Total No. of Questions : 5] **[Total No. of Pages : 4**

P179

[3717] - 1

F.Y. B.Sc.

MATHEMATICS

Algebra and Geometry

(Paper - I) (New Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

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

Q1) Attempt all the subquestions : **[16]**

a) Define power set of a set and equivalence relation on a set.

b) Let f be the function defined by $f(x) = 3x - 4$.

Find $f\left(\frac{1}{3}\right)$ and $f(a + h)$.

c) Show that $\phi(3).\phi(10).\phi(4)$ is a perfect square, where ϕ is Euler's ϕ - function.

d) Using synthetic division find the quotient and remainder when $7x^4 + 3x^3 + 8x + 1$ is divided by $x + 2$.

e) Discuss the nature of the conic $x^4 - 4xy - 2y^2 + 10x + 4y = 0$.

f) Obtain the equation of a line joining the points (–2, 1, 3) and (3, 1, –2).

g) Show that the line $\frac{x-4}{3} = \frac{y+7}{-6} = \frac{z+3}{-4}$ lies wholly in the plane $2x - y + 3z - 6 = 0$.

h) Find x so that rank of the following matrix A is not equal to 3

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 3 & 1 & 2 \\ x & 2 & 2 \end{bmatrix}.$$

Q2) Attempt any four of the following : **[16]**

a) Let g : R $\rightarrow$ R be a function defined by $g(x) = 5x - 2$. Show that the function g is bijective. Also find a formula for g^{-1}.

b) Define '~' on R^2, the set of all points in XY - plane as : for $(x, y), (x_1, y_1) \in R^2$, $(x, y) \sim (x_1, y_1)$ if $x + y = x_1 + y_1$. Show that '~' is an equivalence relation. Interprete the equivalence classes geometrically.

c) If a, b, c are integers such that $a|bc$ and $(a, b) = 1$ then show that $a|c$.

d) If z_1, z_2 are two complex numbers then prove that $\left|\frac{z_1}{z_2}\right| = \frac{|z_1|}{|z_2|}$ and

$\arg\left(\frac{z_1}{z_2}\right) = \arg z_1 - \arg z_2$, where $z_2 \neq 0$.

e) In z_{12}, calculate

i) $\left(\overline{2}.\overline{9} + \overline{1}\right)^{-1}$

ii) $-\overline{5}\left(\overline{4} + \overline{5}\right)$.

f) If $u + iv$, $v \neq 0$ is a root of the real polynomial equation $f(x) = 0$ then prove that $u - iv$ is also a root of $f(x) = 0$.

Q3) Attempt any two of the following : **[16]**

a) If a and b are any two integers with $b \neq 0$, then prove that there exist unique integers q and r such that $a = bq + r$, where $0 \leq r < |b|$.

b) Prove that $\left|\frac{a-b}{1-a\bar{b}}\right| = 1$ if and only if either $|a| = 1$ or $|b| = 1$, where a and b are complex numbers.

c) i) Show that 4999 and 1109 are relatively prime.

ii) Find a polynomial equation of least degree with rational coefficients having roots $1, 2 + \sqrt{3}, 2 - \sqrt{3}i$.

d) i) Let '~' be an equivalence relation on a set X. for $x, y \in X$, prove that $x \in \bar{y}$ if and only if $\bar{x} = \bar{y}$.

ii) By using De Moivre's theorem prove that

$$\sin^5\theta = \frac{1}{16}[\sin 5\theta - 5\sin 3\theta + 10\sin\theta].$$

Q4) Attempt any four of the following : **[16]**

a) Shift the origin to a suitable point so that the equation $x^2 - 6x - 4y - 1 = 0$ will be in the form $x^2 = 4by$. State the value of b.

b) If α, β, γ are the angles made by the line with positive direction of co-ordinate axes then prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$.

c) Prove that the straight line $\frac{x+1}{4} = \frac{y-2}{1} = \frac{z-2}{1}$ touches the sphere $x^2 + y^2 + z^2 = 9$. Find the point of contact.

d) Derive equation of the plane in the normal form.

e) Examine for consistency and solve if consistent

$x - y + z = -1$

$x - 3y + 4z = -6$

$4x + 3y - 2z = -3$

$7x - 4y + 7z = -16$.

f) Find the centre and the radius of the circle $x^2 + y^2 + z^2 - 2y - 4z = 11$, $x + 2y + 2z = 15$.

