define one rad absorbed dose of radiation.

f) What are gamma radiations?

g) Define half life of radioactive substance.

h) State law of radioactivity.

i) Give any two properties of neutron particle.

j) Give the relation between energy of electromagnetic radiation and frequency.

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

a) Explain different types of radioactive source of neutrons.

b) Explain construction and working of scintillation detector with neat diagram.

c) Explain different applications of gamma rays in medical field.

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

a) The initial activity of Co^{60} gamma radiation source is 1 curie, and its half life is 5.27 years. Calculate the activity of source after 12 years.

b) Explain Radiation protection and safety rules as per the regulatory guide lines of the Government of India.

c) Calculate the energy of red photon of visible light in eV [Given : 1 eV = 1.6×10^{-19} J, h = 6.63×10^{-34}J-s] λ_{red} =7000 A°.

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

i) Discuss the various laboratory sources of IR, visible and UV radiations with details of energy spectrum.

ii) Discuss in details principle and methods of generation of characteristics X-rays.

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

i) Explain any one type of interaction of gamma radiations with matter.

ii) Write note on RBE dose.

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Total No. of Questions : 4]

SEAT No. :

P402

[Total No. of Pages : 2

[5422]-419
T.Y. B.Sc.
CHEMISTRY
CH-341 : Physical Chemistry
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram 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) How many atoms are present in a F.C.C. crystal unit cell?

b) Define 'Operator'.

c) Define 'Binding Energy'.

d) Sketch (100) plane in simple cubic crystal lattice.

e) Give any two functions of salt bridge.

f) ${}^{12}_{6}C + {}^{2}_{1}H \rightarrow ..... + {}^{4}_{2}He$.

g) What is liquid-liquid junction potential?

h) The Weiss indices of a plane in a crystal are (2, 1, ∞). What are the Miller indices of the plane?

i) What is reference electrode?

j) What is meant by 'dead time' of G.M. counter?

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

i) State Schrödinger wave equation for a particle in a one dimensional box. Sketch the plot of wave function (ψ) and probability densitites (ψ^2) for the particle in one dimensional box.

ii) Discuss metal-insoluble salt type electrode.

iii) Explain how e.m.f. measurement is used to determine the solubility of sparingly soluble salt.

P.T.O.

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

i) The standard reduction potential of $Cu^{+2} \mid Cu$ and $Ag^{+} \mid Ag$ electrodes are 0.337 V and 0.779 V respectively. Write the cell and cell reactions. Calculate the e.m.f. of the cell.

ii) Calculate mass defect and binding energy per nucleon in $^{20}_{10}Ne$ if its isotopic mass is 19.99244 a.m.u.

Mn = 1.008665 a.m.u. m_p = 1.007820 a.m.u.

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

a) Derive the Bragg's equation, $n\lambda = 2d\sin\theta$.

b) What is Poggendorff's compensation principle? Give construction and working of direct reading potentiometer.

c) Discuss the stability of nucleus with respect to neutron-proton ratio in detail and odd and even nature of proton and neutron.

Q4) a) i) What is correspondence principle? Draw plots of probability densities for various values of *n* for a particle in one dimentional box. **[3]**

ii) Explain Heisenberg's uncertainty principle. **[3]**

OR

a) What are concentration cells? Explain electrolyte concentration cell with tranference with suitable example. **[6]**

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

i) Calcium Fluoride exists as a Face Centered Cubic lattice. The unit cell contains $4Ca^{+2}$ and $8F^{-}$ ions. Find d_{100}.

Given : density of CaF_2 = 3.18 gml^{-1}.

At. wt. of Ca = 40 and

At.wt. of F = 19.

ii) The cell $Zn \mid ZnCl_2 \| Agcl \mid Ag$ gives following data.

e.m.f. / volts	temp. ºC
1.240	25
1.260	35

Predict the cell reaction and calculate ΔG, ΔH and ΔS at 25ºC.

Total No. of Questions : 4]

SEAT No. : ____

P403

[Total No. of Pages : 2

[5422]-420

T.Y.B.Sc.

CHEMISTRY

CH: 342: Inorganic Chemistry

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

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

Instructions to the candidates:

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

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

a) Which lanthanide element is artificially prepared?

b) Write name & symbol of element having atomic no. 147.

c) Which metalloprotein is acting as iron transport protein?

d) What is biodiesel?

e) Which metal is present in Vit B_{12}?

f) Why pure graphite is semi conductor?

g) Draw the structure of F.C.C. unit cell.

h) What is mean by Meissners effect?

i) Give formula of Wilkinson's catalyst.

j) Give the type of closest packing.

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

i) Compare between lanthanides & Actinides

ii) Explain and draw structure of haem unit

iii) Discuss effect of temperature on metal, insulator and semiconductors.

P.T.O.

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

i) Complete the following reactions

1) $^{238}_{92}U + ^{16}_{8}O \rightarrow ..... + ^{1}_{0}n$

2) $^{235}_{92}U + ^{2}_{1}D \rightarrow ..... + ^{1}_{0}n$

ii) Give application of superconductor

iii) Explain biological role of calcium

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

a) Explain the monsanto process with its mechanism to prepare acetic acid

b) What is lattice energy ? Explain Born Haber cycle for calculation of lattice energy of sodium chloride

c) What are lanthanides & Explain ion exchange method for seperation of lanthanides

Q4) a) Explain n(E) & N(E) curve ? Draw N(E) curve for metal, semiconductor and insulator **[6]**

OR

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

i) What is Benzimidazole? How it is synthesized?

ii) Explain the structure of Vit B_{12}.

b) Distinguish between schottky and Frenkel defects **[4]**

OR

b) i) What are the classes of heterogeneous catalyst with suitable example. **[4]**

ii) Why lanthanides are not seperated by using chemical method?

Total No. of Questions : 4]

SEAT No. :

P404

[Total No. of Pages :4

[5422]-421
T.Y.B.Sc.
CHEMISTRY
CH - 343 : Organic Chemistry
(2013Pattern) (Semester - IV) (Paper - III)

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

Instructions to the candidates:

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

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

a) Calculate the fundamental modes of vibration for co_2.

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

c) Calculate the wavenumber of radiation having λ=342nm.

d) Cyclopentadiene forms carbanion readily Explain.

e) Define the term synthetic equivalent.

f) How many sets of protons are present in 

g) In which rearrangement reaction ketone, hydroxylamine and acid are used.

h) Give evidence for nature of oxygen in citval.

i) Define hypsochromic and hyperchromic shift.

j) Define Finger print region.

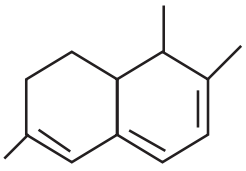
Q2) a) Attempt any two of the following: **[6]**

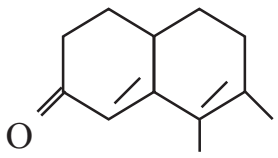
i) How will you prepare cyclobutyl methyl ketone from ethylacetoacetate.

ii) Write retrosynthesis and synthesis of cyclohexene.

iii) Write a note on pinacol - pinacolone rearrangement.

b) Calculate λ max for the following: **[4]**

i) 

ii) 

OR

c) i) Write a note on intramolecular aldol condensation.

ii) Trans stilbene shows higher λ max than its cis isomer.

P.T.O.

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

a) i) Write synthesis of citral from methyl heptenone.

ii) An organic compound having molecular formula C_3H_5N shows IR bands at 2220 cm^{-1}. Suggest the possible structures.

b) i) Explain favorskii rearrangement with suitable example.

ii) TMS is used as internal standard in NMR spectroscopy. Why?

c) i) Explain measurement of chemical shift in NMR spectroscopy.

ii) Give classification of terpenoids.

Q4) a) Propose structures for the compounds from the following spectroscopic data justify your answer. **[6]**

i) Molecular formula : C_3H_6O

IR : 1720, 2720 cm^{-1}

NMR : i) Triplet, 1.20 δ (3H)

ii) Quartet, 2.50 δ (2H)

iii) Singlet, 9.77 δ (1H)

ii) Molecular formula : $C_3H_5Cl_3$

NMR : i) Singlet, 2.20 δ (3H)

ii) Singlet, 4.02 δ (2H)

iii) Molecular formula : C_8H_{10}

UV : λ max = 255 nm

IR : 1600, 1500 cm^{-1}

NMR : i) Triplet, 1.10 δ (3H)

ii) Quartet, 2.70 δ (2H)

iii) Singlet, 6.50 δ (5H)

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

i) Wittig reaction.

ii) Emde's degradation.

iii) Types of couplings.

iv) Target molecule and disconnection.

Total No. of Questions : 4]

SEAT No. : [ ]

P405

[Total No. of Pages : 2

[5422] - 422

T.Y.B.Sc.

CHEMISTRY

CH- 344: Analytical Chemistry

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

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

Instructions to the candidates:

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

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

a) State Nernst distribution law.

b) What is chromatography?

c) Define the term eluate in chromatography.

d) Define the term retention time.

e) What is mean by GLC and GSC.

f) In SFC which gas is used as a mobile phase.

g) Define the term electrophoresis.

h) What is chromatgram?

i) Give the principle of zone electrophoresis.

j) Give the principle of Nephelometry.

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

i) What are advantages of HPLC.

ii) Explain principle of gas chromatography.

iii) What are the steps involved in paper chromatography.

P.T.O.

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

i) Draw a diagram of Ascending and Descending development of paper in paper chromatography.

ii) Calculate the distribution ratio when concentration of solute in organic phase is 0.826 m and in aqueous phase is 0.032 m.

iii) Calculate the transmittance of solution having turbidance 0.121.

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

a) Explain the factors affecting solvent extraction.

b) Explain the flame ionisation defector in GC.

c) Explain the principle and technique of column chromatography.

Q4) a) Explain the principle of ion exchange chromatography. Give its application in purification of water. **[6]**

OR

i) What is R_f value? Give its advantages.

ii) Explain in brief moving Boundary Electrophoresis.

b) A metal was extracted to the extent of 70% when equal volumes of aqueous and organic phases were shaken together. What will be the percent extraction, if the volume of the organic phase is doubled? **[4]**

OR

In an experiment of paper chromatography separation of silver, lead and mercury the solvent front was 25 cm, while front due to these metals were 22 cm (Ag), 20 cm (Pb) and 8 cm (Hg). What are the R_f values of these metals?

EEE

Total No. of Questions :4]

SEAT No. :

P406

[Total No. of Pages : 2

[5422]-423
T. Y. B. Sc.
CHEMISTRY
CH- 345: Industrial Chemistry
(2013 Pattern) (Semester-IV) (Paper - V)

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

Instructions to the candidates:

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

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

a) What are polymers?

b) Define coating.

c) What is power alcohol?

d) Define the term surfactant.

e) What are tranquilizers?

f) What is carbonation?

g) What are plasticizers?

h) Draw the structure of indigo dye.

i) What is toner?

j) What is recycling?

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

i) Write a note on antibiotics.

ii) What are advantages of detergents?

iii) Write a note on Coffey's still.

b) Answer Any Two of the following. **[4]**

i) Give the preparation of PVC.

ii) Explain the term chemotherepeutic agent with suitable example.

iii) What do you mean by chemical waste?

P.T.O.

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

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

b) Draw the structure of Alizarin and Naphthol yellow, state their applications.

c) Give the synthesis and uses of paracetamol and sulphanilamide.

Q4) a) What is scalp? Explain any five problems and their solutions of scalp. **[6]**

OR

a) Explain in detail process of clarification of juice by **[6]**

i) Lime defecation ii) Sulphitation iii) Carbonation

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

i) Red lead ii) Zinc oxide

OR

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

i) Vulcanisation of Rubber

ii) Concept of atom economy

Total No. of Questions : 4]

SEAT No. :

P407

[Total No. of Pages : 2

[5422]-424
T.Y. B.Sc.
CHEMISTRY
CH-346(A) : Nuclear Chemistry
(2013 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

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

a) What is origin of delayed neutrons?

b) What is meant by reactor power?

c) What is the use of nuclear accelerators?

d) Which are the charge carriers used in Semiconductor detectors?

e) State radioisotopes of chlorine.

f) Mention a typical reaction involved in the preparation of radioisotope carbon (^{14}C).

g) State one reaction of cow and milk system.

h) State safety standards required in the study of radio activity.

i) What are fission neutrons?

j) State one name of India's nuclear reactor.

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

i) Describe the points which should be taken care of in using radioisotopes as tracers.

ii) Write a note on Neutron detectors.

iii) Write a note on Linear Accelerators.

P.T.O.

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

i) Describe the biological effects of radiations.

ii) State twin characteristics of nuclear fission.

iii) Calculate fission energy of the following reaction.

$$^{235}_{92}\mathrm{U} + n \rightarrow ^{95}_{42}\mathrm{Mo} + ^{139}_{57}\mathrm{La} + 2n$$

Given : Atomic masses of :

^{235}U = 235.0439 amu; ^{95}Mo = 94.9057 amu

^{139}La = 138.9061 amu; m_n = 1.0087 amu

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

a) Explain the process of nuclear fission, fission fragments and their mass distribution.

b) Discuss the characteristics to be emphasized during classification of reactors.

c) Describe medical applications of radioactivity in thyroids and radioimmuno assay.

Q4) a) Describe the steps involved in 'The Four Factor Formula : The Reproduction Factor K'. **[6]**

OR

Discuss the theory of nuclear fission in the light of : **[6]**

i) Nuclear shape distortion following excitation.

ii) Fission energy verses fission barrier.

b) Write a note on nuclear waste management. **[4]**

OR

Write a note on radiometric titrations. **[4]**

Total No. of Questions : 4]

SEAT No. :

P408

[Total No. of Pages : 2

[5422]-425
T.Y. B.Sc.
CHEMISTRY
CH-346(B) : Polymer Chemistry
(2013 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

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

a) Define the term : Homopolymer.

b) 'Cracks are developed during long use of rubber tyres'. Explain.

c) Give important IR peaks of polyvinyl ketone.

d) What is meant by vulcanisation?

e) Define the term thermoplastic.

f) Draw the correct structure of poly vinyl alcohol.

g) Give two important uses of nylon.

h) Explain the term compounding.

i) What is meant by lubrication of fibre?

j) The acronym – SBR stand for _____.

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

i) 'Crystalline melting point (T_m) is mainly affect on glass transition temperature'. Explain.

ii) Write a brief note on photodegradation.

iii) Comment on crystallisability of polymers.

P.T.O.

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

i) How will you distinguish polyamide and polyester by using IR spectroscopy?

ii) 'Tg of poly $\propto$-methyl-styrene is 170ºC while Tg of polyvinyl acetate is 32ºC'. Explain.

iii) Draw the correct structures of isotactic and syndiotactic polymers.

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

a) Write a detailed a note on conducting polymers.

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

i) Polyvinyl chloride (PVC).

ii) Epoxy polymers.

c) Discuss in detail the testing and analysis of mechanical properties of polymers.

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

i) Give a brief account of blow molding process in polymer processing.

ii) Write a note on reinforcement of polymers.

iii) Explain extrusion technique in detail.

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

Total No. of Questions : 4]

SEAT No. : ____

P409

[Total No. of Pages : 2

[5422]-426

T.Y.B.Sc

CHEMISTRY

CH - 346(C) : Introduction to Biochemistry & 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 Catabolism.

b) Where does TCA Cycle occur in the cell?

c) Name 2 inhibitors of ETC in mitochondria.

d) What are Termination Codons?

e) Define Restriction enzymes with one example.

f) What is the significance of Oric in bacterial DNA.

g) What is reverse transcription?

h) Give the significance of decarboxylation reactions of amino acid.

i) Which enzyme converts Isocitrate to α Ketoglutarate?

j) Name two high energy compounds.

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

i) What are okasaki fragments?

ii) Give the complementary DNA sequence of this RNA fragment 5′ AUGCAUUAC 3′.

iii) Show transamination reactions of amino acids.

P.T.O.

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

i) Distinguish the features of DNA polymerase I, II, III.

ii) Write note on fate of pyruvate.

iii) How is proton gradient formed across inner mitochondrial membrane?

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

a) Describe semi conservative model of replication by Messelson & Stahl.

b) Discuss the features of genetic code.

c) Explain TCA cycle with energetics.

Q4) Answer the following:

a) Elaborate on steps involved in Transcription process. **[6]**

OR

a) Discuss β-oxidation of fatty acids.

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

OR

b) Write note on clover leaf structure of tRNA.

Total No. of Questions : 4]

SEAT No : ____

P 410

[Total No. of Pages :2

[5422]-427
T.Y.B.Sc.
CHEMISTRY
CH - 346D : Environmental and Green Chemistry
(2013 Pattern) (Semester-IV) (Paper-VI) (Elective-II)

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

Instructions to the candidates:

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

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

a) Define the term Electrodialysis.

b) What is meant by soil profile.

c) Define the term Retention time.

d) Principle of Atomic absorption Spectroscopy.

e) What is meant by Green Revolution.

f) Explain Intermolecular hydrogen bonding.

g) How much energy stored by O-H bond.

h) What is meant by sedimentation.

i) Define pyrolysis.

j) Name any two Green house gases.

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

a) Explain Green house coefficient.

b) Explain Municipal water treatment.

c) Explain chemiluminescence.

P.T.O.

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

a) Advantages of solar energy.

b) Water alkalinity.

c) Composting and Vermi composting.

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

a) Explain in detail Tertiary waste water treatment.

b) Give principle and instrumentation of High performance liquid chromatography (HPLC).

c) Explain in detail Important properties of water.

Q4) A) Explain Inorganic and Organic components in soil. **[6]**

OR

Explain in detail Green Engineering and Energy Conversion efficiency.

B) Write short note on any one of the following: **[4]**

a) Radiative forcing.

b) The hydrologic cycle.

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Total No. of Questions : 4]

SEAT No. :

P411

[Total No. of Pages : 2

[5422]-428
T.Y. B.Sc.
CHEMISTRY
CH-346(E) : Dairy Chemistry
(2013 Pattern) (Semester - IV) (Paper - VI) (Elective - II)

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

Instructions to the candidates:

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

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

a) What is 'Solid-Not fat' value in milk?

b) Which pigments are present in the milk?

c) Define pasteurization of milk.

d) What platform tests should be followed to control the quality of receiving milk?

e) Give advantages of sterilized milk.

f) Define homogenized milk.

g) What is structural formula of vitamin A?

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

i) Write the formula to calculate % SNF in cream.

j) Give any two advantages of dried milk products.

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

i) Comment on colour of milk.

ii) What are advantages and disadvantages of fermented milk?

iii) Give structure and uses of Thiamine.

P.T.O.

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

i) Define preservatives. Describe the role of different chemicals as preservatives.

ii) Define 'Butter'. Give uses of butter.

iii) Define cheese powder. Give its uses.