Q5) Attempt any two of the following : **[16]**

a) Reduce the equation $5x^2 + 6xy + 5y^2 - 10x - 6y - 3 = 0$ to the standard form and name the conic.

b) i) Find angle between the line $\frac{x - x_1}{l} = \frac{y - y_1}{m} = \frac{z - z_1}{n}$ and the plane $ax + by + cz + d = 0$, where l, m, n are direction ratios of a line.

ii) Find angle between two lines whose direction cosines are connected by the relations $2l - m + 2n = 0$, $mn + nl + lm = 0$.

c) Show that for every real number λ the equation $S + \lambda U = 0$ represents a sphere containing the circle of intersection of the sphere

$S \equiv x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ and $U \equiv ax + by + cz + d' = 0$. Hence find equation of the sphere through the circle

$x^2 + y^2 + z^2 + 6x - 4y - 6z - 14 = 0$, $x + y - z = 0$ and passing through the point $(1, 1, -1)$.

d) i) Find non-trivial solution of the following system

$x - 4y + 5z = 0$

$2x - y + 3z = 0$

$3x + 2y + z = 0$

ii) Find equation of the plane which passes through (2, 0, 3) and makes intercepts on the axes which are in the ratio 3 : 1 : 2.

Total No. of Questions : 6] **[Total No. of Pages : 3**

P188 **[3717] - 10**

F.Y. B.Sc.

ZOOLOGY (Theory)

Genetics and Parasitology

(Paper - II) (41520) (New Course) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

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.***

SECTION - I
(Genetics)

Q1) Define / Explain the following (Any Ten) **[10]**

a) Gene.
b) Test cross.
c) Dominant Epistasis.
d) Monoploidy.
e) Universal donor.
f) Euchromatin.
g) Law of dominance.
h) Cloning.
i) Paramecin.
j) Gynandromorphs.
k) Pleiotropy.
l) Homozygous.

Q2) Write short notes on (Any Three) **[15]**

a) Down's syndrome.
b) DNA finger printing.
c) Albinism.
d) Polytene chromosome.
e) Haemophilia.

P.T.O.

Q3) Attempt the following : **[15]**

a) Explain the inheritance of supplementary genes (9 : 3 : 4 ratio).

b) What is sex determination? Explain XX - XO method of sex determination.

c) What type of blood groups are possible in the offsprings of the following crosses with reference to ABO blood group system in man

i) $I^AI^A \times I^OI^O$

ii) $I^AI^B \times I^AI^B$

iii) $I^OI^O \times I^BI^B$

iv) $I^AI^O \times I^BI^O$

v) $I^BI^O \times I^BI^O$

OR

What is eugenics? Explain various factors contributing to positive and negative eugenics.

SECTION - II
(Parasitology)

Q4) Define / Explain the following (Any Ten) **[10]**

a) Medical protozoology.

b) Mutualism.

c) Host.

d) Neoplasia.

e) Antigen.

f) Miracidium larva.

g) Taeniasis.

h) Nocturnal periodicity of microfilaria.

i) Vaccination.

j) Sporogony.

k) Vector.

l) Sporocyst larva.

Q5) Write short notes on (Any Three) : **[15]**

a) Toxoplasmosis.

b) Bird flu.

c) Pathological effects of head louse.

d) Control measures of Entamoeba histolytica.

e) Signs and symptoms of malaria.

Q6) Attempt the following : **[15]**

a) What is antibody? Explain any four classes of antibody.

b) Explain parasitic adaptations in endoparasites.

c) What is host specificity? Explain physiological host specificity with suitable example.

OR

Explain in detail life cycle of Ascaris lumbricoides. Add a note on its control measures.

Total No. of Questions : 5] **[Total No. of Pages : 4**

P191 **[3717] - 13**

F.Y. B.Sc.

STATISTICS / STATISTICAL TECHNIQUES

Descriptive Statistics

(Paper - I) (New Course)

Time : 3 Hours] ***[Max. Marks : 80***

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 have their usual meanings.***
5) ***Graph papers will be supplied on request.***

Q1) Attempt the following :

a) Choose correct alternative for the following : **[4 x 1 = 4]**

i) If Corr(X, Y) = 0.8, then Corr(X + 3, Y + 5) is

1) 0.16 2) 0.1

3) 0.8 4) 0.12

ii) A measure of dispersion which is independent of measuring units is

1) Standard deviation 2) Coefficient of variation

3) Range 4) Mean deviation..

iii) In case of two attributes A and B, the class frequency (AB) in terms of other class frequencies can be expressed as