Q3) a) Define cream powder. Give its composition and nutritive value. Give flow sheet diagram for the manufacture of cream powder. **[5]**

OR

State and explain the physico-chemical properties of major constituents of milk. **[5]**

b) What is composition and provisional structure of vitamin B_{12}. Give its properties and uses. **[5]**

OR

Define Ice-cream. Give flow sheet diagram of manufacture of ice-cream. Give its food and nutritive value and uses. **[5]**

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

i) Define casein in milk. Give its importance as industrial uses.

ii) Define Srikhand. Give its flow sheet diagram for preparation of Srikhand base and Srikhand powder.

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

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

i) Give nutritional value and uses of lactose.

ii) How will you test the presence of hydrogen peroxide (H_2O_2) in milk?

iii) Define standardised milk. Give its advantages.

Total No. of Questions : 4]

SEAT No. :

P412

[Total No. of Pages : 2

[5422]-429
T.Y. B.Sc.
BOTANY
BO-341 : Plant Physiology and Biochemistry
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

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

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

a) What are lipids?

b) Enlist photosynthetic pigments.

c) Define photorespiration.

d) Give role of secondary metabolites.

e) What is net gain of ATP in Glycolysis?

f) Which enzyme used for breakdown of starch?

g) Give properties of amino acids.

h) What is source and sink relationship?

i) Define Xenobiotic stress.

j) Name the substrates used in respiration.

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

a) Describe the evidences for phloem transport.

b) Give properties and functions of lipids.

c) Explain chemi-osmotic hypothesis.

P.T.O.

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

a) Schematic diagram of Kreb's cycle.

b) Classification of carbohydrates.

c) Secondary metabolites.

Q4) What are C_4 plants? Explain the mechanism of CO_2 fixation and significance of C_4 plants. **[10]**

OR

What are enzymes? Describe various factors affecting the enzyme activity. **[10]**

Total No. of Questions : 4]

SEAT No : ____

P 413

[Total No. of Pages :2

[5422]-430
T.Y.B.Sc.
BOTANY
BO - 342 : Plant Ecology and Biodiversity
(2013 Pattern) (Semester-IV) (Paper-II)

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

Instructions to the candidates:

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

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

a) What is homeostasis?

b) Write any two causes of Environmental Crisis.

c) What is Economics?

d) Give long form of EIA.

e) What is Environmental Audit?

f) Enlist any two RET Plant Species.

g) What is inventorying?

h) Give any two objectives of Biodiversity.

i) What is species diversity?

j) What is Sacred Groves?

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

a) Explain Man and Biosphere Concept (MAB).

b) Write Remote Sensing Techniques.

c) Give phytogeographical regions of India.

P.T.O.

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

a) Global Warming.

b) Inbreeding Depression.

c) Need of Environmental Audit.

Q4) Explain the impact of human activities on Environment with respect to water. Give its causes, prevention measures and control. **[10]**

OR

Explain the role of National agencies in conservation. Write a note on social approaches to biodiversity conservation. **[10]**

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Total No. of Questions : 4]

SEAT No. :

P414

[Total No. of Pages : 2

[5422]-431
T.Y.B.Sc.
BOTANY
BO- 343 : Plant Pathology
(2013 Pattern) (Semester - IV) (Paper - III)

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

Instructions to the candidates:

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

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

a) Define infection.

b) What is epidemics?

c) Define etiology.

d) What is continuous dissemination?

e) Write long form of IARI.

f) Define biological control.

g) Enlist name of any two nematodal diseases.

h) Give cause of Black heart of potato.

i) Define polyclonal antibodies.

j) What is mixed cropping?

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

a) Describe pre-existing structural defence.

b) Contribution of ICRISAT.

c) Explain bacteria as a plant pathogen.

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

a) Cultural control practices.

b) Microscopic study of plant diseases.

c) Abiotic causes and plant diseases.

P.T.O.

Q4) Give an account of Tikka disease of Groundnut and little leaf of Brinjal with reference to causal organism, symptoms & control measures. **[10]**

OR

What is epidemic? Describe various factors governing on epidemics.

Total No. of Questions : 4]

SEAT No. : ____

P415

[Total No. of Pages : 2

[5422] - 432

T.Y.B.Sc.

BOTANY

BO- 344: Medicinal and Economic Botany

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

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

Instructions to the candidates:

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

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

a) Define Pharmacognosy.

b) What is Pitta?

c) Define drug evaluation.

d) Mention any two methods of drying.

e) Write any two uses of Ephedra.

f) What is pharmacodynamics?

g) What are Glycosides?

h) Define ethanoagriculture.

i) What are non wood forest products?

j) Give any two uses of safflower.

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

a) What are different methods of morphological evaluation of drug?

b) Explain microscopic characters and uses of clove.

c) Give the applications of biopharmaceutics.

P.T.O.

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

a) Factors affecting cultivation of drug plants.

b) Macroscopic and microscopic characters of Tinospora.

c) Botanical resources of gum.

Q4) Explain in detail the concept of Tridosha. Add a note on Ayurveda system of medicine. **[10]**

OR

Give evolution, origin, sources and uses of Curcuma longa.

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Total No. of Questions :4]

SEAT No. :

P416

[Total No. of Pages : 2

[5422]-433
T. Y. B. Sc.
BOTANY (Theory)
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) ***Figures to the right indicate full marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

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

a) Enlist the hormone pair required for callus formation.

b) Enlist any two achievements of Biotechnology.

c) What is in-situ conservation?

d) What is genetic engineering?

e) What is NCBI?

f) What is IPR?

g) What is Data base?

h) Define proteomics.

i) What is Nod gene?

j) What is embryogenesis?

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

a) Explain the use of Bioinformatics tools in analysis.

b) Describe the types of Genomics.

c) Describe four applications of Cryopreservation.

P.T.O.

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

a) Cyclodextrins

b) GM food and safty.

c) Micropropagation

Q4) What is plant tissue culture? Describe the concept, protocol technique and application of callus culture. **[10]**

OR

What are Biofertilizer? Describe BGA and organic fertilizers. **[10]**

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Total No. of Questions : 4]

SEAT No :

P 417

[Total No. of Pages :2

[5422]-434
T.Y.B.Sc.
BOTANY
BO - 346 : Plant Breeding and Seed Technology
(2013 Pattern) (Semester-IV) (Paper-VI)

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

Instructions to the candidates:

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

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

a) Give any two importance of plant breeding.

b) Write any two advantages of plant introduction.

c) What are abiotic stresses?

d) Define backcross.

e) What is selection?

f) Mention any two role of seed technology.

g) What is field count?

h) Define seed.

i) What is purity components?

j) Define germination testing.

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

a) Describe mechanisms and genetic bases of resistance to biotic stresses in plants.

b) What is germination testing? Explain its general principles.

c) What are polyploids? Describe methods used in obtaining haploids.

P.T.O.

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

a) Properties of polyploids.

b) Seed transportation and storage.

c) Moisture testing by air over method.

Q4) What is selection? Describe mass selection with their advantages. **[10]**

OR

What is seed sampling? Describe methods of protection and control of seed storage.

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Total No. of Questions : 4]

SEAT No. :

P418

[Total No. of Pages : 2

[5422]-435
T.Y. B.Sc.
ZOOLOGY
ZY-341 : Biological Techniques
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

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

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

a) What is Colorimetry?

b) Define molality.

c) What is dehydration?

d) What is clotting time?

e) State any two precautions for avoiding tissue damage during procurement.

f) Define basic stain.

g) What is histochemistry?

h) Define centrifugation.

i) What is stage micrometer?

j) What is spectroscopy?

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

a) Explain principle and working of simple microscope.

b) Give an account of process of block making.

c) What is a microtome? Explain in detail rotary microtome.

P.T.O.

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

a) Differential count of WBCs.

b) Electrophoresis.

c) PAS technique.

Q4) What is chromatography? Describe in detail principle and applications of paper chromatography. **[10]**

OR

What are fixatives? Write the names of their classes with one example of each. Describe characteristics of an ideal fixative.

Total No. of Questions : 4]

SEAT No. : ____

P419

[Total No. of Pages : 2

[5422]-436

T.Y.B.Sc.

ZOOLOGY

ZY - 342 : Mammalian Physiology and Endocrinology

(2013 Pattern) (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 are pacemakers?

b) Define renal calculi.

c) State any one chemical change during muscle contraction.

d) Define epilepsy.

e) Define menstrual cycle.

f) State any two symptoms of diabetes insipidus.

g) What is angiography?

h) What is chloride shift?

i) State the role of pancreas in physiology of digestion.

j) State the significance of colour doppler.

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

a) Describe role of liver in physiology of digestion.

b) Explain countercurrent multiplier of urine concentration.

c) Describe saltatory conduction.

P.T.O.

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

a) B M R

b) Mechanism of hormone action.

c) Hormonal control of lactation.

Q4) Define cardiac cycle. Describe different phases of cardiac cycle. **[10]**

OR

Describe ultrastructure of striated muscle, Add a note on sliding filament theory of muscle contraction. **[10]**

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Total No. of Questions :4]

SEAT No. :

P420

[Total No. of Pages :2

[5422] - 437

T.Y.B.Sc.

ZOOLOGY

ZY- 343 : Genetics and Molecular Biology

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

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

Instructions to the candidates:

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

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

a) Give significance of crossing over.

b) Define chance mating.

c) What is initiation codon?

d) Mention applications of VNTRs.

e) Give role of DNA ligase.

f) What is mutation?

g) Define heterochromatin.

h) Mention two properties of genetic code.

i) Enlist types of purine bases.

j) What is trp operon?

P.T.O.

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

a) Describe any two types of mutations.

b) Explain: 'RNA as genetic material'.

c) Give an account of restriction enzymes.

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

a) DNA packaging.

b) Gene frequency.

c) Hardy - Weinberg Law

Q4) What is 'Central Dogma of Molecular Biology'? Describe the process of transcription in eukaryotes. **[10]**

OR

Describe in detail various types of mutagenic agents.

Total No. of Questions : 4]

SEAT No. : ____

P421

[Total No. of Pages : 2

[5422] - 438

T.Y.B.Sc.

ZOOLOGY

ZY- 344: Organic Evolution

(2013 Pattern) (Paper - IV) (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 indicates full marks.***

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

a) Who was Darwin?

b) What is speciation?

c) What are symbionts?

d) What is paleozoic era?

e) Define eukaryotic ceu.

f) Define coacervate.

g) Mention any one embryo logical evidence of organic evolution.

h) What is geological time scale?

i) Mention any two characters of Homo Sapiens.

j) Explain prezygotic isolating mechanism.

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

a) Describe factors affecting animal distribution.

b) Describe Ethiopian and palearctic realms with reference to geographic range of fauna.

c) Describe patterns of speciation.

P.T.O.

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

a) Kenyapithecus.

b) Post zygotic isolating mechanism.

c) Modern synthetic theory of organic evolution.

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

OR

What is organic evolution? Explain Lamark's theory of organic evolution.

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Total No. of Questions :4]

SEAT No. :

P422

[Total No. of Pages : 2

[5422]-439
T. Y. B. Sc.
ZOOLOGY
ZY- 345: General Embryology
(2013 Pattern) (Semester-IV) (Paper - V)

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

Instructions to the candidates:

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

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

a) Define mesolecithal egg.

b) What is allantois?

c) What is radial cleavage?

d) What is primary egg membrane?

e) What are somites?

f) What is secondary organiser?

g) Define spermiogenesis.

h) What is anisogamy?

i) What is pre-vitellogenesis?

j) What is involution?

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

a) Describe the structure of telolecithal egg.

b) Describe coeloblastula.

c) Describe structure of Hen's egg.

P.T.O.

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

a) Spermiogenesis.

b) Preformation theory.

c) Holoblastic cleavage.

Q4) What is fertilization? Describe activation of ovum during fertilization. **[10]**

OR

Describe the development of chick embryo up to 33 hours.

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Total No. of Questions : 4]

SEAT No. :

P423

[Total No. of Pages : 2

[5422]-440
T.Y. B.Sc.
ZOOLOGY
ZY-346(A) : Public Health and Hygiene
(2013 Pattern) (Semester - IV) (Paper - VI) (Elective - II)

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

Instructions to the candidates:

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

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

a) Define community health.
b) What is necessity of food?
c) What is diabetes mellitus?
d) State types of radiations.
e) Define occupational disease.
f) Enlist two causes of epidemiology.
g) State any two symptoms of measles.
h) Define mental hygiene.
i) Enlist provisions for disabled persons.
j) State any two properties of soil.

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

a) Describe various methods of data sampling.
b) Give an account of soil borne diseases.
c) Describe sources and properties of water.

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

a) Epidemiology.
b) Beverages and condiments.
c) Ventilation system.

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

OR

What is sanitation? Describe various methods of disposal of animal waste.

P.T.O.

Total No. of Questions : 4]

P423

[5422]-440
T.Y. B.Sc.
ZOOLOGY
ZY-346(B) : Medical Entomology
(2013 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

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

a) Define Eusociality.
b) Mention any two methods of cockroach control.
c) Define vector.
d) Mention any two diseases spread by flea.
e) Enlist the castes in termites.
f) Define veterinary entomology.
g) Enlist the divisions of insect thorax.
h) Holometabolic insect.
i) Mention any two adaptations in mosquito.
j) Define biological control.

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

a) Describe the effects of flea on host.
b) Explain different types of insect legs.
c) Describe social organisation in Wasps.

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

a) Agricultural entomology.
b) Insect integument.
c) Intraspecific relationship.

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

OR

Describe life cycle of furniture bettle in brief and add a note on its distribution, damage and control measures.

Total No. of Questions : 4]

SEAT No. :

P424

[Total No. of Pages : 2

[5422]-441
T.Y. B.Sc.
GEOLOGY
GL - 341 : Metamorphic Petrology
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

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

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

a) What is prograde metamorphism?

b) Enlist any four metamorphic facies.

c) What is pneumatolytic metamorphism?

d) What is mylonite?

e) What is augen structure?

f) What is schistose structure?

g) What is plutonic metamorphism?

h) Enlist different types of metasomatism.

i) Give any two points of significance of inclusions in metamorphic crystals.

j) What is mosaic structure?

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

a) Write about lower & upper limits of metamorphism.

b) Write note on stress & solubility of minerals.

c) Write note on charnockites.

P.T.O.

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

a) What is tourmalinisation? Write in brief.

b) Write a note on slaty cleavage.

c) Write a note on aureoles of thermal metamorphism.

Q4) Write a note on metamorphic facies. Explain in detail the facies of contact metamorphism. **[10]**

OR

Write about regional metamorphism of argillaceous rocks.

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Total No. of Questions : 4]

SEAT No. : ____

P425

[Total No. of Pages : 2

[5422]-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) ***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 avalanches

b) Desertification

c) Give different types of environmental pollutions.

d) What do you mean by subsidence of land?

e) Enlist the causes of accelerated erosion.

f) Tsunami

g) Focus and Epicenter.

h) Ozone layer depletion

i) Define Erosion

j) Soil conservation

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

a) Predictibility of floods.

b) Types of mining hazards

c) Nitrogen cycle

P.T.O.

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

a) Enumerate seven fundamental concepts in environmental Geology.

b) Explain the types of volcanic hazards.

c) Explain types of water pollution. Add note on Flurosis at Bhandara (Maha).

Q4) What do you mean by natural resources? Give types of natural resources. Add a note on crisis faced by mankind with regards to conventional source of energy. **[10]**

OR

Define mass movement. Explain causes and types of mass movement.

Total No. of Questions :4]

SEAT No. :

P426

[Total No. of Pages :2

[5422] - 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) ***Black figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

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

a) What is ore?

b) What is anthracite?

c) What are pitches and flats?

d) What is calc - tufa?

e) Define metasomatic replacement.

f) What are epithermal deposits?

g) What are residual deposits?

h) What are gas hydrates?

i) Give the ore minerals of lead.

j) Give the crystal system and specific gravity of gold.

P.T.O.

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

a) Stockwork and saddle reefs.

b) Uses of uranium and thorium.

c) Gossans as guides to the hidden deposits.

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

a) Geological and geographical distribution of copper deposits.

b) Coal fields of Maharashtra.

c) Mineral deposits associated with different plate boundaries.

Q4) Explain early and late magmatic deposits with suitable examples. **[10]**

OR

Explain the origin of petroleum. Describe the Krishna- Godavari Basin with reference to it's stratigraphy and structure. **[10]**

Total No. of Questions :4]

SEAT No. :

P427

[Total No. of Pages :2

[5422] - 444

T. Y. B. Sc.

GEOLOGY

GL - 344 : Geotectonics

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

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

Instructions to the candidates:

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

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

a) Define lithosphere.

b) What are S waves?

c) Name the seismic discontinuity between outer & inner core.

d) Define CRM.

e) Name 2 reverse epochs from geomagnetic time scale.

f) Define plate margin.

g) What is RRR triple junction?

h) Name the hotspot responsible for formation of Deccan Traps.

i) Define subduction zone.

j) Name 2 cratons from India.

Q2) Write notes on (Any 2) **[10]**

a) Shadow zone.

b) Achondrites.

c) Characteristics of plates.

P.T.O.

Q3) Write notes on (Any 2) **[10]**

a) Difference between transform & transcurrent fault.

b) Craton & platform

c) Plate tectonic model of mountain formation.

Q4) Write a note on ophiolites. **[10]**

OR

Q4) Explain different data sources used to interprete interior of earth. **[10]**

Total No. of Questions : 4]

SET No. :

P428

[Total No. of Pages : 2

[5422]-445
T. Y. B. Sc.
GEOLOGY
GL- 345 :Phanerozoic Stratigraphy of India and Palaeontology
(2013 Pattern)(Paper - V)(Semester - IV)

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

Instructions to the candidates:

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

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

a) Give stratigraphic units of cretaceous of Narmada valley.

b) Give economic importance of Tertiary of K-G basin.

c) Give fossil content of kutch area.

d) Give important characters of ptillophyllum fossil.

e) Give economic important of Cauvery basin.

f) Give geological & geographical distribution of Glossopteris plant.

g) Give fossil content of Spiti valley.

h) Give important conditions for fossilization.

i) Give geographical distribution of Karewas of Kashmir.

j) Give Generic definition of Nilssonia.

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

a) Describe the origin of Laterites.

b) Describe the climatic conditions and fossil content of siwalik group .

c) Describe the stratigraphy of Maharashtra.

P.T.O.

Q3) Write notes on (Any Two) : **[10]**

a) Describe Precambrian-Cambrian boundary.

b) Brief history of Tertiary of Assam.

c) Describe the causes of Mass Extinction.

Q4) Describe the geographical distribution stratigraphic classification of Gondwana super group. Add a note on its age. **[10]**

OR

Give the type area, broad lithology, fossil content &classification of Cambrian system.

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Total No. of Questions : 4]

SEAT No. :

P429

[Total No. of Pages : 2

[5422]-446
T.Y. B.Sc.
GEOLOGY
GL-346 : Applied Geology - II
(2013 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

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

a) Define Engineering Geology.

b) Name types of dams.

c) What are Highway aggregates?

d) Define Railroad Ballast.

e) State any two qualities of good facing stones.

f) What is water table?

g) What are connate and Juvenile waters?

h) What is meant by Rainwater harvesting?

i) What is Worden gravimeter?

j) What are geophones?

Q2) Write in short (any two) : **[10]**

a) Recharge through Pits and shafts.

b) Permeability and ground water flow.

c) Significance of geology in Civil engineering.

P.T.O.

Q3) Write in short (any two) : **[10]**

a) Open cast mining.

b) Any two engineering properties of rocks.

c) Geochemical prospecting.

Q4) Enumerate different engineering properties of rocks. Explain compressive strength, Tensile strength and Elasticity of rocks. **[10]**

OR

Explain the term aggregates. State their properties. Write in short about Runway aggregates and Highway aggregates.

Total No. of Questions : 4]

SEAT No. :

P430

[Total No. of Pages : 3

[5422]-447
T.Y. B.Sc.
STATISTICS (Principal)
ST - 341 : Actuarial Statistics
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of 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: **[4]**

a) The rate of discount is

i) iv ii) i + v

iii) $\frac{i}{v}$ iv) i – v

b) The p.d.f. $g_T(t)$ of T(x) is given by

i) ${}_tp_x\mu_x$ ii) ${}_tq_x\mu_{x+t}$

iii) ${}_tp_x\mu_{x+t}$ iv) ${}_tq_x\mu_x$

c) If δ is constant force of mortality then δ =

i) – v ii) – log v

iii) log v iv) v

d) In equivalence principle, premium P is found such that

i) $E(z) = P\,E(y)$ ii) $E(z) = \frac{E(y)}{P}$

iii) $E(z) = E(y)$ iv) $E(z) = E(P^2 y)$

P.T.O.

B) State whether each of the following statements is true or false: **[1 each]**

a) If $F(x) = 0$, for $x < 0$

$= 1 - \frac{1}{x+1}$, for $x \geq 0$

then ${}_{10}P_{39} = 0.8$

b) $K(x)$ is a discrete random variable

C) Explain each of the following concepts: **[1 each]**

a) Policy.

b) Loss function.

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

a) $A^{1}_{x:\overline{n}|}$

b) $\ddot{a}_{x:\overline{n}|}$

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

a) Explain the term 'annuity' with an illustration. Also explain.

i) annuity certain due.

ii) Annuity certain immediate

b) State any two properties of survival function $S(x)$. Derive the expression for $\mu(x)$ (i.e. force of mortality) in terms of the survival function $S(x)$.

c) The survival rates (p_x) for a population of certain animal are as follows:

Age (in months) (x)	0	1	2	3	4	5	6
p_x	0.8	0.75	0.7	0.4	0.2	0.1	0.0

For a radix of 1,00,000 obtain the columns l_x, L_x and T_x.

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

a) Show that the condition for mutually advantageous policy is $G \geq \mu$, where G is onetime premium and μ is expected value of loss at issue random variable. Also state the assumptions.

b) With effective rate of interest 5% per annum, obtain.

i) Effective rate of discount.

ii) Force of interest.

iii) Accumulated value of 20,000 at the end of 5^{th} year.

iv) Present value of 15,000 due after the end of 4^{th} year.

c) Given that $P_{60} = 0.985$, $P_{61} = 0.98$, $i = 0.05$, $A_{62} = 0.6$. Calculate A_{61} and A_{60}

Q4) Attempt any one of the following:

A) a) Explain with an illustration each **[5]**

i) *n* year endowment insurance

ii) whole life insurance

State and explain the expressions for net single premium in terms of V for each of the above insurance schemes.

b) L is the loss at issue random variable for a fully discrete whole life insurance of 1 issued to (49). Calculate P and E(L), when the following information is known: **[5]**

$A_{49} = 0.23882$, $\ddot{a}_{49} = 13.4475$, ${}^{2}A_{49} = 0.08873$, $i = 0.06$ and Var (L) = 0.10.

B) a) In the annuity certain, the payments are made regularly at the beginning of the year then derive that **[5]**

$$\ddot{s}_{\overline{n}|} = (1+i)^{n}\ \ddot{a}_{x:\overline{n}|}$$

b) Find the present value and accumulated value of 10 year annuity immediate of Rs. 1000 per annum with effective rate of interest 6%. **[5]**

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Total No. of Questions : 4]

SEAT No. :

P431

[Total No. of Pages : 3

[5422]-448

T. Y. B. Sc.

STATISTICS (Principal)

ST - 342 : Testing of Hypotheses

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator and statistical tables 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) Power of a test is probability of

i) rejecting H_0 when H_0 is true.

ii) rejecting H_0 when H_1 is true.

iii) accepting H_0 when H_0 is true.

iv) rejecting H_1 when H_1 is true.

b) In an SPRT with strength (0.05, 0.05) the values of A and B are

i) $19, \frac{1}{19}$ ii) $\log 19, \log \frac{1}{19}$

iii) 5, 95 iv) log 5, log 95

c) Which of the following tests can be considered as goodness of fit test?

i) Run ii) Sign

iii) Man-Whitney iv) Kolmogorov-Smirnov

d) Let X~ Poisson(m). To test $H_0 : m = m_0$ against $H_1 : m > m_0$, the best critical region based on a sample of size n is of the form :

i) $\sum_{i=1}^{n} X_i < C$ ii) $\sum_{i=1}^{n} \left(X_i - \overline{X}\right)^2 > C$

iii) $\sum_{i=1}^{n} X_i > C$ iv) $\sum_{i=1}^{n} X_i^2 > C$

Where C is a constant.

P.T.O.

B) State whether each of the following statements is true or false : **[1 each]**

a) SPRT always requires more sample observations to come to a conclusion than the test based on fixed sample size.

b) MP test is always UMP test.

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

a) A test of hypothesis

b) Level of significance.

D) Attempt each of the following : **[1 each]**

a) State the asymptotic distribution of $-2 \log_e \lambda(x)$.

b) Explain the term composite statistical hypothesis with an illustration.

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

a) Construct SPRT of strength (α, β) for testing H_o: $\theta=\theta_0$ against $H_1 : \theta=\theta_1$ $(\theta_1>\theta_0)$ for an exponential variate with mean $1/\theta$.

b) A random variable X follows B(n=10, p). Determine UMP level α test for testing $H_0 : p = 0.6$ against $H_1 : p > 0.6$.

c) Describe sign test for one sample problem.

Q3) Attempt <u>any two</u> of the following : **[5 each]**

a) Construct likelihood ratio test of level of significance α for testing $H_0 : \mu=\mu_0$ against $H_1 : \mu \neq \mu_0$ where μ is the mean of $N(\mu, \sigma^2)$ distribution where σ^2 is unknown.

b) X is continuous random variable with p.d.f.

$$f(x, \alpha, \beta) = \frac{\alpha^\beta}{\lceil \beta} e^{-\alpha x} x^{\beta-1}, \quad 0 \leq x < \infty, \ \alpha, \beta > 0$$

$$= 0 \quad , \text{otherwise}$$

It is required to test the null hypothesis $H_0 : \alpha = 1, \beta = 1$ against $H_1 : \alpha=1, \beta=2$, on the basis of a single observation from the distribution of X. Find the B.C.R. if the probability of type I error is to be 0.05. Also find the power of the B.C.R.

c) Distinguish between parametric and nonparametric tests.

Q4) Attempt any one of the following :

a) i) Construct SPRT of strength (α, β) for testing $H_0 : m = m_0$ against $H_1 : m = m_1$ ($m_1 < m_0$) for a Poisson variate X with mean m. **[5]**

ii) The weights (in gms) of 12 rats after treated with certain diet are as follows :

146, 102, 73, 171, 137, 90, 82, 120, 143, 70, 135, 132.

Use Wilcoxn's signed rank test to test whether the diet has increased the average weight of rats about 95 gms. **[5]**

b) i) Let $X_1, X_2, ..., X_n$ denote the random sample of size n from normal distribution with mean μ and variance 100. It is required to test the null hypothesis $H_0 : \mu = 75$ against the alternative $H_1 : \mu$ 80. The best test procedure is to reject H_0 when the sample mean $\bar{X} \geq$ C, where C is constant. Find n and c such that the probability of type I error is 0.05 and that of type II error is 0.1. **[6]**

ii) A person has planted tomato plants in his garden. Some plants are found to be healthy (H) and others are found to be diseased (D) as listed below :

H H H H D H D D D H D D D D

Test at 5% level of significance whether this arrangement may be regarded as random. **[4]**

Total No. of Questions :4]

SEAT No. :

P432

[Total No. of Pages :3

[5422] - 449

T.Y.B.Sc.

STATISTICS (PRINCIPAL)

ST - 343: Statistical Quality Control

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

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

Instructions to the candidates:

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

Q1) Attempt each of the following: **[1 each]**

a) Choose the correct alternative in each of the following:

i) The following limits are not used as control limits for a control chart.

A) 3σ limits B) exact probability limits

C) specification limits D) K - σ limits

ii) If U and L denote UCL and LCL on an $\bar{X}$ chart, then the estimate of process standard deviation (σ) is [Assume that standards are not specified]

A) $\frac{(U-L)}{2}.\frac{A_2}{d_2}$ B) $\frac{(U-L)}{2A_2d_2}$

C) $\frac{(U-L)}{2}.\frac{d_2}{A_2}$ D) $\frac{(U-L)}{2}.A_2 d_2$

iii) Consumer's risk is probability of accepting a lot of quality

A) AQL B) AOQ

C) AOQL C) LTFD

iv) The Average Sample Number (ASN) in single sampling plan

A) n B) N

C) $n P_a(P)$ D) $NP_a(P)$

P.T.O.

b) State whether each of the following statements is **true or false**.**[1 each]**

i) Acceptance sampling is used to protect the purchaser or user against inferior quality or a lot.

ii) The points out of the control limits on R-chart are also considered while constructing $\bar{X}$ - chart.

c) Define the following terms: **[1 each]**

i) Lot Tolerance Percent Defective (LTPD)

ii) Defective

d) i) State any two advantages of double sampling plan. **[1]**

ii) Interpret the value C_{pk} =1.33 **[1]**

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

a) Write the note on cause and effect diagram.

b) Distinguish between assignable cause and chance cause.

c) Find producer's risk for a single sampling plan N = 5000, n=150, c = 3 AQL = 0.04, Use Poisson distribution.

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

a) Explain in detail the construction of P-chart when subgroup sizes are same.

b) Derive an expression for average outgoing quality (AOQ) for a double sampling plan (DSP).

c) Define

i) Capability ratio

ii) Natural tolerance limit

iii) Specification limit

iv) Probability limit

Q4) Attempt any one of the following:

a) i) Following data are obtained from statistically controlled process. **[7+3]**

Assume that the standards are not specified.

UCL on R chart = 32.825

UCL on $\bar{X}$ chart = 168.67

Sample size = 5

1) Estimate the process average and process standard deviation.

2) The process average shifts to 151. Calculate the probability of catching shift on $\bar{X}$ chart in first sample after the shifts has taken place.

ii) Write a note on OC curve of a single sampling plan.

b) i) The following is a record of the number of defects per unit for metal disk equipment painted by dipping: 6, 5, 7, 5, 4, 6, 8, 7. Draw a suitable chart and comment about the process control.

ii) Explain normal, reduced and tightened inspection.

[6+4]

Total No. of Questions :4]

SEAT No. :

P433

[Total No. of Pages :3

[5422] - 450

T. Y. B. Sc.

STATISTICS (Principal)

ST 344 : Operations Research

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific 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) A Transportation problem (T. P.) has an alternate optimum solution if for non-basic variables.

i) At least one net evaluation is 0.
ii) All net evaluations are equal to 0.
iii) All net evaluations are less than 0.
iv) All net evaluations are greater than 0.

b) In canonical Form of Linear Programming Problem (LPP) for maximisation of objective function, the constraints are expressed as

i) equations
ii) less than or equal to type inequalities.
iii) strict less than type inequality.
iv) strict greater than type inequality.

c) If 3 time estimates of an activity in PERT are 14, 18 and 40 days, then expected time of that activity is

i) 21 days ii) 24 days
iii) 20 days iv) 16 days

P.T.O.

d) Every basic Feasible solution of an Assignment Problem (AP), having a square pay-off matrix of order n should have assignments equal to

i) n + 1 ii) n iii) n – 1 iv) 2n

B) State whether each of the following is True or False. **[1 each]**

a) Primal and dual form of LPP has the same objective function.

b) T. P. is a special case of A. P.

C) Define each of the following, in network analysis. **[1 each]**

a) event b) activity

D) a) Define standard form of LPP. **[1]**

b) Explain the concept of degeneracy in a T. P. **[1]**

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

a) Define the following terms used in LPP.

i) artificial variable

ii) basic solution

iii) feasible solutin

iv) degenerate solution

v) non-degenerate solution.

b) Define unbalanced transportation problem and explain how to convert it to balanced T. P. Further, explain least cost method to obtain initial basic feasible solution of T. P.

c) Obtain the initial basic feasible solution for the following transportation problem using Vogel's Approximation method. The profit matrix is as given below.

Destination / Origin	D_1	D_2	D_3	D_4	Supply
O_1	15	51	42	33	23
O_2	30	42	26	81	44
O_3	90	40	66	60	33
Demand	23	31	16	30	

Q3) Attempt any TWO questions : **[5 each]**

a) Describe general Linear Programming Problem (LPP). Write it in mathematical form.

b) A manufacturer produces two types of products A and B. Product A is produced by using 3 units of chemical salt and 2 units of chemical mixture. Product B is produced by using 2 units of chemical salt and 5 units of chemical mixture. Only 800 units of chemical salt and 1200 units of chemical mixture are available. The per unit profit on product A and B are ₹30 and ₹25 respectively. Formulate it as LPP.

c) Explain the term 'simulation'. Write advantages and disadvantages of simulation.

Q4) Attempt any ONE of the following.

a) i) Describe an Assignment Problem (AP). Write steps involved in Hungarian method to solve AP (minimisation type) **[5]**

ii) Write dual of the following LPP.

Max $Z = -2x_1 - 4x_2 - x_3$

Subject to $x_1 + 2x_2 - x_3 \leq 5$

$2x_1 - x_2 + 2x_3 = 2$

$x_1, x_2, x_3 \geq 0.$ **[5]**

b) i) Draw a network diagram from following activities. Find critical path. Calculate total float and free float for each activity. **[8]**

Job	A	B	C	D	E	F	G	H	I
Immediate Predecessor	–	A	B	C	B	E	D,F	E	H
Job time	13	8	10	9	11	10	8	6	7

ii) Describe pseudo random number generators. **[2]**

Total No. of Questions : 4]

SEAT No. :

P434

[Total No. of Pages : 6

[5422]-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) Parallel system of n independent components has number of minimal path sets equal to

i) 1 ii) n

iii) 2^n iv) ${}^nC_k$

b) Reliability of 2-out-of-3 : G system is

i) $3p^2 - 2p^3$ ii) $3p\ (1-p)^2$

iii) $(1-p)^3$ iv) p^3

c) Which one of the following relationship between failure rate function r(t) and mean residual life L(t) of a unit aged t is correct?

i) $r(t) = \dfrac{1 - L'(t)}{L(t)}$ ii) $r(t) = \dfrac{L(t)}{1 + L'(t)}$

iii) $r(t) = \dfrac{1 + L'(t)}{L(t)}$ iv) $r(t) = \dfrac{L(t)}{1 - L'(t)}$

d) Which of the following statement is incorrect for exponential distribution?

i) $\overline{F}(x+t) = \overline{F}(t) \cdot \overline{F}(x)$; $t, x > 0$ where $\overline{F}(\cdot)$ is a surival function.

ii) Lack of memory property hold.

iii) Constant failure rate function

iv) Mean residual life depends on t

P.T.O.

B) State whether each of the following statements is true or false. **[1 each]**

a) In type II censoring, number of failures is a random variable.

b) By positive ageing we mean that the age has adverse effect on the residual lifetime of the unit.

C) Define the following terms : **[1 each]**

a) Irrelevant component

b) Reliability of a component

D) Attempt each of the following : **[1 each]**

a) State the relative importance of each of the component of a series system having n independent components.

b) If a random variable X follows exponential distribution with mean $\frac{1}{5}$ then find r(t).

Q2) Attempt ANY TWO of the following : **[5 each]**

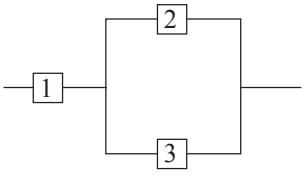
a) Define a coherent system. Show that the performance of a coherent system is bounded below and above by the performance of the series system and parallel system composed of the same components respectively.

b) Let h($\underline{P}$) be the reliability function of a coherent structure then show that h($\underline{P}$) is strictly increasing function in each pi for $0 < pi < 1$.

c) Define Decreasing Failure Rate (DFR) and Decreasing Failure Rate in Average (DFRA) class of lifetime distributions. Show that if F belongs to DFR implies that $F \in$ DFRA.

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

a) Consider the following Reliability Block Diagram :



i) Find the structure function of the above system.

ii) Find minimal path sets

iii) Find minimal cut sets.

iv) Express this system as the parallel arrangement of the minimal path series structures.

v) Express this system as the series arrangement of the minimal cut parallel structures.

b) Show that $r(t) = \frac{f(t)}{\bar{F}(t)}$ provided $F(t) < 1$, where $r(t)$, $\bar{F}(t)$ are failure rate function and survival function of a random variable T.

c) Derive an expression for kaplan Meier estimator of survival function.

Q4) Attempt Any One of the following :

a) i) Define dual of a coherent system. Show that dual of a coherent system is a coherent system. **[5]**

ii) Define Harmonically New Better than Used in Expectation (HNBUE) class of lifetime distributions. State and prove the implication relation between New Better than Used in Expectation (NBUE) and HNBUE class of lifetime distributions. **[5]**

b) i) Suppose a component has life time distribution as weibull with scale parameter $\lambda = 2$ and shape parameter $\gamma = 1$ then find

i) Mean failure time

ii) Probability that the component will worked for 2 hours will operate another 5 hours. **[5]**

ii) If each of the two components has independent exponential lifetime distribution then find the reliability of the system and its expected lifetime when they are connected in series. **[3]**

iii) State a non-parametric unbiased estimator and confidence band for survival function. **[2]**

Total No. of Questions : 4]

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[5422]-451

T.Y.B.Sc.