1) (AB) – (A) 2) (AB) – (B)

3) (A) – (AB) 4) N – (AB)

iv) For a cultural programme, 4 students are selected from each class to work as volunteers. The sampling scheme used in this situation is

1) Stratified sampling 2) Systematic sampling

3) Cluster sampling 4) Two stage sampling.

b) State whether the following statements are true or false : **[4 x 1 = 4]**

i) The algebraic signs of b_{xy}, b_{yx} and r are same.

ii) For a moderately asymmetric unimodal frequency distribution, the following empirical relationship holds approximately

mean – median = 3 (mean – mode).

iii) Among all the mean deviations, mean deviation about median is minimum.

iv) In case of negatively skewed distribution we observe that

mode < median < arithmetic mean.

c) State any two demerits of standard deviation. **[2]**

d) Demand function of a shirt at a departmental store is given by Q = 4000 – 6P. The supply function is S = 4P. Find the price at which equilibrium of demand and supply is observed. **[2]**

e) Define geometric mean and state the formula of it, in case of individual observations. **[2]**

f) Explain the term 'Kurtosis'. Also state the types of Kurtosis. **[2]**

Q2) Attempt any four of the following : **[4 x 4 = 16]**

a) A sample of n observations on X and Y shows that X and Y are uncorrelated and their variances are 5 and 3 respectively. Let U = 3X + 5Y and V = X – Y, show that U and V are uncorrelated.

b) Construct a box plot to represent the data given below :

16, 12, 17, 29, 23, 15, 14, 19, 31, 13, 26.

c) Explain the construction of Parato diagram with a suitable example.

d) The first two moments of a distribution about the value 4 are 3 and 34 respectively. Find the mean and variance.

e) Write a short note on ISI.

f) The regression equations of X and Y are $3x - y - 5 = 0$ and $4x - 3y = 0$. Obtain :

i) $\bar{x}$ and $\bar{y}$,

ii) Corr(X, Y).

Q3) Attempt any four of the following : **[4 x 4 = 16]**

a) Find the elasticity of demand at price P = 2, if the demand function is :

$$Q = \frac{20}{(P+1)^3}.$$

Interpret the result.

b) Explain cluster sampling with an illustration.

c) In a certain frequency distribution,

$Q_1 + Q_3 = 45$

$Q_3 - Q_1 = 15$,

Where Q_1 and Q_3 denote lower and upper quartiles. If median is 25, obtain Bowley's coefficient of skewness and interpret it.

d) Show that Yule's coefficient of association (Q_{AB}) between attributes A and B lies between –1 and 1.

e) Define an index number. State the various problems involved in construction of an index number.

f) Explain the concept of central tendency of data. State any two requirements of a good measure of central tendency?

Q4) Attempt any two of the following : **[2 x 8 = 16]**

a) Derive an expression for an angle between two regression lines. Hence discuss the situations of regression lines when :

i) $r = 0$

ii) $r = \pm 1$.

b) i) Show that S.D ≥ M.D about arithmetic mean.

ii) State and prove the effect of change of origin and scale on variance.

c) i) Explain the following terms :

1) dichotomy,

2) ultimate class frequency.

ii) Spearman's rank correlation coefficient between X and Y is $\frac{2}{3}$ and $\sum di^2 = 55$, assuming that no rank is repeated, find the number of pairs.

Note that, $\sum di^2$ is sum of squares of differences between the ranks.

d) i) Give the limitations of index numbers.

ii) A person travels first 18 km at a speed of 50 km per hour and next 20 km at a speed of 70 km per hour. What is the average speed over the entire distance?

Q5) Attempt any two of the following : **[2 x 8 = 16]**

a) i) If (AB) = 256, $(\alpha B) = 768$, $(A\beta) = 48$ and $(\alpha\beta) = 144$. Verify whether A and B are independent attributes.

ii) Explain the procedure of fitting the exponential curve $Y = ab^X$.

b) i) Explain the following terms :

1) Explained variation,

2) Unexplained variation.

ii) Explain the following terms :

1) Less than type cumulative frequency,

2) Relative frequency.

c) i) Compute Fisher's price index number for the following data :

Commodity	p_0	q_0	p_1	q_1
A	5	8	3	4
B	2	6	6	2
C	1	5	2	3

ii) With usual notation, show that :

$$\frac{P_{01}^{L}}{Q_{01}^{L}} = \frac{P_{01}^{P}}{Q_{01}^{P}}$$

(ignore the multiplier 100).

d) Derive the formula of mode for a continuous frequency distribution.