STATISTICS

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) A state j is said to be persistent if

i) return to state j is certain

ii) it is ergodic

iii) if it is communicating

iv) if it is absorbing

b) If a Markov chain does not contain any other proper closed subset other than the state space then it is called

i) reducible ii) finite

iii) irreducible iv) discrete

c) Consider a Markov chain $\{x_n, n \geq 0\}$ with discrete state space. If the transition probabilities are independent of n, the Markov chain is said to be

i) homogeneous ii) reducible

iii) non homogeneous iv) independent

d) The mean of inter arrival time of a Poisson process $\{N(t), t \geq 0\}$ with parameter λ is

i) λ ii) $1/\lambda$

iii) λt iv) $1/\lambda t$

B) State whether each of the following statements is true or false : **[1 each]**

a) An absorbing state of a Markov chain is a state such that once entered in that state cannot be left.

b) The sum of two independent Poisson processes is also a Poisson process.

C) Define : **[1 each]**

a) Markov chain

b) Communicating states of a Markov chain

D) a) Explain what is meant by aperiodic state of a Markov chain. **[1]**

b) The number of accidents in a town take place in accordance with Poisson process with mean rate 2.5 per day. Compute the probability that exactly 3 accidents take place on a particular day. **[1]**

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

a) Consider a Markov chain with one step probability matrix P as

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

Show that the Markov chain is irreducible. Compute $f_{33}^{(2)}$ i.e. probability that it reaches state 3 for first time in 2 steps.

b) What is state space of a stochastic process? Discuss different types of state spaces with suitable illustrations.

c) Suppose that the probability that a target is hit is 0.8 if it is hit in the previous attempt and 0.6 if it is not hit in the previous attempt.

If $X_n = 1$ if the target is hit on n^{th} attempt

$= 0$ if it is not hit on n^{th} attempt.

Find the probability that the target is hit on 3^{rd} attempt if it was not hit on 1^{st} attempt.

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

a) If $\{N_1(t), t \geq 0\}$ and $\{N_2(t), t \geq 0\}$ are two independent Poisson processes with parameters λ_1 and λ_2 respectively.

Show that

$$P[N_1(t) = k \mid N_1(t) + N_2(t) = n] = \binom{n}{k} p^k \, q^{n-k}$$

where $p = \dfrac{\lambda_1}{\lambda_1 + \lambda_2}$ and $q = \dfrac{\lambda_2}{\lambda_1 + \lambda_2}$

b) Discuss gambler's ruin problem.

c) Consider a Markov chain $\{X_n, n \geq 1\}$ with state space $\{0, 1, 2\}$ with one step transition probability matrix

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

Obtain 2-step transition probability matrix and hence state $P[X_3 = 2 / X_1 = 0]$.

Q4) Attempt Any One of the following :

a) i) State and prove Chapman Kolmogorov equations. **[5]**

ii) Define compound Poisson process. State its mean and variance. Discuss a situation where compound Poisson process is applicable. **[5]**

b) i) Consider a Markov chain with state space $S = \{1, 2, 3, 4\}$ and one step transition probability matrix

$$P = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1/4 & 1/8 & 1/8 & 1/2 \end{bmatrix}$$

Show that state 4 is ergodic. **[6]**

ii) State and explain the postulates of Poisson process. **[4]**

Total No. of Questions : 4]

SEAT No. : ____

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[Total No. of Pages : 3

[5422]-452

T.Y.B.Sc.

STATISTICS (Principal)

ST - 346 : Statistical Computing using 'R' Software (Online Paper)

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Each question is to be solved using R software installed on your computer.***
4) ***Attach computer printout of your work to the answer book supplied to you.***

Q1) Attempt each of the following: **[1 each]**

a) Create a data frame containing roll number and marks of 5 students in statistics using edit command.

b) Create a file in MS-Excel containing name and hometown of 2 students and save it as a text file, further import this file to R.

c) Draw a random sample of size 8 from a normal distribution with mean 4.8 and variance 4. Also find median of the sample.

d) Create a vector *x* of observations: 30, 28, 42, 71, 98, 44, 87, 69 using scan function.

e) Let $X \sim P(8.5)$, compute P(X = 7) and P(X > 4).

f) Draw stem and leaf plot using observations as given below: 18, 21, 11, 34, 42, 07, 48, 39, 31, 28, 04, 17, 24, 38, 44, 16.

g) Write R-program script for summing up the numbers 11 to 25 using for loop.

h) Test for normality of the data: 34, 76, 48, 92, 77, 88, 92, 35, 49, 56, 74, 65, 67, 70, 90 using Shapiro-Wilk's test.

i) Find mean deviation about mean of the below given observations: 1.8, 2.3, 4.4, 3.9, 1.6, 2.4, 3.8.

j) Compute geometric mean and harmonic mean of the observations: 3.4, 4.4, 7.9, 11.4, 12.6, 11.4, 9.1, 8.8.

P.T.O.

Q2) Attempt any <u>two</u> of the following: **[5 each]**

a) Represent the following data related to the cost of living in percentage of a family by Pie diagram.

Item	Food	Clothing	Housing	Education	Medical	Miscellaneous
Expenses (%)	30	15	10	10	15	20

b) Fit a Poisson distribution to the following data and find the expected frequencies:

number of defects	0	1	2	3	4	5
number of items	128	69	22	11	3	1

c) Compute measure of skewness and kurtosis based on moments for the given data: 8, 3, 9, 16, 11, 21, 10, 18, 17, 7.

Q3) Attempt any <u>two</u> of the following: **[5 each]**

a) Draw less than and more than ogive curve for the following data of annual income of some families.

Income ₹ lakhs	0-5	5-10	10-15	15-20	20-25	25-30	30-35
Number of families	8	12	20	24	19	7	2

b) Following data is related to the height in cms of 10 individuals: 170 168 160 162 172 174 162 156 158 163 can the sample be regarded as taken from a population with median more than 164 cms, by using Wilcoxon's signed rank test at 5% level.

c) Two horses A and B were tested according to the time in seconds for covering a particular track gave the following results:

Horse A:	30	31	28	27	26	28
Horse B:	32	27	26	28	25	27

Write R-program script for testing the equality of variances of time taken by 2 horses to cover the track by verifying assumptions.

Q4) Attempt any one of the following:

a) i) Write R-program script to carryout ANOVA for the following data by verifying the underlying assumptions.

Treatment	Observations					
A	42	41	37	52	54	46
B	28	42	40	30	34	
C	62	60	58	73		

ii) Draw the graph of probability curve of Cauchy distribution with parameters $\theta = 4.8$ & $\lambda = 1$.

[7+3]

b) i) Use the following data to test whether the attributes condition of home and condition of child are independent at 5% level of significance.

child → home ↓	clean	fairly clean	dirty
clean	48	24	15
medium	16	20	12
dirty	10	09	38

ii) Carryout two-way ANOVA for the below given data.

Treatment / Block	A	B	C	D
1	9.2	7.4	6.8	8.4
2	7.2	8.0	7.8	6.9
3	9.2	7.3	6.2	5.4

[4+6]

Total No. of Questions :4]

SEAT No. :

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[5422]-453
T.Y.B.Sc.
GEOGRAPHY
Gg - 341 : Fundamentals Of Human Geography
(2013 Pattern) (Semester-IV) (Part-II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in two or three sentences (any ten). **[10]**

a) What is urbanization?

b) Which state in India is the most urbanized?

c) Name the ancient cities of India.

d) Name the indices of transport network analysis

e) Give examples of two countries in the second stage of demographic transition.

f) According to Malthus what are preventive checks?

g) Define birth rate.

h) Define balance of payments.

i) What is slash and burn cultivation?

j) What is multi cropping?

k) Define working population?

l) What are trade restrictions?

m) What is WTO?

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

a) Indicators of urbanization

b) Characteristics of umland

c) Importance of Giri coefficent

d) Green revolution

P.T.O.

Q3) Answer the following questions in 100 words (any two). **[10]**

a) Characteristics of population in the second stage of demographic transition.

b) Differentiate between rural and urban settlements

c) Changing pattern of agriculture in India due to globalization

d) Importance of transport nodes

Q4) Answer the following questions in 200 words (any one). **[10]**

Explain webers theory of Industrial Location

OR

Critically discuss the theory of trade given by Adam Smith.

❖ ❖ ❖

Total No. of Questions : 4]

SEAT No :

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[Total No. of Pages : 2

[5422]-454
T.Y. B.Sc.
GEOGRAPHY
Gg-342 : Geography of Travel and Tourism
(2013 Pattern) (Semester-IV) (Paper - IV) (Part-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.***
3) ***Diagrams and Maps must be drawn wherever necessary.***
4) ***Use of Maps stencils is allowed.***

Q1) **Answer the following questions in two to three sentences each. (any ten)** **[10]**

a) What do you mean by Rural tourism?

b) Define the term geo-tourism.

c) Name any two forms of tourism.

d) What are dormitories?

e) What do you mean by indirect expenditures?

f) Define output multiplier.

g) Name any two impacts of recreation on wildlife.

h) State any two cultural impacts of tourism.

i) Name any two historical places in India.

j) In which states Ooty and Bodhgaya are located?

k) State any two advantages of rail transport.

l) What are E-magazines?

m) What are the main advantages of the tourist place 'Kaziranga'?

P.T.O.

Q2) **Write Short note. (any two)** **[10]**

a) Geo-tourism

b) Youth Hostels

c) Web Portals

d) Sales Multiplier

Q3) **Answer the following in 100 words. (any two)** **[10]**

a) Explain in brief the concept of second homes.

b) Discuss in brief the effects of foreign elements on indigenous culture.

c) What is the role of airways in tourism development of 21st century India?

d) Explain the impact of tourism on land value and government revenue.

Q4) **Answer the following in 200 words. (any one)** **[10]**

a) Give an account of types of tourism.

b) Explain the importance of Kerala and Goa as major beach resorts of India.

Total No. of Questions :4]

SEAT No. :

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[Total No. of Pages :2

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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) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in **two or three** sentences **(any ten)** **[10]**

a) What do you understand by Geoinformatics?

b) Mention any two data sources in GIS.

c) Define GPS

d) Mention any two terminologies related to Geoinformatics.

e) Who is the father of GIS?

f) Mention any two accuracy factors in GPS.

g) Define contiguity.

h) Mention any two methods of digitization.

i) What is DTM?

j) Define proximity analysis.

k) What is RMS (Root Mean Square) error?

l) Why is GIS used?

m) Mention any two Global navigation satellites system.

P.T.O.

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

a) Scan map as input in GIS.

b) Dissolve process.

c) Edge matching.

d) GPS accuracy.

Q3) Answer the following question in 100 words **(any two)** **[10]**

a) Discuss various types of data input in GIS.

b) What is attribute data linking?

c) Explain Global navigation satellites system.

d) Explain accuracy factors in GPS.

Q4) Answer the following question in 200 words **(any one)** **[10]**

a) Discuss the applications of GIS and GPS in decision support system.

b) Write an account on topographic analysis with examples.

♦ ♦ ♦

Total No. of Questions :4]

SEAT No. :

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T. Y. B. Sc.

GEOGRAPHY

Gg - 344 : Geography of India (Part II)

(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in two to three sentences (Any ten) : **[10]**

a) State two souther Indian states rich in Iron ore.

b) State any two regions of India with high potential of hydel power generation.

c) What is 'polly-house' agriculture?

d) Which crop saw the highest yield in green revolution in India?

e) What is over population?

f) State any four states in India, known for in-migration.

g) Mention any two major items provided by livestock in India.

h) What is "Operation Flood"?

i) State any two characteristics of population composition.

j) Name any two objectives of regional planning.

k) State any two causes of landslides in the Himalayas.

l) What is Cloud burst?

m) Mention any two remedial measures for droughts in Maharashtra

P.T.O.

Q2) Write short notes (Any Two) **[10]**

a) Potential of wind energy in India.

b) Horticultural development in W.India

c) Regional development in Maharashtra.

d) Thinly populated regions of India.

Q3) Answer the following questions in 100 words (Any two) : **[10]**

a) Write on development of atomic energy in India.

b) Give an overview of 'Blue Revolution' in India.

c) What are the remedial measures for over population?

d) Comment on the Dry farming in Maharashtra.

Q4) Answer the following questions in 200 words (Any one) : **[10]**

a) What is 'Conventional energy resource'? Write a detail account on the distribution of any one major conventional energy resource found in India.

b) Explain the causes and distribution of population density in India.

Total No. of Questions : 4]

SEAT No. :

P440

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[5422]-457
T.Y. B.Sc.
GEOGRAPHY
Gg - 345 : Geography of Soils (part-II)
(2013 Pattern) (Paper - X) (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 whenever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in two to three sentences. **(any ten)** **[10]**

a) Write any two types of soil erosion.

b) Define process of 'addition'.

c) Write importance of Soil pH.

d) Define clay.

e) What is organic carbon?

f) Define AEC (Anion-Exchange Capacity).

g) Write any two measures to reduce soil degradation.

h) What is alkaline soil?

i) Define 'soil fertility'.

j) What is C: N ratio?

k) What do you understand by process of translocation?

l) Mention any two types of tropical soils.

m) Write any two factors responsible for losing processes?

P.T.O.

Q2) Write short notes **(any two)** **[10]**

a) Class VI land capability classification

b) Organic colloids

c) Components of carbon cycle

d) Adverse effects of soil pH on soil properties and plant growth

Q3) Answer the following questions in 100 words **(any two)** **[10]**

a) Write the importance of benchmark method in soil surveying.

b) Describe the components of Humus.

c) Discuss the causes of Acidic soils.

d) Explain the importance of transformation process giving suitable examples.

Q4) Answer the following questions in 200 words. **(any one)** **[10]**

a) Give an account of classification of soils in Maharashtra.

b) Describe the Universal Soil Loss Equation.

Total No. of Questions : 4]

SEAT No. :

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[5422]-458
T.Y. B.Sc.
GEOGRAPHY
Gg-346 : Fundamentals of Geoinformatics (Part - II)
(2013 Pattern) (Semester - IV) (Paper - XII)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Diagrams and maps must be drawn wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in two or three sentences (any ten) **[10]**

a) What do you understand by Geoinformatics?

b) What is PSLV?

c) Define passive sensor.

d) What do you understand by Geostationary?

e) What is 'pixel'?

f) What is image interpretation?

g) What do you understand by thermal infrared image?

h) What is 'radiometric resolution'?

i) What is infrared scanner?

j) State any two satellites of ERTS series.

k) What is the abbreviation SPOT stands for?

l) What is unsupervised classification?

m) Mention any two keys of visual image interpretation.

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

a) LANDSAT satellite.

b) Types of platforms.

c) Advantages of radar.

d) Image enhancement.

P.T.O.

Q3) Answer the following questions in 100 words (any two) : **[10]**

a) Explain the term resolution with suitable examples.

b) What are the uses of satellite data in natural resource management?

c) Explain multispectral images.

d) Explain the element of image interpretation.

Q4) Answer the following questions in 200 words (any one) : **[10]**

a) Write a detail note on INSAT series satellites.

b) Give an account of digital image processing.

Total No. of Questions :4]

SEAT No. :

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[Total No. of Pages : 2

[5422]-459
T.Y.B.Sc.
MICROBIOLOGY
MB- 341 : Medical Microbiology-II
(2013 Pattern) (Semester-IV) (Paper-I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***

Q1) Attempt the following: **[5]**

a) Match the following

i)	Rotavirus	a)	Salk vaccine
ii)	HIV	b)	Cancer
iii)	Polio oral vaccine	c)	Reverse transcriptase
iv)	Oncogenic virus	d)	Sabin vaccine
v)	Polio injectable vaccine	e)	Gastroenteritis

b) Answer the following: **[3]**

i) Enlist the animals used for cultivation of viruses.

ii) Define: MBC

iii) Enlist the symptoms of Herpes.

c) Fill in the blanks: **[2]**

i) Vector of Dengue is_____.

ii) Rabies virus is transmitted by _____ dog.

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

a) Explain the mode of action of Trimethoprim.

b) Describe the pathogenesis of Entamoeba histolytica.

c) Enlist key symptoms and describe the transmission of Rinderpest virus.

P.T.O.

Q3) Write short notes (Any two) **[10]**

a) Antibiotics misuse

b) Candidiasis

c) Mode of action of polymyxin

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

a) Describe the antigenic structure and laboratory diagnosis of Influenza

b) Discuss the mode of action of following antiviral agents.

i) Zidovudine

ii) Acyclovir

Total No. of Questions : 4]

SEAT No :

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[5422]-460
T.Y. B.Sc.
MICROBIOLOGY
MB-342 : Genetics & Molecular Biology-II
(2013-Pattern) (Paper - II) (Semester - IV)

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

Instructions to the candidates:

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

Q1) A) Attempt the following : **[5]**

a) Define - Cistron.

b) 1 Map unit is _____

c) F plasmids with few bacterial genes integrated into it is denoted as _____

d) Genetic transfer between bacterial cells which require cell to cell contact is _____

e) State true or false : Hfr X F^- mating always results in the formation of F^+ transconjugants.

B) Match the Following **:** **[5]**

A	B
a) Phage Lamda	i) Spot test
b) Benzer	ii) Homologous DNA
c) F plasmid	iii) Phage mutant
d) Temperature sensitive	iv) Site specific Recombination
e) H. influenzeae	v) Tra operon

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

a) Recombination repair.

b) DNA Cutting enzymes in Recombinant DNA technology

c) Specialised transducation in phage Lamda

P.T.O.

Q3) Draw neat labelled diagrams: (Any two) **[10]**

a) Structure of a typical BAC vector.

b) Base Excision repair Mechanism.

c) Natural comptence and transformation in Gram Positive bacteria.

Q4) a) What are Bacteriophage mutants? Enlist them. Explain in detail any two with their significance. **[10]**

OR

b) How is joining achieved in - vitro? Give the role of T_4 and E. coli DNA ligase in the same.

Add a note on Linkers and Adaptors used in Recombinant DNA technology.

Total No. of Questions :4]

SEAT No. :

P444

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[5422] - 461

T. Y. B. Sc.

MICROBIOLOGY

MB- 343: Metabolism

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

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

Q1) Answer following:

a) State second law of thermodynamics. **[1]**

b) Define. **[3]**

i) Diffusion

ii) Uniport

iii) Oxidative phosphorylation

c) Give structure of a phospholipid. **[1]**

d) True or False.

i) ADP - Glucose serves as an intermediate donor in the glycogen synthesis. **[1]**

ii) Undecaprenyl phosphate is the carrier in peptidoglycan synthesis. **[1]**

iii) Bacterial photosynthesis is always oxygenic. **[1]**

e) Give an example of purple - sulfur bacteria. **[1]**

f) The standard free energy change of PEP degradation at pH - 7 is -------- K cal. **[1]**

P.T.O.

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

a) Explain concept of free - energy.

b) Describe synthesis of triglycerides.

c) State first law of thermodynamics and explain its applications to biological systems.

Q3) Write short Notes any two: **[10]**

a) ATP as high energy compound.

b) Transport of sugars by group translocation.

c) Cellulose degradation.

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

a) Describe steps in starch synthesis.

b) Schematically represent Calvin Cycle and describe in detail its carboxylation step.

* * *

Total No. of Questions :4]

SEAT No. :

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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) A) Match the following and Rewrite **[5]**

a)	Mouse MHC	i)	Antigen excess
b)	Hybridoma	ii)	Anti - H antibody
c)	Bombay blood group	iii)	ELISA
d)	Serum sickness	iv)	H - 2 system
e)	Biotin - Avidin system	v)	Antibody excess
		vi)	HAT selection

B) State true or false :- **[2]**

a) Haptens can be detected by Agglutination Inhibition Test.

b) Cytokines carry out cell to cell communication.

C) Name any two for each of the following :- **[3]**

a) Medico - legal applications of blood groups.

b) Applications of Monoclonal antibodies.

c) Theories of origin of autoimmunity.

Q2) Attempt Any Two **[10]**

a) Compare in tabular form - Immediate and delayed type of hypersensitivity.

b) Illustrate diagrammatically - Coomb's direct and indirect tests.

c) Comment on - Live attenuated vaccines are better than killed vaccines.

P.T.O.

Q3) Write short note on - Any Two **[10]**

a) Interferons

b) Gel precipitation techniques.

c) Myasthenia gravis

Q4) Attempt Any One **[10]**

a) Describe immunofluorescence techniques in detail.

b) Describe structure and functions of MHC class I and class II molecules in detail.

Total No. of Questions : 4

SEAT No. :

P446

[Total No. of Pages : 2

[5422]-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) A) Define wine and enlist the types of wine. **[1]**

B) Match the following and write correct pairs. **[4]**

i)	Citric acid production	a)	Ashbya gossypii
ii)	L-Glutamic acid production	b)	Aspergillus niger
iii)	Riboflavin	c)	Agaricus bisporus
iv)	Mushroom production	d)	Coryne bacterium glutamicum

C) State True or False. **[2]**

i) Beer fermentation is generally carried out at low temp.[10ºC-11ºC]

ii) Cottage cheese is an example of rippened variety of cheese.

D) Fill in the blanks with correct answer and write complete statement : **[3]**

i) Dual fermentation of Lysine requires.....as prime source.

ii) Fringe generator is used for..... fermentation

iii) **.....**. is the precursor for production of benzylpenicillin.

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

a) Explain by products of ethanol fermentation.

b) Describe in brief production of amylase.

c) Describe in brief production of Baker's yeast.

P.T.O.

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

a) Explain nutritive and therapeutic importance of Yogurt.

b) Describe diseases of wine.

c) Draw a flow sheet and describe in brief Rabies vaccine production.

Q4) Answer any one. **[10]**

a) Explain large scale production of streptomycin.

b) Describe the Production of lactic acid.

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Total No. of Questions : 4]

SEAT No. :

P447

[Total No. of Pages : 2

[5422]-464
T.Y. B.Sc.
MICROBIOLOGY
MB-346 : Agricultural and Environmental Microbiology
(2013 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagram wherever necessary.***

Q1) Attempt the following :

a) Define **[3]**

i) Bioterrorism.

ii) Biodegradable plastics.

iii) Biochips.

b) Enlist **[2]**

i) Two applications of biosensors.

ii) Two advantages of bioleaching.

c) Write two applications of : **[2]**

i) Bioaugmentation.

ii) Biofuels.

d) What is Integrated pest management? **[1]**

e) State True or False : **[1]**

Nitrogenase enzyme reduces other substrates besides nitrogen.

f) What is potassium mobilization? **[1]**

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

a) Genetically modified microorganisms in bioremediation.

b) Diazotrophy.

c) Applications of Nanoparticles.

P.T.O.

Q3) Comment on any two : **[10]**

a) Mechanism of phosphate solubilization.

b) Bioleaching of silver.

c) Any two mechanisms of Environmental tolerance by plants.

Q4) Attempt any one : **[10]**

a) Explain RNA interference in controlling plant pathogens.

b) Explain the role of plants and microbes in bioremediation of heavy metlas and dairy industries.

Total No. of Questions :4]

SEAT No. :

P448

[Total No. of Pages : 2

[5422]-465
T.Y.B.Sc.
ELECTRONIC SCIENCE
EL - 341 : Advanced Communication Systems
(2013 Pattern) (Semester-IV) (Paper-I)

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

Instructions to the candidates:

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

Q1) Attempt all of the following.

a) State one application of space wave propogation. **[1]**

b) List the advantages of Delta modulation system. **[1]**

c) Write the principle used in balanced modulator. **[1]**

d) What is the use of duplexer pin TV transmitter. **[1]**

e) Write two applications of low noise amplifier. **[2]**

f) "Product detector is used for demodulation of FM signal" comment. **[2]**

g) "To minimise quantization error always use large number of standard levels for a given range of base -band signal" comment. **[2]**

h) How much current does an antenna draws when power radiation is 500 watt and radiation resistance is 300 Ω. **[2]**

Q2) Attempt any two of the following.

a) Explain working of synchronous detector using its block diagram. Write its advantages and disadvantages. **[4]**

b) Draw the block diagram of frequency stabilized reactance FM transmitter and explain it in detail. **[4]**

c) Discuss tropospheric scatter propogation. **[4]**

Q3) Attempt any two of the following.

a) Define following antenna parameters- **[4]**

i) Directive gain ii) Directivity

iii) Beam width iv) Band width

P.T.O.

b) What is vocoder ? Write applications of vocoder. State different types of vocoding system. **[4]**

c) Explain working of frequency modulated CW radar with its block diagram. **[4]**

Q4) Attempt any two of the following.

a) i) Write short note on "evolution of dipole" **[3]**

ii) Compare resonant and non-resonant antenna with respect to standing waves, radiation pattern, termination by resistor and length of antenna. **[3]**

b) Draw the block diagram of digital communication system. State advantages and disadvantages of digital communication system. **[6]**

c) Describe working of phase-shift method of side band suppression with the help of its block diagram. Derive expression for its output. **[6]**

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Total No. of Questions : 4]

SEAT No :

P 449

[Total No. of Pages : 2

[5422]-466
T.Y. B.Sc
ELECTRONIC SCIENCE
EL-342 : Micro controller and its Applications
(New Course) (2013 Pattern) (Paper-II) (Semester - IV)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator is allowed.***

Q1) **Attempt <u>all</u> of the following**

a) Give the magnitude of unsigned int. **[1]**

b) Which timer of 8051 is used to set the baud rate? **[1]**

c) Upon reset all interrupts of 8051µc are disabled- Ture or False **[1]**

d) What is the size of data RAM in PIC 18F 4580 µc? **[1]**

e) List the advantages of 8051C programming over assembly. **[2]**

f) With xTAL= 11.0592 MH_z, Find the value of TH_1 to have a 9600 band rate **[2]**

g) On which factors the speed of DC motor depends? **[2]**

h) What is PIC microcontroller? **[2]**

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

a) Explain the factors that affects time delay length in 8051 timers. **[4]**

b) Draw LCD interface to 8051µc and explain it. **[4]**

c) Write a 8051 C program to send values of -3 to +3 to the port P2. **[4]**

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

a) Explain the difference between CISC and RISC architectures. **[4]**

b) What is RTC? Interface DS 12887 RTC to 8051µc. **[4]**

c) Write a 8051 C program to transfer the letter 'Z' serially at 2400 baud rate continuously use 8-bit data and 1 stop bit. **[4]**

P.T.O.

Q4) **Attempt any <u>two</u> of the following:**

a) Draw the simplified View of PIC 18 microcontroller, Write its features. **[6]**

b) Explain the bit-wise logical operators in 8051C giving example of each. **[6]**

c) Interface 8-bit DAC to 8051μc. Write a C program to generate square wave on it. **[6]**

OR

Q4) **Attempt <u>all</u> of the following:**

a) Write a 8051 C program to convert ASCII digits '9' and '8' to packed BCD and display them on P1. **[4]**

b) Write an 8051 C program to generate a delay of 50ms. Use timer o, mode 1 to create the delay. (Given : xTAL= 11.0592 MH_z) **[4]**

c) What is interupt priority ? Explain the role of IP register in it. **[4]**

Total No. of Questions :4]

SEAT No. :

P450

[Total No. of Pages :2

[5422] - 467

T. Y. B. Sc.

ELECTRONIC SCIENCE

EL - 343: Power Electronics

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

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

Instructions to the candidates:

1) ***All Questions are Compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator is allowed.***

Q1) Attempt all of the following.

a) Draw symbols of IGBT & PUT. **[1]**

b) What is Schockley diode equation for current through diode? **[1]**

c) Define: ripple factor and TUF of rectifier. **[1]**

d) Draw switching model of MOSFET. **[1]**

e) What are ideal characteristics of switch? Explain any two. **[2]**

f) "When diodes are connected in series , they can not handle equal voltages across them" Justify. **[2]**

g) What is the average output voltage of step down chopper? If $V_s = 100V$, $K = 0.4$, determine its output voltage? **[2]**

h) What is working principle of fly back converter? **[2]**

Q2) Attempt any two of the following.

a) How to protect thyristor against high $\frac{dv}{dt}$? **[4]**

b) Explain the working of step up chopper with inductive load. **[4]**

c) What is Switch Mode Power Supply? Explain the working of forward converter? **[4]**

P.T.O.

Q3) Attempt any two of the following:

a) What are different types of power circuits? **[4]**

b) Explain thyristor firing circuit using pulse transformer. **[4]**

c) What is inverter? Explain the working of single phase full bridge inverter. **[4]**

Q4) Attempt any two of the following.

a) i) Define power electronics. Explain the concepts of single phase and three phase using phasers. **[3]**

ii) What are different types of power diodes? **[3]**

b) What is ac voltage controllers? What is difference between on off control and phase angle control? Explain the working of phase angle control. **[6]**

c) i) What are the advantages of SMPS? **[3]**

ii) How dc - dc converters are used for dc motor drives? **[3]**

OR

Attempt all of the following.

a) In single phase full wave rectifier if $R_L = 100\,\Omega$ V_m=100V, what is V_{dc}, I_{dc}, V_{rms} & I_{rms} through load? **[4]**

b) In single phase semiconverter if $V_m = 50V$, delay angle $\alpha = 60^o$; what is average out put voltage across load? **[4]**

c) In relaxation oscillator by using UJT ; if $R = 1K\,\Omega$, $C = 0.1\ \mu f$ & $\eta = 0.5$ then what is frequency of sawtooth waveform? **[4]**

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Total No. of Questions :4]

SEAT No. :

P451

[Total No. of Pages :2

[5422] - 468

T. Y. B. Sc.

ELECTRONIC SCIENCE

EL - 344 : Foundation of Nanoelectronics

(2015 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.***

Q1) Answer all of the following

a) Write an expression for a force on moving charged particle. **[1]**

b) How would you convert bad conductor into good conductor? **[1]**

c) State the difference between classical & quantum behavior of a particle. **[1]**

d) What do you mean by tunneling effect? **[1]**

e) What is length scale? **[2]**

f) Give the expression for Gaussian distribution. **[2]**

g) Explain in short top bottom approach. **[2]**

h) What is NEMS? List the applications of NEMS **[2]**

Q2) Answer Any Two

a) State & prove poynting Vector Theorem. **[4]**

b) With a help of a suitable diagram explain the concept of barrier penetiation. **[4]**

c) What is lithography? Write the steps involved in lithography. **[4]**

Q3) Answer Any Two

a) What is Hall effect? Derive the expresion for Hall coefficient. Give the applications of Hall effect. **[4]**

b) Discuss in detail Fermi Dirac Statistics **[4]**

c) Explain the transport of electron in quantum wire. **[4]**

P.T.O.

Q4) Answer Any Two

a) What is skin dept? Derive the expresion for skin depth. **[6]**

b) Explain in detail atoms & atomic orbitals. **[6]**

c) Discuss conductivity in metal & semiconductor. **[6]**

OR

Answer All.

a) Calculate the speed of light in free space. **[4]**

b) Calculate the ground state energy of electron that is confined to move freely between two ends seperated by 10 A^{o}. **[4]**

c) A 10 gm bullet shoots through a cylindrical tunnel of 5 cm diameter. What would be the uncertainty in velocity of bullet? **[4]**

Total No. of Questions : 4]

SEAT No. :

P452

[Total No. of Pages : 3

[5422]-469
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL-345: Mathematical Methods and Circuit Analysis using MATLAB
(2013 Pattern) (Paper - V) (Semester - IV)

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

Instructions to the candidates:

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

Q1) All questions are compulsory :

a) Find Laplace transform of $f(t) = e^{10t}$ **[1]**

b) Explain even periodic function. **[1]**

c) Give Laplace transform of $\frac{d}{dt}f(t)$. **[1]**

d) Write expression for fourier coefficient a_n **[1]**

e) Explain 'Sort' command in MATLAB. **[2]**

f) What is inverse Laplace transform of $F(s) = \frac{1}{s-a}$? **[2]**

g) Give Dirichlet condition for fourier series. **[2]**

h) List the relational and logical operators used in MATLAB. **[2]**

Q2) Answer any two of the following :

a) Find Inverse Laplace transform by using partial fraction method.

$$F(s) = \frac{s+7}{s^2 - 3s - 10}$$ **[4]**

P.T.O.

b) The table below gives the temp T(in °C) and length l (in mm) of a heated rod. If $l = a_0 + a_1 T$, find best values for a_0 and a_1.

T(in °C)	20	30	40	50	60	70
l (in mm)	800.3	800.4	800.6	800.7	800.9	801.0

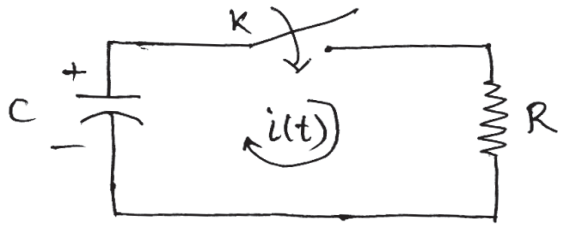
[4]

c) Explain 'if – elseif – elseif – else – end' structure used in MATLAB with example. **[4]**

Q3) Answer any two of the following :

a) Find roots of an algebraic equation $f(x) = x^2 - 2x - 3$ using MATLAB function. Also elaborate use of 'poly' command. **[4]**

b) In the network shown in fig. C is charged to v_0, and the switch K is closed at $t=0$, solve for $i(t)$ using Laplace transformation method. **[4]**



c) Using fourier series determine fourier coefficient 'b_n'. **[4]**

Q4) Answer any two of the following :

a) Write a MATLAB program that determines sin x using Taylor series expansion. $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} \cdots\cdots\cdots = \sum_{k=0}^{\infty} \frac{(-1)^k x^{(2k+1)}}{(2k+1)!}$ **[6]**

b) Find a fourier series for a triangular wave represented as

$$f(x) = \begin{cases} x\ , & 0 < x < \pi \\ -x\ , & -\pi < x < 0 \end{cases}$$ **[6]**

c) Write the MATLAB program to compute the following series $1 + \frac{x^2}{2} + \frac{x^4}{4} + \frac{x^6}{6} + \cdots\cdots\cdots + \frac{x^n}{n}$ for given x and n. **[6]**

OR

All questions are compulsory :

a) If R=10 ohm and the current through it is increased from 0 to 10 amp. with increment of 2 amp. write a MATLAB program to plot graph of current versus voltage. **[4]**

b) Expand the function as partial fraction $F(s) = \frac{7s+2}{s^3+3s^2+2s}$ **[4]**

c) Determine the constants a and b by the method of least squares such that $y = ae^{bx}$ fits the following data.

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

[4]

Total No. of Questions : 4]

SEAT No. :

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[Total No. of Pages : 4

[5422]-470
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL - 346 (A) : Industrial Automation
(2013 Pattern) (Semester - IV) (Paper - VI) (Optional)

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

Instructions to the candidates:

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

Q1) Attempt all of the following:

a) What is Hall effect? **[1]**

b) What is transimpedance amplifier? **[1]**

c) What is control lag? **[1]**

d) What is proportional band in proportional control mode? **[1]**

e) Draw symbols of push button and pressure switches used in ladder diagram. **[2]**

f) Explain the construction of LED in brief. **[2]**

g) Identify two parameters of ON-OFF controller. **[2]**

h) Draw the circuit diagram of non-inverting amplifier using opamp. **[2]**

Q2) Attempt any two of the following:

a) Draw and explain instrumentation amplifier using three opamps. **[4]**

b) Describe the action of integral control mode. **[4]**

c) Explain thermocouple as temperature sensor with neat diagram. **[4]**

P.T.O.

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

a) State and explain process equation for control of temperature by process control with neat diagram. **[4]**

b) Draw block diagram of generalized measurement system. Explain the function of each block. **[4]**

c) What is ADC? Explain counter type ADC with neat diagram. **[4]**

Q4) Attempt any <u>two</u> of the following:

a) What is second order system? Draw and explain step response of second order system. **[6]**

b) Explain the terms : **[6]**

i) Control parameter range and

ii) Process lag

c) Explain the action of single speed and multiple speed floating control mode with neat diagrams. **[6]**

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Total No. of Questions : 4]

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[5422]-470
T.Y. B.Sc.
ELECTRONIC SCIENCE
EL - 346 (B) : Consumer Electronics
(2013 Pattern) (Semester - IV) (Paper - VI) (Optional) (New Course)

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

Instructions to the candidates:

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

Q1) Attempt all of the following:

a) State the working principle of crystal microphone. **[1]**

b) Which loudspeaker needs external power supply for field coil. **[1]**

c) What do you mean by CATV. **[1]**

d) Explain the importance of source of light used in scanner. **[1]**

e) State any two specifications used in CCIR-B standards. **[2]**

f) List the names of Blocks used in Cellular Phone. **[2]**

g) "Zero crossing detector is used in washing machine" comment. **[2]**

h) "Base plate of microwave oven always rotates during the process of food cooking" comment. **[2]**

Q2) Attempt any two of the following:

a) Draw the Block diagram of public Address system and explain each Block in detail. **[4]**

b) State any two advantages and disadvantages of CATV and Dish TV. **[4]**

c) With the help of Block diagram explain the working of remote control. **[4]**

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

a) Draw the Block diagram of basic land line telephone and explain the working of each Block. **[4]**

b) Explain the process of firing of the print pin at Dot Matrix print head. **[4]**

c) With the help of Block diagram explain the measurement of load by Electronic weighing machine. **[4]**

Q4) Attempt any <u>two</u> of the following:

a) Draw the functional block diagram of microwave oven and explain the working of microwave oven. **[6]**

b) With the help of block diagram explain the process of writing of image on the OPC drum by laser beam used in laser printer. **[6]**

c) Draw the Block diagram of Monochrome TV Receiver and explain the importance of each block. **[6]**

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Total No. of Questions :4]

SEAT No. :

P454

[Total No. of Pages : 1

[5422]-471
T.Y.B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS - 401 : Internal Security of India
(Semester-IV) (2013 Pattern)

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

Instructions to the candidates :

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

Q1) Answer in 2 to 4 Sentences each **[16]**

a) Define internal security.
b) What are challenges to human security?
c) Define ethnicity.
d) Write any two characteristics of insurgency.
e) Define cross border terrorism.
f) Define Military power.
g) Define cultural identity.
h) Define sustainable development.