Total No. of Questions : 5] **[Total No. of Pages : 5**

P192 **[3717] - 14**

F.Y. B.Sc.

STATISTICS / STATISTICAL TECHNIQUES

Discrete Probability and Probability Distributions

(Paper - II) (New Course)

Time : 3 Hours] ***[Max. Marks : 80***

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 have their usual meanings.***

Q1) a) Choose correct alternative for the following : **[4 x 1 = 4]**

i) If A and B are independent events with P(A) = 0.5 and P(B) = 0.2, then $P(A \cup B)$ is

I) 0.7 II) 0.6

III) 1.0 IV) 0.52

ii) If random variable X has binomial distribution with parameters *n* and *p*, then

I) mean > variance II) mean = variance

III) mean < variance IV) mean $\leq$ variance.

iii) For a Poisson distribution if $P[X = 2] = \frac{1}{2} P[X = 3]$, then the parameter of the distribution is equal to

I) 2 II) 3

III) 6 IV) 5

iv) For a sample space $\Omega = \{w_1, w_2, w_3, w_4\}$, $P\{w_1\} = P\{w_2\} = \frac{2}{8}$, $P\{w_3\} = \frac{1}{8}$, $P\{w_4\} = k$.

This will be a probability model if *k* is equal to

I) 0 II) 1

III) $\frac{1}{8}$ IV) $\frac{3}{8}$

P.T.O.

b) State whether the following statements are true or false : **[4 x 1 = 4]**

i) For two discrete random variables X and Y, $E(X + Y) = E(X) + E(Y)$, only if X and Y are independent.

ii) If $B \subset A$, then P(A/B) = 1.

iii) Mode of a random variable X is the maximum value of X.

iv) Mean and variance of discrete uniform distribution are equal.

c) Define discrete sample space. **[2]**

d) State any two properties of distribution function. **[2]**

e) Define joint probability mass function of two dimensional discrete random variable. **[2]**

f) Explain with illustration what is meant by a Bernoulli trial. **[2]**

Q2) Attempt any four of the following : **[4 x 4 = 16]**

a) Explain the following, with one illustration each :

i) Mutually exclusive events.

ii) Exhaustive events.

b) Given the following distribution function of a random variable X :

X	1	2	3	4	5
F(x)	0.10	0.35	0.65	0.80	1.00

Find

i) Probability mass function of X.

ii) Median of X.

iii) Mode of X.

c) Suppose that the number of cars X that pass through a washing centre between 5.00 p.m. to 6.00 p.m. on a particular day has the following distribution :

X	4	5	6	7	8	9
P[X = x]	$\frac{1}{12}$	$\frac{2}{12}$	$\frac{2}{12}$	$\frac{3}{12}$	$\frac{2}{12}$	$\frac{2}{12}$

Let 9(X) = 12X, represent the amount of money in rupees, paid to the attendent by the manager. Find the attendent's expected earning for the time period specified above.

d) Give the classical definition of probability. State its limitations.

e) If A and B are any two events defined on Ω, then prove that, $P(A \cup B) \leq P(A) + P(B)$. Also state Boole's inequality for k events $A_1, A_2, \ldots\ldots A_k$.

f) Define :

i) Conditional probability.

ii) Pairwise independence of three events.

Q3) Attempt any four of the following : **[4 x 4 = 16]**

a) State and prove the multiplication theorem for two events A and B defined on a sample space Ω. Also state its generalisation for three events A, B and C.

b) If X and Y are independent random variables with the following distributions :

X	1	2
P[X = *x*]	0.6	0.4

Y	5	10	15
P[Y=y]	0.2	0.5	0.3

Find the joint distribution of X and Y.

c) If $P(A) = \frac{1}{3}$, $P(B) = \frac{3}{4}$ and $P(A \cup B) = \frac{11}{12}$,

Find

i) $P(A \cap B)$

ii) P(exactly one of A and B occurs).

d) Let X be a discrete r.v. with following probability distribution :

X	0	1	2	3
P[X = x]	$\frac{2}{8}$	$\frac{1}{8}$	$\frac{4}{8}$	$\frac{1}{8}$

Find $E[X^2]$.

e) A random variable X has the following probability distribution :

X	–1	0	2	3
P[X = *x*]	0.15	0.20	0.35	0.30

i) Find $P[X \leq 0]$.

ii) Find probability distribution of Y = 2X – 1.

f) Show that all raw moments of a Bernoulli (p) r.v. are equal to p.