Q2) Answer in 8 to 10 Sentences each (any two) **[8]**

a) Explain characteristics of nation-state.
b) Discuss Link between ethnicity and internal security.
c) Describe social dimensions of India's internal security.

Q3) Write short notes on (any two) **[8]**

a) Agitations over economic issues.
b) Naxalite.
c) Role of Governance in human security.

Q4) Answer in 18 to 20 sentences (Any one) **[8]**

a) Discuss relationship between development and internal security.
b) What are the security challenges to Northeast region of India? Explain.

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Total No. of Questions : 4]

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SEAT No :

[Total No. of Pages : 2

[5422]-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 side indicate full marks.*

Q1) **Answer in 2 to 4 Sentences each** **[16]**

a) Define financial management

b) Write any two functions of Ministry of Defence

c) Write any two merits of private sectors

d) Define Zero Budget

e) Define performance Budget

f) Define Mixed Economy

g) What do you mean by war Finance?

h) Write full form of DPSU

Q2) **Answer in 8 to 10 Sentences each (any two)** **[08]**

a) Explain organization of Ministry of Defence

b) Discuss role of public sector in India's Defence production

c) Describe historical perspectives of India's Defence Budget

P.T.O.

Q3) **Write short notes on (any two)** **[08]**

a) Structure of India's Defence Budget

b) Link between Parliament and Defence Budget

c) DRDO

Q4) **Answer in 18 to 20 sentences (Any one)** **[8]**

a) Describe salient features of Indian economy

b) Discuss trends in India's defence expenditure since 1947

Total No. of Questions :4]

SEAT No. :

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[Total No. of Pages :2

[5422] - 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 Communication

b) What do you mean by information Flow?

c) State the concept of cyber security

d) What do you mean by 'Early Warning Response'?

e) Define Surveillance

f) State the meaning of "Battle Field information system"

g) What do you mean by 'Battle field command and control?'

h) Define operational research

Q2) Answer in 8 to 10 Sentences each (any two) **[8]**

a) Explain types of Information

b) Discuss needs for Information Security

c) Explain scientific approach to Missile Defence system

P.T.O.

Q3) Write short notes on (any two) **[8]**

a) Information and Air- Warfare

b) Role of Computers in Defence Management

c) Evolution of Information Warfare

Q4) Answer in 18 to 20 sentences (Any one) **[8]**

a) Explain challenges and prospects of Information warfare.

b) Discuss role of information in the management of national security.

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Total No. of Questions : 4]

SEAT No. : ____

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[Total No. of Pages : 2

[5422]-474
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS No.-405 : Defence Production and Logistics in India (Core Paper)
(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 "Logistics".

b) What do you mean by DRDO?

c) What do you understand by DPSU?

d) State any two principles of logistics.

e) Write the long from of "M.D.L." Mumbai?

f) By whom the department of Defence production controlled?

g) What is rational of defence production?

h) What do you know about HAL?

Q2) Answer in 8 to 10 sentences (Any two) **[8]**

a) Explain in brief management of integrated defence logistics.

b) Write in brief present status of Ordnance factories.

c) Highlight on "problems of foreign collaboration".

Q3) Write short notes on (Any Two) **[8]**

a) Foresight as a principle of logistics.

b) Role of department of defence production.

c) Functions of DRDO.

P.T.O.

Q4) Answer in 16 to 20 sentences (Any one) **[8]**

a) How far "Make in India" programme will help for defence procurement of the Armed Forces?

b) Explain the role of private sector in defence production of India.

Total No. of Questions : 4]

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[5422]-475
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS:- 406(A); Defence Journalism and 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 Mass communication.

b) Define Defence Journalism.

c) Define Conflict Management.

d) State the meaning of Features Writing.

e) Define Media Ethics.

f) Define professional journalism.

g) Define Conflict Studies.

h) Define communication management.

Q2) Answer in 8 to 10 Sentences each (any two) **[08]**

a) Explain current trends in Defence journalism.

b) Discuss essential knowledge for Defence Journalism.

c) Describe relationship between Media and Conflict Management.

P.T.O.

Q3) Write short notes on (any two) **[08]**

a) Media Responsibilities

b) Evolution of Defence Journalism

c) Future prospects of Mass Communication

Q4) Answer in 18 to 20 sentences (Any one) **[08]**

a) Explain problems and prospects of Defence journalism

b) Describe link between Defence Journalism and security studies.

[Total No. of Questions: 4

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[5422]-475
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS:- 406(B); Gender Based Conflicts and Human Rights
(2013 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 Sentences each. **[16]**

a) Write any two causes of gender discrimination.

b) Define 'positive peace'.

c) Define Gender Equality.

d) What do you mean by measurement of violence?

e) Define conflict resolution.

f) Define New Feminist perspectives.

g) State the meaning of sustainable education.

h) Write the meaning of Structural violence.

Q2) Answer in 8 to 10 Sentences each (any two) **[08]**

a) Explain feminism and philosophy for peace.

b) Write a note on the culture of peace.

c) Discuss Gender Issues in Africa.

Q3) Write short notes on (any two) **[08]**

a) Law and the state

b) Gender violence in South Asia

c) Peace Building Education

Q4) Answer in 18 to 20 sentences (Any one) **[08]**

a) Explain causes of gender discrimination and it's solutions.

b) Discuss status of women in India.

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[Total No. of Pages : 2

[5422]-476
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS-407(A) : Role of the Armed Forces in Disaster Management
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

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

Q1) Answer in 2 to 4 sentences each : **[16]**

a) Define Disaster Management.

b) State the meaning of Guideline to Disaster management.

c) Define Environmental Disaster.

d) Define Natural Disaster.

e) Define Global Warning.

f) Define strategic planning.

g) Define Sustainable Development.

h) Write two challenges to Disaster Management.

Q2) Answer in 8 to 10 sentences each (any two): **[8]**

a) Explain Roles of state in Disaster management.

b) Discuss role of Local Civil Administration in Disaster Relief.

c) Describe importance of traning in Disaster Management.

Q3) Write short notes on (any two) : **[8]**

a) Difficulties in relief operations.

b) Role of NGO's in Disaster Management.

c) Structure of NDRF.

Q4) Answer in 18 to 20 sentences (any one) : **[8]**

a) Describe Contribution of the Armed Forces in Disaster Response.

b) Explain Roles of Army in Disaster Relief.

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P.T.O.

Total No. of Questions : 4]

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[5422]-476
T.Y. B.Sc.
DEFENCE AND STRATEGIC STUDIES
DS-407(B) : Global Security - II
(2013 Pattern) (Semester - IV) (Paper - I)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each : **[16]**

a) Define 'Global Security'.
b) State the meaning of "Nuclear Arsenal".
c) At present either it is UNO or U.N.?
d) What do you mean by Nuclear proliteration?
e) State any two progressive purposes of Nuclear energy?
f) What do you mean by "American monopoly"?
g) In which sea chinese having lot of maritime disputes?
h) What do you mean by power projection?

Q2) Answer in 8 to 10 sentences each (any two): **[8]**

a) Explain in brief any one example of Chinese catchment policy.
b) Write in brief nature of dispute between U.S.A. & North Korea.
c) Explain in short any one example of Chinese containment policy.

Q3) Write short notes on (any two) : **[8]**

a) Nature of maritime dispute between China & Japan.
b) China Indian ocean policy.
c) Attempts for Non-nuclear proliteration.

Q4) Answer in 16 to 20 sentences (any one) : **[8]**

a) How far UN successed for preserving & maintaining global peace & security? Dismiss.
b) Highlight on role of U.S.A. as a responsible member of international community.

Total No. of Questions : 4]

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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 indicates full marks.***

Q1) Answer in 2 or 4 sentences each: **[16]**

a) What do you know about Domel post?

b) What was the aim of Pakistan during 1947-48?

c) What was the basic intrest of Raje Harisingh?

d) On which sector Pakistan attacked on India during 1965 war with majority of Tanks?

e) State the date & year of Chinese aggression.

f) Who was the Indias PM during Indo-Pak War of 1965.

g) What do you know about Chou-En-Lai?

h) Which agreement it was signed between India & Pakistan at the end of war of 1965.

Q2) Answer in 8 or 10 sentences (Any two): **[8]**

a) Explain the concept of “ceasefire”.

b) Highlight on “Role of U.S.S.R during Indo-Pak War of 1965”.

c) Explain in brief nature of India-China border dispute.

P.T.O.

Q3) Write short notes on (Any two): **[8]**

a) Role of U.S,A during Indo-Pak War of 1965.

b) Significance of “Instrument of Accession”.

c) Ceasefire for Indo-Pak War of 1947- 48.

Q4) Answer in 16 to 20 sentences (Any One): **[8]**

a) “Though India won the war of 1965 but practically it was looser” Do you agree? Justify your answer.

b) What were the causes of India-China war of 1962.

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Total No. of Questions : 4]

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[5422] - 477

T.Y.B.Sc.

DEFENCE & STRATEGIC STUDIES

DS- 408 (B): Indian Military Strategy (1680-1818)

(2013Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each: **[16]**

a) Which tactics it was introduced by Shivaji?

b) State any two achievements by Sambhaji.

c) Why Rajaram took Asylum at Jinji?

d) Which tactics it was adopted by Santaji & Dhanaji?

e) What do you mean by sanad?

f) State the meaning of Peshwa.

g) What was the outcome of third anglo-Maratha war?

h) What do you know about Tarabai?

Q2) Answer in 8 or 10 sentences (Any two): **[8]**

a) Write few line on “Bapu Gokhale”.

b) Explain in brief the result of battle of Bhopal.

c) Write few lines on first Bajirao Peshwa.

Q3) Write short notes on (Any two): **[8]**

a) Santaji.

b) Sambhaji as a Military leader.

c) Kanhoji Angre.

Q4) Answer in 16 to 20 sentences (Any One): **[8]**

a) Analyse the causes of downfall of Maratha.

b) Assess the leadership of Sadashivrao Bhau with special reference to the third battle of Panipat.

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Total No. of Questions : 4]

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[5422]-478

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS. NO. - 409(A) United Nations Organisation

(Semester-IV) (2013 Pattern)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each **[16]**

a) On which date & year the UNO came into existence.

b) Write the names of permanent members of security council.

c) What do you mean by world parliament?

d) State the meaning of Disarmament.

e) Define "Globalization".

f) What do you mean by Human Rights?

g) State any two functions of Secretary General of UN.

h) At present which one is correct U.N. or U.N.O.?

Q2) Answer in 8 to 10 sentences(Any Two) **[8]**

a) Explain in short the provision for UN peace keeping operation.

b) Discuss the objectives of UNO.

c) Write a few lines on "Veto Power".

P.T.O.

Q3) Write short notes on(Any Two) **[8]**

a) N.P.T.

b) Structure of UN

c) Secretariat

Q4) Answer in 16 to 20 sentences(Any One) **[8]**

a) Critically evaluate the role of UN for maintaining international peace & security.

b) Evaluate the role of UN for protection of Human Rights.

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Total No. of Questions : 4]

SEAT No. :

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[5422]-478

T.Y.B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS. No. - 409(B) India's Maritime Security

(Semester-IV) (2013 Pattern)

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

Instructions to the candidates:

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

Q1) Answer in 2 or 4 sentences each **[16]**

a) Define Maritime Security.

b) State the limits of Territorial water.

c) Write the long form of LTTE.

d) What do you mean by "Sea Piracy".

e) State the meaning of "Coast Guard".

f) Define National Security.

g) What do you mean by "Maritime Boundaries"

h) State the meaning of "Fixed Assests".

Q2) Answer in 8 to 10 sentences(Any Two) **[8]**

a) Write a few lines on "Continental shelf".

b) Explain in brief the concept of "Naval Bases".

c) Highlight on any one threat to "Maritime Trade".

Q3) Write short notes on(Any Two) **[8]**

a) Exclusive Economic Zone

b) Human Trafficking

c) Limitations of India's Navy

Q4) Answer in 16 to 20 sentences(Any One) **[8]**

a) Explain the role of coast guard for Maritime Security.

b) Highlight on the significance of Territorial water in relation to the economic development of the country.

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Total No. of Questions :4]

SEAT No. :

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[5422]-479
T.Y.B.Sc.
ENVIRONMENTAL SCIENCE
ENV : Aquatic Ecosystems and Management
(2008 & 2013 Pattern) (Semester-IV) (Paper-I)

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

Instructions :

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 ecotone.
b) What are planktons
c) Define commensalism
d) Define ecological niche
e) Give full form of GIS.
f) Write two examples of Amensalism.
g) Define profoundal zone in aquatic ecosystem
h) Write two examples of esturine phytoplankton.
i) Define aphotic zone in marine environment
j) Give any two examples of biotic communities of pelagic zone.

Q2) Write a short note on any two of the following **[10]**

a) Characteristics of latic environment
b) Role of mangroove vegetation in coastal marine environment
c) Role of local government and peoples in conservation of wetlands.

Q3) Answer any two questions from the following **[10]**

a) Briefly explain the Various methods of aquatic sampling.
b) What is impact of tourism on ecosystem.
c) How traditional methods are useful in conservation of ecosystems.

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

a) Explain in brief the aesthetic and cultural values of aquatic ecosystem.
b) Write the importance of GIS and Rs techniques useful in bioresource monitoring and conservation.

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Total No. of Questions : 4]

SEAT No :

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[5422]-480

T.Y. B.Sc. (Environmental Science)

ENV : NATURE CONSERVATION

(New Course) (Semester-IV) (Paper-II) (2008 and 2013 Pattern)

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 side indicate full marks.***

Q1) Attempt the following in 1-2 lines each **[10]**

a) What is meant by habitat conservation ?

b) Write any two objectives of ecotourism

c) What are crocodile farms?

d) What is meant by captive breeding?

e) What is meant by natural heritage?

f) What is Red Data Book?

g) Mention any two objectives of nature conservation

h) Write any two examples of extrene activism in nature conservation

i) What are protected areas?

j) What is the name of our national animal?

Q2) Write a short note on ANY TWO of the following **[10]**

a) Convention on Biological Diversity

b) Ex-situ conservation

c) International Efforts for conservation

P.T.O.

Q3) **Answer ANY TWO questions of the following** **[10]**

a) What are the merits and demerits of wildlife protection act?

b) Discuss on the role of NGO's in nature conservation.

c) Discuss in detail Functional areas of IUCN and WWF.

Q4) Attempt ANY ONE of the following **[10]**

a) Which are Various In-Situ methods of conservation? Also add a note on importance of traditional conservation practices.

b) What are the challenges associated with nature conservation in India? Also add a note on administrative setup for nature conservation in our country.

Total No. of Questions :4]

SEAT No. :

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[5422] - 481

T. Y. B. Sc.

ENVIRONMENTAL SCIENCE

ENV: Air And Soil Quality

(2008 And 2013 Pattern) (Semester- IV) (Paper - III)

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

Instructions to the candidates:

1) ***All Questions are Compulsory and carry equal marks.***
2) ***Neat and labelled daigrams 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 are the reasons behind soil erosion?

b) Write name of methods used for estimation of nitrogen dioxide and sulphur dioxide.

c) Mention effects of organic pollutants in soil on human health.

d) Write any two ways for soil conservation.

e) Mention any two factors which affect plant growth.

f) What is meant by acid rain?

g) What are micronutrients?

h) What was the reason behind Bhopal disaster?

i) What is meant by soil sickness?

j) Write any two effects of particulate matter.

Q2) Write a short note on ANY TWO of the following. **[10]**

a) Photochemical Reactions of the Atmosphere.

b) Vehicular Pollution.

c) Composition of soil.

P.T.O.

Q3) Answer ANY TWO questions of the following. **[10]**

a) What are effects of carbon monoxide and nitrogen dioxide on human health?

b) Write an account on various chemical reactions that occur in soil.

c) Discuss the role of NPK in soil environment.

Q4) Attempt ANY ONE of the following. **[10]**

a) What is meant by soil fertility? Explain methods used in estimation of total nitrogen and phosphorous from soil.

b) Explain analytical methods used for estimation of any four air pollutants.

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Total No. of Questions : 4]

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[5422]-482
T.Y. B.Sc.
ENVIRONMENTAL SCIENCE
ENV : Issues in Environmental Science - II
(2008 and 2013 Pattern) (Paper - IV) (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 full form of 'GIS'.

b) What is waste land?

c) Enlist causes of Eutrophication.

d) Mention any two reasons of rehabilitation.

e) Define sustainable Development.

f) Who initiated 'Narmada Bachao Andolan'?

g) Write examples of Epidemiological diseases.

h) What is Urbanization?

i) Mention any two effects of Global warming.

j) Write any two examples of wetlands in India.

Q2) Write a short notes on ANY TWO of the following **[10]**

a) Bhopal Gas Tragedy

b) Methods of rain water harvesting

c) Applications of RS & GIS in Resource management.

Q3) Answer Any TWO questions of the following **[10]**

a) Discuss strategies of sustainable development.

b) Explain merits & demerits of Interlinking of Rivers.

c) Discuss Environmental problems of population explosion.

P.T.O.

Q4) Attempt ANY ONE of the following **[10]**

a) What is soil erosion? Explain process of formation of saline soil. Discuss methods of soil reclaimation.

b) Discuss causes of Natural resource depletion. Add a note on environmental problem associated with urbanization.

Total No. of Questions : 4]

SEAT No. :

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[5422]-483
T.Y. B.Sc.
ENVIRONMENTAL SCIENCE
ENV- 305 : Environmental Governance and Equity: EMS and ISO 14000
(2008 &2013 Pattern) (Paper - V) (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) Define 'Aspect'.

b) What is EMS?

c) Write the statement of article S_1 A (g).

d) Write the full form of ISO.

e) What are the stages of Environmental Audit?

f) Mention any two functions of BIS.

g) What is Environmental Economics?

h) Write any two examples of non renewable energy sources.

i) What is Generic standard?

j) Write any two drinking water quality standards in India.

P.T.O.

Q2) Write a short note on ANY TWO of the following **[10]**

a) PDCA cycle

b) EIA

c) Environmental status report

Q3) Answer any TWO questions of the following **[10]**

a) Explain role of NGO in Environment protection.

b) Discuss need of ambient air quality standards.

c) Explain types of Environmental Audit.

Q4) Attempt any ONE of the following **[10]**

a) What is ISO 14000 family of standards? Discuss functions of EMS. Explain benefits of ISO 14001.

b) Explain in detail about Environmental governance and regulations in India.

Total No. of Questions : 4]

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[5422]-484
T.Y. B.Sc.
ENVIRONMENTAL SCIENCE
ENV-306 : Environmental Biotechnology - II
(2013 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

Q1) Attempt the following in 1-2 lines each : **[10]**

a) Define intrensic bioredimediation.

b) Name any two methanogens in biogas production.

c) Define thermo chemical lysis in hydrogen production.

d) Enlist any two micro organism for bioleaching of metals.

e) Define bioscrubber used in air pollution control.

f) Define bioagumention.

g) What is slope bioleaching.

h) Define pyrolysis.

i) Define phytovolatization.

j) What are the merits of activated sludge process?

Q2) Write a short note on ANY TWO of the following : **[10]**

a) Role of hydrogenase in biofuel production.

b) Upflow anaerobic sludge reactor (UASB).

c) Biomass gasification.

P.T.O.

Q3) Answer ANY TWO questions from the following : **[10]**

a) What are the advantages of immobilization of enzymes?

b) Explain the process of ethanol production.

c) Explain the factors influencing the biomethanation process.

Q4) Attempt ANY ONE of the following : **[10]**

a) Write in detail metal-microbe interaction and mechanism of metal removal.

b) Briefly explain biosorption techniques for removal of pollutants.

Total No. of Questions : 4]

SEAT No. : ____

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T.Y.B.Sc. (Vocational)

BIOTECHNOLOGY

Environmental Biotechnology and Bioinformatics

(2013 Pattern) (Paper - V) (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 indicates full marks.***

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

a) Name the microbes involved in phosphate solubilization.

b) Define bioinformatics.

c) Name the microbes involved in biodegradation of hazardous wastes.

d) What is SCOP?

e) What is bio augmentation.

f) Name any two literature databases.

g) Define environmental biotechnology.

h) What is PAM?

i) What are xerobiotics?

j) What is EBI?

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

a) Describe the process of pesticide degradation by microbes.

b) What are protein sequence databases? Explain any one.

c) Describe the role of microbes in waste water treatment.

P.T.O.

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

a) BLAST.

b) Phytoremediation.

c) GenBank.

Q4) Answer in detail any one: **[10]**

a) Define biofuels. Give examples of biofuels. Explain any two types of biofuels in detail.

b) Describe structural databases with examples.

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Total No. of Questions : 5]

SEAT No. : ____

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[5422] - 487

T.Y.B.Sc. (Vocational)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Entrepreneurship Development

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

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

Instructions to the candidates:

1) ***Question number five is compulsory.***
2) ***Answer any three questions from the remaining questions.***
3) ***Provide suitable examples wherever necessary.***
4) ***Figures to the right indicates full marks.***

Q1) Who is an "Entrepreneur"? Discuss ten essential skill sets of a successful entrepreneur. **[10]**

Q2) How is "Marketing" different from "Sales"? Discuss the 4 Ps of Marketing in detail with suitable examples. **[10]**

Q3) How does an Entrepreneur influence Economic Development of the nation? Support your answer with suitable logic and examples. **[10]**

Q4) Write short notes on any two of the following: **[10]**

a) Goods vs Services.

b) Customer vs Consumer.

c) Entrepreneur vs Manager.

P.T.O.

Q5) Answer the following: **[10]**

Mr. Ashirwad is a big dealer based in Dubai with an entire Gulf presence. However, Mr. Ganesh is a very well known supplier of electric wires and ICs and owns a workshop in Khopoli. Mr. Amit has a huge road transport business. His road transport network spans across all the Gulf nations. Miss. Neeraja and Miss. Sanjana have a similar network of transportation in India. However, they are not into International Cargo Transportation. Mr. Jonty is into Air Cargo and Mr. Shivang is into Water Cargo. Air Cargo is costlier and takes less time, while Water Cargo is cheaper but takes a lot of time to reach the destinations. Mr. Chetan has a huge farm of tomatoes near Bhigwan. Miss. Harshada and Miss Siddhi recently migrated to Abu Dhabi from Bhigwan in order to start some retail business outlets in the gulf. Mr. Shreyas owns a huge warehouse near JNPT Mumbai, but does not have cold storage facility. This facility is available in the warehouse of Mr. Gaurang, but it is a bit far from Mumbai JNPT and is a relatively costlier warehouse. Mr. Ketan and Mr. Kaushik are similar warehouse competitors in Dubai. Mr. Ketan has cold storage facility and has a cheaper storage rate. But there is no access to market from his warehouse. Whereas Mr. Kaushik does not have storage facility, but is costlier as he has a great proximity to the Gulf markets. Mr.Oshan has a supreme command over any kind of production processes and is looking forward to joining a company in India as a Production Incharge. In all this, Mr. Pushkar is a confused entrepreneur at the moment. He is working out two options of starting an Export Business. Option 1 is to manufacture & export electric components in Gulf nations, while Option 2 is to manufacture tomato ketchups and export in Gulf nations. He plans to start a workshop in Pune. He comes to you for help, and asks you to design a Supply Chain for both the options. What are the 2 designs that you would prepare for him?

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Total No. of Questions : 4]

SEAT No :

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[5422]-488

T.Y. B.Sc (Vocational)

ELECTRONIC EQUIPMENT AND MAINTENANCE (EEM)

Entrepreneurship Development

(2013 Pattern) (New course) (Paper-V) (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) ***Use of log table, Calculators is allowed.***

Q1) Answer the following

a) Answer the following: **[4×1=4]**

i) What is 'Value Added Tax'?

ii) Define the term 'entrepreneurship'

iii) State two disadvantages of sole propritorship.

iv) What is cash flow?

b) Answer the following: **[2×2=4]**

i) State four types of entrepreneur.

ii) State two methods for market survey.

c) Comment on the following: **[2×2=4]**

i) Modern concept of marketing is consumer centric.

ii) Innovation is special tool for an entrepreneur.

Q2) Answer <u>any two</u> of the following: **[2×4=8]**

a) Discuss the functions of District Industry Centre (DIC)

b) Explain characteristics of entrepreneur.

c) Explain the term working capital. State its importance.

P.T.O.

Q3) Answer any two of the following: **[2×4=8]**

a) Explain the scope of small scale industry in economic development of country.

b) Write a note on market segmentation.

c) Explain advantages and disadvantages of joint stock company.

Q4) Answer any two of the following : **[2×6=12]**

a) Discuss source of finance to start a new business. state facilities provided by MSFC.

b) Explain the entrepreneurship as a career option.

c) Explain the functions of Human Resource Management in Industry.

OR

Write short notes on the folloinwg : **[3×4=12]**

a) Stress management.

b) Digital marketing.

c) Costing and Pricing.

Total No. of Questions : 4]

SEAT No : ____

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[5422]-489
T.Y. B.Sc. (Vocational)
INDUSTRIAL MICROBIOLOGY
VOC-IND-MIC-345
Molecular Biology and Recombinant DNA Technology
(2013 Pattern) (Semester-IV) (Paper-V)

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) What is the prime objective of Human Genome Project?

b) Maximum size of DNA that can be inserted in BAC vector is _____

c) State the function of DNA ligase.

d) Draw the structure of ddNTP.

e) PCR was developed by _____

f) Name any two examples of vaccines produced using RDT.

g) What do you mean by insertional inactivation?

h) According to HGP human genome consists of approximately _____ number of genes.

i) What is Quantitative PCR?

j) What is DNA polymorphism?

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

a) Diagrammatically explain Polymerase chain reaction.

b) How are gene based technologies used to diagnose genetic disorders/ diseases in humans. Explain with a suitable example.

c) What is dideoxy method of sequencing?

P.T.O.

Q3) **Comment on: (Any two of the following) :** **[10]**

a) PAC as vector.

b) c DNA library.

c) Microinjection technique.

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

a) What are transgenic plants? Explain the role of Ti plasmid as a vector for production of transgenic plants. Mention advantages and applications of transgenic plants with suitable examples.

b) What is a recombinant protein? Write detailed description of how is insulin produced using *E. coli* as host? Comment on the protein engineering of Insulin.

Total No. of Questions : 4]

SEAT No. :

P886

[Total No. of Pages : 2

[5422]-490
T.Y. B. Sc. (Semester IV)
COMPUTER HARDWARE & NETWORK ADMINISTRATION (Vocational)
Network Concepts - II (Paper - V)
(New Course)

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

Instructions to the candidates:

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

Q1) Attempt all of the following : **[10 × 1 = 10]**

i) Give one Use of a Proxy Server.

ii) Internet Datacard is used as a failsafe for Internet Connectivity. True or False?

iii) TCP/IP stands for.

iv) What is Email Spamming?

v) What is a MODEM?

vi) What is Eavesdropping

vii) What is a VLAN?

viii) What is Cryptography?

ix) What is a Cold Site?

x) List one name of a Known Virus.

Q2) Attempt any Two of the Following : **[2×5=10]**

a) Give the Steps to share a Printer on Network.

b) What are Passive Attacks? Explain with proper example.

c) What is Database server? Explain its use.

P.T.O.

Q3) Attempt any Two of the Following : **[2×5=10]**

a) Write a Note on Proxy server.

b) What is NAS? Give its applications.

c) Explain the Threats caused by handheld devices.

Q4) Attempt any One of the Following : **[1×10=10]**

a) Explain the Terms :

i) Antivirus

ii) Mirroring

iii) DoS

iv) Encryption

v) Hotsite

b) Give the steps involved in Installation of Win 7 on a Desktop PC.

Total No. of Questions : 4]

SEAT No : ____

P472

[Total No. of Pages : 2

[5422]-491
T.Y. B.Sc. (Vocational)
VOC-ST-321 : SEED TECHNOLOGY
Entrepreneurship Development
(Semester-IV) (2013 Pattern)

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

Instructions to the candidates:

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

Q1) Answer in one sentence. **[10×1=10]**

a) Give the concept of entrepreneurship.

b) Write the full form of SISI.

c) What is proprietorship?

d) Give names of any two funding agencies for entrepreneurship.

e) What is fund flow?

f) What is marketing?

g) What is costing?

h) What is sales tax?

i) Give the full form of NABARD.

j) Mention any one type of entrepreneur.

Q2) Answer any <u>two</u> of the following. **[2×5=10]**

a) Give an account of any two channels in marketing.

b) Explain the need and scope of entrepreneurship.

c) Write about the role of consultancy organisation.

P.T.O.

Q3) Write notes on any two of the following: **[2×5=10]**

a) Pollution Control Board.

b) Market Segmentation.

c) National Entrepreneurship Development Board.

Q4) Explain the process for becoming a successful entrepreneur. **[10]**

OR

Write an account on the ideas to start a new business, **[10]**

Total No. of Questions : 4]

SEAT No. :

P473

[Total No. of Pages : 2

[5422]-493

T.Y.B.Sc. (Vocational)
BIOTECHNOLOGY
ENTREPRENEURSHIP DEVELOPMENT
(2013 Pattern) (Semester-IV) (Paper-VI)

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

Instructions to the candidates:

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

Q1) Answer the following questions in short. **[10]**

a) What is Joint Stock Company?

b) What is NEDB?

c) What are the types of Small Scale Industries?

d) What is NIESBUD?

e) What is meant by sole proprietor ship?

f) What is MSSIDC?

g) What is Sales Tax?

h) Enlist two patent rules.

i) What is the importance of marketing?

j) Enlist the different modes of employment.

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

a) Define Market Segmentation along with the steps involved. What is the basis of Market segmentation?

b) Explain the role of consulting organizations in entrepreneurship development.

c) Explain the preparation of Project report.

P.T.O.

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

a) Exit policies

b) Market survey

c) Organizations promoting entrepreneurship

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

a) Define an entrepreneur. Discuss the key elements and characteristics of an entrepreneur. Add a note on barriers to entrepreneurship.

OR

b) Discuss in detail the various sources of finance.

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

P474

[Total No. of Pages : 1

[5422]-494

T.Y.B.Sc. (Vocational)

PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION

Radio Production

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

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

Instructions to the candidates:

1) ***Question number ONE is compulsory.***
2) ***Answer any FOUR questions from the remaining questions.***
3) ***Provide suitable examples wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) Radio is a medium of "Intimacy". Explain. **[8]**

Q2) What are the important features of the Youth programme? **[8]**

Q3) In an interview programme why interviewer should listen others? **[8]**

Q4) Write a dialogue for 2 minutes on any One. **[8]**

a) Students asks permission from teacher to remain absent from practical.

b) You are caught without helmet by traffic police.

Q5) What is OB programme? What care should be taken to cover any OB programme? **[8]**

Q6) Explain any Broadcasting code in detail. **[8]**

Q7) It is a challenge to broadcast for blind listener. Illustrate. **[8]**

Q8) Appreciate any movie you like the most. **[8]**

♦ ♦ ♦

Total No. of Questions : 4]

SEAT No. :

P475

[Total No. of Pages : 2

[5422]-495

T.Y.B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE

Voc. - EEM : Medical Instrumentation

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

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

Instructions to the candidates:

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

Q1) a) Answer the following - **[4 × 1 = 4]**

i) State the resting potential range for excitable cell in human body.

ii) Define electrode array.

iii) What acts as communication network of human body system?

iv) State full-forms of

1) EEG

2) EMG

b) Answer the following - **[2 × 2 = 4]**

i) What is volume of packed blood cells called?

ii) Explain the meaning and need of 'defibrillation'.

c) Answer the following - **[2 × 2 = 4]**

i) What is nomogram?

ii) What is haemoglobin?

Q2) Answer the following(Any 2) - **[2 × 4 = 8]**

a) Explain - microelectrodes.

b) Discuss basic recording system in biomedical instrumentation.

c) Give the basic features of all the 4 EEG waves in brain signal recording.

P.T.O.

Q3) Answer any 2 - **[2 × 4 = 8]**

a) Explain electrodes for electrical stimulation of tissues of human body.

b) What are -

i) general senses

ii) special senses

c) What is PNS? State four components of reflex arc.

Q4) Answer the following - **[2 × 6 = 12]**

a) Write a short note on - 'Spectrophotometer'.

b) Discuss physiological effects of electric current on human body.

OR

Q4) Answer the following - **[2 × 6 = 12]**

a) Explain - 'shock hazards' in context with bioinstrumentation system.

b) Discuss - Ion-selective electrodes.

♦ ♦ ♦

Total No. of Questions : 4]

SEAT No. :

P476

[Total No. of Pages : 2

[5422]-496

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 a Working Capital?

ii) What is a Sole Proprietorship?

iii) What is Income Tax?

iv) Write full form of IDBI.

v) Write the Act of wages payment.

b) Match the pairs.

Group "A"	**Group "B"**
Cooperative Society	1948
Income Tax Act	Votes in proportion to Shares
Factories Act	One member one vote
Company	2013
The Companies Act	1961

P.T.O.

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

a) State the objectives of Human Resource Management.

b) Write advantages of a Sole Proprietorship.

c) Write a note on Marketing Channels.

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

a) Distinguish between a Company and a Co-operative Society.

b) Explain the Levels of Market Segmentation.

c) Explain the types of entrepreneurs.

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

a) Define partnership firm. Explain its merits and demerits.

b) What is Entrepreneurship? Explain Barriers to Entrepreneurship.

♦ ♦ ♦

Total No. of Questions : 4]

SEAT No. :

P885

[Total No. of Pages : 2

[5422]-497
T.Y. B. Sc.
COMPUTER HARDWARE & NETWORK ADMINISTRATION (Vocational)
Entrepreneurship Development
(New Course) (Semester - IV)(Paper - VI)

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

Instructions to the candidates:

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

Q1) Attempt all of the following : **[10 × 1 = 10]**

a) What is SICOM?

b) Who is an Entrepreneur?

c) Explain the Term 'Break Even Point'?

d) What is a PMYR Loan Scheme?

e) Entrepreneur ship Development Program of India is carried out under which Ministry?

f) Which Tax do we pay on our excess income?

g) What is a meaning of SIDBI?

h) Give any one characteristic of an Entrepreneur.

i) What is a 'Capital Investment'?

j) Is 'Place' one of the important factors of Marketing Mix.

Q2) Attempt any Two of the Following : **[2×5=10]**

a) What are the different modes of Employment?

b) What are the Merits of a Partnership Firm?

c) What is the Role of Human Resource Department in Entrepreneurship Development program of India?

P.T.O.

Q3) Attempt any Two of the Following : **[2×5=10]**

a) Explain the importance of Softskill development programme.

b) Which funding agencies help Entrepreneurs to grow?

c) Explain the concept of "Angel Finance".

Q4) Attempt any One of the Following : **[1×10=10]**

a) Explain the Roles of Following Agencies :

i) MIDC

ii) Pollution Control Board

iii) DIC

iv) SISI

v) NEDB

OR

b) Explain the advantages of Digital Marketing Tools given below :

i) SMS Campaign

ii) Mailers

iii) Facebook

iv) Search Engines

v) Online Trade

Total No. of Questions :4]

SEAT No. :

P477

[Total No. of Pages :2

[5422] - 498

T.Y.B.Sc. (Vocational)

SEED TECHNOLOGY

VOC-ST - 322 : Biotechnology and Intellectual Property 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.***
3) ***Draw neat and labeled diagrams wherever necessary.***

Q1) Answer in one sentence each. **[10×1=10]**

a) What is Biotechnology?

b) Write full form of ELISA.

c) What are cosmids?

d) Define, tissue culture.

e) What is Northern Blotting?

f) Give any one name of Transgenic plant.

g) What is copy right?

h) What is IARI?

i) Define Embryo culture.

j) What is DNA finger printing?

P.T.O.

Q2) Answer the following (Any two) **[2×5=10]**

a) Describe PCR.

b) Explain in detail Western Blotting.

c) Give applications of Transgenics.

Q3) Write Notes on any two of the following. **[2×5=10]**

a) Lambda phase vectors.

b) Synthetic seeds.

c) Plant Breeder's Rights.

Q4) What is Micropropagation? Describe in detail tissue culture technique in Banana. **[10]**

OR

Describe in detail RFLP technique for varietal identification.

Total No. of Questions : 4]

SEAT No. : ____

P323

[Total No. of Pages : 2

[5422]-601
T.Y. B.Sc.
PHYSICS
PH - 345 (B) : Advanced Electronics
(2008 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 calculators is allowed.***

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

a) State the principle of photovoltaic detector.

b) Define the term : Signal conditioning

c) State the operating principle of solid state temperature sensors.

d) What is the function of sludge level control step in a water treatment plant?

e) Draw the symbol for a control relay and its contacts, used in a ladder diagram.

f) Which thermistors are used as sensors?

g) What is meant by signal level and bias changes in signal conditioning.

h) State the principle of broad and pyrometer.

i) State the objective of the input module of a PLC.

j) State seebeck effect in thermocouples.

Q2) Attempt any two (five marks each)

a) Discuss the construction and working of a photo conductive detector.

b) A metal wire shows the following variation of resistance with temperature. Find the linear approximation for the resistance.

T(°C)	70	75	80	85	90	95	100
R (Ω)	201.0	203.1	205.6	207.1	210.0	212.1	213.6

c) State and explain various elements involved in a process control system, in short.

P.T.O.