Q4) Attempt any two of the following :

a) i) State and prove the additive property of binomial random variables. **[5]**

ii) Consider following sample space of English alphabets

$\Omega = \{a, b, c, d, \ldots\ldots y, z\}$

List the elements of the following events.

$A = \{ x \mid x \text{ is a vowel} \}$

$B = \{ x \mid x$ precedes 'e' in alphabet$\}$

Also, answer the following :

Are A and B mutually exclusive? **[3]**

b) i) Define :

1) Mutual independence of three events.

2) Partition of a sample space. **[4]**

ii) State the p.m.f. of a H(N, M, n) random variable and obtain its mean. **[4]**

c) For the following joint probability distribution of (X, Y), compute the correlation coefficient between X and Y $[\rho(X, Y)]$.

X \ Y	1	2	3
1	$\frac{1}{8}$	0	$\frac{2}{8}$
2	$\frac{2}{8}$	$\frac{1}{8}$	$\frac{2}{8}$

[8]

d) i) Define a discrete uniform probability distribution. Give two real life situations where it can be applied. **[4]**

ii) For a Bernoulli r.v. X, $\mu_3^1 = 0.6$. Find its mean, variance and third central moment. **[4]**

Q5) Attempt any two of the following : **[2 x 8 = 16]**

a) Let X be a discrete r.v. with mean μ and variance σ^2, then prove that,

i) $\text{Var}(X + b) = \sigma^2$ **[2]**

ii) $\text{Var}(aX) = a^2 \sigma^2$ **[3]**

iii) $\text{Var}(aX + b) = a^2 \sigma^2$. **[3]**

b) The following table gives the joint probability distribution of X and Y :

X \ Y	0	1	2
1	$\frac{2}{12}$	$\frac{1}{12}$	$\frac{3}{12}$
2	$\frac{1}{12}$	$\frac{2}{12}$	0
3	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

Find

i) $E(X - 2Y)$

ii) $\text{Var}(Y/X = 2)$ **[8]**

c) Prove that under certain conditions to be stated, binomial distribution tends to Poisson distribution. **[8]**

d) Define :

i) A discrete random variable.

ii) The $(r, s)^{th}$ raw moment of a bivariate distribution.

iii) r^{th} order factorial moment of a discrete r.v.

iv) Probability generating function (p.g.f) of a discrete r.v. **[8]**

Total No. of Questions : 5] **[Total No. of Pages : 4**

P180

[3717] - 2

F.Y. B.Sc.

MATHEMATICS

Calculus

(Paper - II) (New Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

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

Q1) Attempt all the subquestions : **[16]**

a) Find the rational number between $\sqrt{2}$ and $\sqrt{3}$.

b) Show that $\sum_{n=0}^{\infty} \cos\left(\frac{\pi}{n}\right)$ is divergent.

c) Define Cauchy sequence.

d) Find the left hand and right hand limits of the function $f(x)$ at $x = 4$, where $f(x)=\frac{|x-4|}{x-4}$, $x \neq 4$.

e) If the function $f : \mathrm{R} \rightarrow \mathrm{R}$ is defined as

$f(x) = -1$, if $x < \mathrm{C}$

$= 1$, if $x \geq \mathrm{C}$

then show that $|f|$ is continuous at $x = \mathrm{C}$.

f) Evaluate, $\lim_{x \to 0} \frac{a^x - 1}{b^x - 1}$.

g) Test whether Rolle's theorem is applicable for the function $f(x) = |x|$ on $[-1, 1]$.

h) State Taylor's theorem with Lagrange's form of remainder.

P.T.O.

Q2) Attempt any four of the following : **[16]**

a) For any two distinct, positive real numbers a and b, prove that $\sqrt{ab} < \frac{1}{2}(a+b)$.

b) If $<x_n>, <y_n>$ and $<z_n>$ are three sequences such that $x_n \le y_n \le z_n$, $\forall n \in \mathbf{N}$ and $\lim_{n\to\infty} x_n = \lim_{n\to\infty} z_n = l$ then prove that $\lim_{n\to\infty} y_n = l$.

c) Show that the sequence $<x_n>$ of real numbers whose n^{th} term is defined by $x_n = \frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots\ldots + \frac{1}{n.(n+1)}$, $\forall n \in \mathbf{N}$ is convergent.

d) Evaluate $\lim_{x\to 0} \frac{e^{1/x}}{1+e^{1/x}}$, if it exist.

e) Examine for convergence of the series $\sum_{n=1}^{\infty} \frac{3\sqrt{n}}{(n+1)\sqrt{n}}$.

f) If $x_1 = 2$ and $x_{n+1} = 3 + \frac{1}{2x_n}$, $n \ge 1$ then show that $<x_n>$ is contractive sequence.