Q3) Attempt any two (five marks each)

a) Discuss the concept of linearization in analog signal conditioning.

b) Draw a neat labelled block diagram for a programmable logic controller.

c) Discuss the working of pre-chlorination control unit in a water treatment plant.

Q4) a) Attempt any one (eight marks)

i) Explain the principle, construction and working of a selective radiation pyrometer; with a neat diagram.

ii) Explain the construction and working of photo-emissive cell**.**

b) Attempt any one (two marks)

i) The dissipation constant of a RTD is 30 mw/°c when it is connected in a circuit, the temperature rise due to self heating is 0.75 °c Calculate the power dissipated in the RTD from the circuit.

ii) What is a relay sequencer?

Total No. of Questions : 4]

SEAT No. :

P324

[Total No. of Pages : 4

[5422]-602
T.Y. B.Sc.
PHYSICS
PH - 346 (G) : Physics of Nanomaterials
(2008 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

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

a) What is nanoscience?

b) State two types of CNT's.

c) What happens to the band structure of nanomaterials?

d) Name the formulla used for determination of particle size of nanomaterial.

e) Range of interplaner distances is of the order of wavelength of which electromagnetic tradition?

f) State any one characterization technique of nanoparticles with it's function.

g) Name any one nanomaterial prominently used in consmetics.

h) What are gerogels?

i) What is surface plasmon resonance?

j) Write the expression for energy of a particle in 1-D box.

Q2) Attempt any two of the following:

a) Write a note on sputter deposition method for nanomaterials synthesis. **[5]**

b) Write a detail note on high energy ball milling method. **[5]**

c) State and explain Debye-Scherrer equation. What is it's significance in the analysis of nanoparticles. **[5]**

P.T.O.

Q3) Attempt any two of the following:

a) Explain with diagram how the porous silicon is formed. **[5]**

b) Compare the electrical properties of bulk and nanomaterials. **[5]**

c) Write a note on applications of nanomaterials in sport, medical, electronics, biology and health. **[5]**

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

i) Write a note on "Growth of nanoparticles". Explain transmission electron microscopy for surface morphology and size of nanomaterials.

ii) Describe the synthesis, properties and applications of carbon nanotubes.

b) Attempt any one of the following:

i) During synthesis of nanostructures, how the morphology is controlled. **[2]**

ii) Compare top-down and bottom up approach of synthesis of nanomaterials. **[2]**

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Total No. of Questions : 4]

P324

[5422]-602
T.Y. B.Sc.
PHYSICS
PH - 346 (H) : Microcontrollers
(2008 Pattern) (Semester - IV) (Paper - VI) (Elective - II)

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

Instructions to the candidates:

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

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

a) Explain the instruction SWAPA in 8051.

b) Enlist features of 8051.

c) Convert 03FFH hex number into decimal.

d) What is the address range for ON-CHIP RAM and ROM in 8051?

e) Explain the difference between ACALL and LCALL.

f) What is Half-duplex serial data transfer?

g) What is the size of DPTR (Data Pointer) register?

h) State function of ALU.

i) Give format of TCON register.

j) Explain the function of instruction DIV-AB.

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

a) Compare parallel data transfer with serial data transfer.

b) What are the various addressing modes in 8051? Explain each with suitable example.

c) Give the comparison between microprocessor and microcontroller.

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

a) Draw block diagram of 8051 microcontroller.

b) Write an assembly language program for dividing two eight bit nos. stored in R_2 and R_3 registers store the quotient in R_0 and the remainder in R_1.

c) Interface 2 × 16 line LCD to 8051 and explain in brief.

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

i) Explain the role of TMOD and TCON registers in operation of TIMER/COUNTER in 8051.

ii) Draw internal block diagram of 8051. Explain internal RAM structure in detail.

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

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

ii) Explain the 'XOR' instruction of 8051.

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Total No. of Questions : 4]

SEAT No. :

P325

[Total No. of Pages : 2

[5422]-603
T.Y.B.Sc.
STATISTICS (Principal)
ST - 343 : Statistical Process Control (Offline Methods)
(2008Pattern) (Semester - IV) (Paper - III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right incidate 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: **[1 each]**

a) Choose the correct alternative in each of the following:

i) When a lot is accepted on the basis of second sample in double sampling plan the total inspection is

A) n_1 B) n_2 C) n_1+n_2 D) N

ii) The cut set of the three component parallel system is

A) {1,2,3} B) {2,3} C) {1,3} D) {1,2}

iii) For a coherent binary system of three components total number of state vectors are

A) 2 B) 3 C) 8 D) 9

iv) Average total Inspection for single sampling plan if

A) n

B) $N.(1-p_a)$

C) $n.p_a+N.(1-p_a)$

D) N

b) State whether each of the following statement is true or false. **[1 each]**

i) Life time of series system of independent components with independent IFR, life time is IFR.

ii) Series system of n component is also known as 1 out of n: G system.

c) Define the following terms: **[1 each]**

i) Hazard rate

ii) Average Outgoing Quality

d) i) Describe nature of Average Outgoing Quality (AOQ) curve of single sampling plan [N, n, c]. **[1]**

ii) State the rule for shifting to reduced inspection from normal inspection. **[1]**

P.T.O.

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

a) Explain the procedure for double sampling plan and also write down the advantages of double sampling plan over single sampling plan.

b) Draw and OC curve for the single sampling plan N=2000, n=100, c=0,by taking p=0.01, 0.03, 0.05, 0.07, 0.09. Also explain how you will obtain producer's risk for AQL of 2% using OC curve.

c) There are 4 components A, B, C and D in a system. The system works if (A and B) or (C and D) function. Draw reliability block diagram and find structure function for this situation.

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

a) Write note on ISO 9001 :2000(E).

b) Explain the followings:

i) Series system

ii) Parallel system

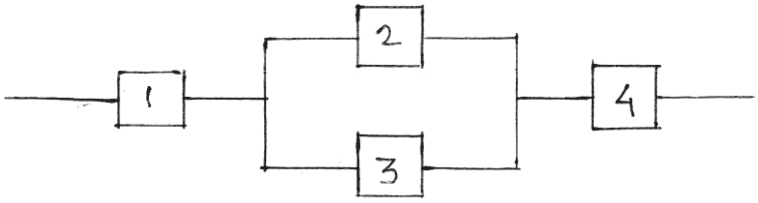
iii) K out of n:G system

c) Compute consumer's risk and producer's risk for the following sampling plan: N=500, n=50, c=1
Given the AQL = 0.01 and LTPD = 0.08

Q4) Attempt any one of the following:

a) i) Define hazard rate. Show that $r(t) = \frac{f(t)}{F(t)}$ if p.d.f. exist. **[5]**

ii) Obtain minimal path vectors and minimal cut vectors for the following reliability block diagram. **[5]**



b) i) Write note on Dodge Roming Table. **[5]**

ii) Define the terms IFRA and DFRA. Also show that exponential distribution belongs to IFRA as well as DFRA. **[5]**

Total No. of Questions : 4]

SEAT No. : ____

P326

[Total No. of Pages : 4

[5422]-604
T.Y. B.Sc.
STATISTICS (Principal)
ST - 345 : Operations Research
(2008 Pattern) (Semester - IV) (Paper - V)

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

Instructions to the candidates:

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

Q1) Attempt each of the following:

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

i) In a transportation problem, the least cost method is used

A) to find initial solution

B) to find optimal solution

C) to find alternate solution

D) to find initial basic feasible solution

ii) To solve a LPP by graphical method the number of decision variables should be

A) 3 B) 2

C) less than 2 D) more than 3

iii) If primal problem has an infeasible solution then solution of the dual problem is

A) unbounded B) feasible

C) infeasible D) degenerate

iv) In an assignment problem, decision variable can take values.

A) either 0 or 1 B) either 1 or 0

C) either 1 or 1 D) either 1 or 2

P.T.O.

b) In each of the following cases state whether the given statement is true or false: **[1 each]**

i) An assignment problem is a special case of transportation problem.

ii) The value of objective function is same for primal and dual problem.

c) Explain the following terms: **[1 each]**

i) The assumptions for sequencing problem.

ii) Degenerate and non-degenerate solution for LPP.

d) **[1 each]**

i) Explain linear programming problem in canonical form.

ii) Explain balanced and unbalanced transportation problem (T.P.)

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

a) Four different jobs can be done on four different machines and take down time costs are prohibitively high for change overs. The matrix below gives the cost in rupees of producing job *i* on machine *j*.

Job / Machine	M_1	M_2	M_3	M_4
J_1	5	7	11	6
J_2	8	5	9	6
J_3	4	7	10	7
J_4	10	4	8	3

How should the jobs be assigned to the various machines so that the total cost is minimized?

b) Explain merits, limitations and applications of simulation.

c) Use Big-M method to solve the following LPP:

Maximize $Z=x_1+2x_2+3x_3-x_4$

subject to $x_1+2x_2+3x_3=15$

$2x_1+x_2+5x_3=20$

$x_1+2x_2+x_3+x_4=10$

$x_1, x_2, x_3, x_4 \geq 0$

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

a) There are five jobs each of which must go through the two machines A and B in the order AB. Processing times are given below:

Machine / Job	1	2	3	4	5
A	5	1	9	3	10
B	2	6	7	8	4

Determine a sequence for five jobs that will minimize the total elapsed time.

b) Use graphical method to solve the following LPP:

$$\begin{aligned} &\textit{Maximize} && Z=4X+6Y \\ &\text{subject to} && -X+Y \leq 11 \\ & && X+Y \leq 27 \\ & && 2X+5Y \leq 90 \\ & && X, Y \geq 0 \end{aligned}$$

c) What are pseudo random numbers? Explain linear congruential generator. Generate five random numbers using it.

Q4) Attempt any one of the following:

a) i) Explain following terms related to linear programming: **[5]**

1) Slack variable

2) Surplus variable

3) Basic and non-basic variables

4) Basic feasible solution

5) Optimal solution

ii) A person requires at least 10, 12 and 15 units of chemicals A, B and C respectively for his garden. A liquid product contains 5, 2 and 1 unit of chemicals A, B and C respectively per jar where as a dry product contains 1, 2 and 4 units of A, B and C per carton. The liquid product is sold for Rs. 30 per jar and the dry product is sold for Rs. 200 per carton. Formulate above problem as L.P.P. to minimize the total cost. **[5]**

b) Find the optimal solution to the following transportation problem using u-v method by obtaining initial basic feasible solution using VAM. **[10]**

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

Total No. of Questions : 4]

SEAT No. :

P327

[Total No. of Pages : 5

[5422]-605
T.Y. B.Sc.
STATISTICS (Principal)
ST - 346 (A) : Medical Statistics
(2008 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator and statistical tables 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]**

i) The logistic growth equation is called sigmoidal because it is shaped like letter.

a) V b) Z

c) S d) σ

ii) The relative risk of an event is always

a) positive

b) zero

c) negative

d) a number between zero and one

iii) A study that begins with tests on animals is called as :

a) Preclinical study b) Phase I study

c) Phase II study d) Phase III study

iv) Pharmaco-kinetics (Pk) is the study of the time course of

a) absorption b) distribution

c) metabolism and excretion d) all above

P.T.O.

B) In each of the following cases, state whether the given statement is true or false : **[1 each]**

i) Life table provides a broad picture of mortality and survivorship.

ii) A control is a treatment that is useful as a standard for comparison.

C) Define the following terms : **[1 each]**

i) 80/20 for assessment of bioequivalence

ii) Prevalence

D) i) State the role of CRO. **[1 each]**

ii) Explain the term safety of drug.

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

a) Write a short note on 'Crossover design' used in clinical trails.

b) Explain in brief the discoveries in epidemiology made by the following :

i) Cholera in London

ii) Florence Nightingale

c) A survival model is defined by the following values of P_x for a radix of 1,00,000 :

Time Units (x)	0	1	2	3	4	5	6
Survival Probability (P_x)	0.95	0.90	0.80	0.50	0.30	0.10	0

Prepare life-table containing columns d_x, q_x, L_x, T_x, e_x.

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

a) Suppose μ_C and μ_T denote the mean responses of two formulations control (C) and test (T) with unknown variance. Explain how you test $H_0 : \mu_T = \mu_C$ against $H_1 : \mu_T > \mu_C$. Assuming equal sample sizes for both the test groups, find the expression of sample size of each group to get power $1-\beta$.

b) Define hazard rate function at age x denoted by h(x). Also derive the formula for hazard rate of the Weibull distribution.

c) Explain Simpson's paradox with help of an illustration from medical study.

Q4) Attempt any one of the following:

a) i) Explain in brief Phase II study in clinical trails. **[5]**

ii) Given below are caffeine concentration values after taking a dose.

Estimate C_{max}, T_{max}. Also calculate $AUC_{(0.180)}$ **[5]**

Time (in minutes)	10	30	60	90	120	180
Concentration (microgram/ml)	4	3	1	0.75	0.55	0.3

b) i) Write a short note on 'Bioavailability'. **[5]**

ii) Derive the equation for sigmoidal growth. **[5]**

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Total No. of Questions : 4]

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[5422]-605
T.Y. B.Sc.
STATISTICS (Principal)
ST - 346 (B) : Statistical Ecology
(2008 Pattern) (Semester - IV) (Paper - VI)

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

Instructions to the candidates:

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

Q1) A) In each of the following cases choose the correct alternative : **[1 each]**

i) In Gompertz model the growth rate is maximum at

a) $\frac{k}{z}$ b) $\frac{e}{k}$

c) $\frac{k}{e}$ d) $2k$

ii) The time at which population gets doubled in an exponential growth model is

a) $\text{klag}_e\, 2$ b) $2e^k$

c) $\frac{\log_e 2}{k}$ d) $2\log_e k$

iii) Peterson's estimator of population size for single recapture is

a) $\frac{n_1 n_2}{m_2}$ b) $\frac{n_1 m_2}{n_2}$

c) $\frac{n_2 m_2}{n_1}$ d) $\frac{m_2}{n_1 n_2}$

iv) For logistic growth model, stable equilibrium is

a) $N_t = 0$ b) $N_t = k$

c) $N_t = \frac{k}{2}$ d) $N_t = \infty$

B) In each of the following, state whether the given statement is true or false : **[1 each]**

i) Logistic growth model is sigmoidal.

ii) The regular forest is generally a result of competition between the species for nutrients in the soil.

C) i) Define Poisson forest **[1 each]**

ii) Define stable equilibrium.

D) i) Explain two kinds of parameter in Leslie matrix model (LMM). **[1 each]**

ii) Explain in brief rarefraction curves.

Q2) Attempt <u>any two</u> of the following: **[5 each]**

a) Explain the method of quadrat sampling to estimate population density in a forest. Also discuss scope and limitations of this method.

b) Describe the line transact method for estimating animal population in a forest. What is the rationale behind using exponential detection function?

c) Derive an expression for Gompertz model.

Q3) Attempt <u>any two</u> of the following: **[5 each]**

a) Derive the expression for logistic growth model.

b) Describe the capture-recapture method. Derive Peterson's estimator of population size for single recapture in case of a closed population.

c) Give the following projection matrix $M=\begin{bmatrix} 0 & 2 \\ 0.2 & 0 \end{bmatrix}$ obtain stable population structure and comment on the growth of the population.

Q4) Attempt <u>any one</u> of the following:

A) i) In LMM state **[5+5]**

a) Assumption made

b) Model

c) matrix notation

ii) Define Simpson's index (λ) for diversity. Compute λ for the following data :

Species	1	2	3	4	5
Number of individuals	6	4	3	5	2

B) What is meant by point to individual nearest neighbour distance in Poisson forest? Derive maximum likelihood estimator of λ. Is this estimator unbiased? If not, obtain its bias and also give unbiased estimator for λ. **[10]**

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Total No. of Questions : 4]

SEAT No. :

P328

[Total No. of Pages : 3

[5422]-606
T.Y. B.Sc.
STATISTICS (Principal)
ST-346(c) : Statistical Computing using R-Software (Online Paper)
(2008 Pattern) (Semester - IV) (Paper - VI) (Elective - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Each question is to be solved using R Software installed on your computer.***
4) ***Attach computer printout of your work to the answer book supplied to you.***

Q1) Attempt each of the following : **[1 each]**

a) Create a data frame of 5 individuals containing name and income of father.

b) Find Geometric mean and Harmonic mean of following numbers.

100, 190, 210, 160, 150, 160, 190, 200, 170, 152.

c) Simulate an experiment of tossing a coin 100 times and prepare its frequency distribution.

d) Draw a boxplot of following observations.

68, 44, 55, 47, 65, 50, 72, 54, 75, 60, 48, 60, 42, 60, 56, 65, 45, 55, 65, 44.

e) Draw a random sample of size 15 from Normal distribution with mean 10 and variance 8. Find mean of the sample.

f) Draw a systematic sample of size 7 from a population of 35 units.

g) Let $X \rightarrow B(n = 8, p = 0.4)$ find $p(X = 3)$ and $P(X > 7)$.

h) Draw rod plot for the following data

Number appeared	1	2	3	4	5	6
Frequency	4	8	13	17	6	2

i) Obtain lower and upper Quartiles of following observations.

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

j) Create a vector of odd numbers between 1 and 100.

P.T.O.

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

a) Fit a Poisson distribution to the following data and find expected frequency.

No. of misprints (x)	0	1	2	3	4	5
No. of pages (y)	139	76	28	4	2	1

b) Find quartile deviation using following data :

Age	5-10	10-15	15-20	20-25	25-30	30-35
No. of persons	8	17	30	26	12	7

c) Tests were made at short intervals on spark plugs of two manufacturers A & B. The following are the no. of hours of service for the two types of plugs.

A	200	210	190	200	190	200	180	200	200	210
B	190	200	210	190	180	190	200	192		

Test where there is significant difference between mean length of service of two types of spark plugs.

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

a) Find mean deviation about 7 and mean deviation about median for the following observations.

2, 5, 9, 7, 11, 6, 5, 2, 7, 9, 3, 2, 8, 12, 14, 6, 3, 9, 8, 7

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

Life	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of tyres	5	8	13	20	14	6	4

Draw histogram and frequency polygon for the above data.

c) Fit a straight line $y = a + bx$ to the following data.

X	9	14	16	27	35	14	19	24	7
Y	15	31	42	57	39	23	34	49	11

Also estimate y for $x = 6$.

Q4) Attempt any one of the following : **[5 + 5]**

a) i) Carry out one way ANOVA for the following data;

Varieties	Observations
A	50,52
B	53, 55, 53
C	60, 58, 57, 56
D	52, 54, 54, 55

ii) Compute Bowley's Coefficient of Skewness and comment on the nature of the data.

x	1	3	7	8	9	12
f	4	9	12	10	7	5

b) i) Represent the data by using simple bar diagram. **[5+5]**

Year	2000	2001	2002	2003	2004
No. of Students	3500	4100	4300	5000	4900

ii) Compute mean deviation about mode for the following data.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	5	8	7	12	28	24	10