Q3) Attempt any two of the following : **[16]**

a) Prove that $\sum_{n=1}^{\infty} \frac{1}{n^P}$ is convergent, if P > 1. Hence for what value of P is the series $\sum_{n=1}^{\infty} \frac{\sqrt{n+1} - \sqrt{n}}{n^P}$ convergent?

b) i) Show that the sequence $<x_n>$ defined by $x_1 = 1$ and $x_{n+1} = \sqrt{2 + x_n}$, $\forall n \in \mathbf{N}$ is convergent.

ii) Solve $\left|\frac{3-x}{2+x}\right| < 1$ $\forall x \in \mathbf{R}$ and $x \ne -2$.

c) i) Prove that limit of function $f(x)$ as $x \to C$ is unique, if it exists.

ii) Show that the sequence $<x_n>$ of reals whose n^{th} term is defined by $x_n = \frac{1}{n}$ is a Cauchy sequence.

d) i) State the field axioms for set of real numbers.

ii) Prove that $\lim_{x\to 0} x \cdot \sin\frac{1}{x} = 0$.

Q4) Attempt any four of the following : **[16]**

a) State and prove Lagrange's mean value theorem.

b) Verify Rolle's theorem for the function $f(x)=\frac{\sin x}{e^x}$ on $[0, \pi]$.

c) Verify Cauchy's mean value theorem for the function $f(x) = \cos x$ and $g(x) = \sin x$ on $\left[0, \frac{\pi}{2}\right]$.

d) Find α, β, if the function $f(x)$ is continuous on $(-3, 5)$

where

$f(x) = x + \alpha, -3 < x < 1$

$= 3x + 2, 1 \le x < 3$

$= \beta + x, 3 \le x < 5.$

e) By using Maclaurin's series prove that, $\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \ldots\ldots$

f) Evaluate $\lim_{x\to 2}\left(\frac{1}{x-2} - \frac{1}{\log(x-1)}\right)$.

Q5) Attempt any two of the following : **[16]**

a) State and prove Leibnitz's theorem. Hence find y_5, if $y = x^3 . e^x$.

b) i) If $f : [a, b] \to \mathrm{R}$ is continuous function on $[a, b]$ and $f(a) < k < f(b)$, then prove that there exists a point $C \in (a, b)$ satisfying $f(C) = k$, where $k \in \mathrm{R}$.

ii) Discuss the continuity of the function

$f(x)=\sqrt{(x-2)(x-4)}, \forall x \in \mathrm{R}$.

c) i) Prove that, if $f(x)$ is differentiable at point $x = a$, then it is continuous at $x = a$. Is the converse true?

ii) If $y = \sin^{-1}x$, then show that, $(1 - x^2)y_{n+2} - (2n + 1)x.y_{n+1} - n^2y_n = 0$.

d) i) Prove that

$$\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}, \text{ if } a < b.$$

ii) Evaluate, $\lim_{x \to 0} (\cos x)^{\frac{1}{x^2}}$.

Total No. of Questions : 5] **[Total No. of Pages : 3**

P181

[3717] - 3

F.Y. B.Sc.

PHYSICS - I

Mechanics, Heat and Thermodynamics

(Paper - I) (New Course)

Time : 3 Hours] ***[Max. Marks : 80***

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.***
4) ***Neat diagram must be drawn wherever necessary.***

Q1) Attempt all of the following :

a) Define instantaneous speed and velocity. **[2]**

b) What do you mean by inertia of the body. **[2]**

c) State Pascal's law. **[2]**

d) Calculate speed of bob of simple pendulum at its mean position, if the bob is to rise a maximum vertical height of 5 cm. **[2]**

e) What is mean by reversible process? **[2]**

f) What is equation of state? Give equation of state for perfect gas. **[2]**

g) Give principle of resistance thermometer. **[2]**

h) Find the coefficient of performance of Carnot's refrigerator working between 227°C & 27°C. **[2]**

Q2) Attempt any four of the following :

a) What is an average acceleration? Interpret average acceleration using V-t graph in one dimensional motion. **[4]**

b) Explain the workdone. Obtain workdone by a constant force. **[4]**

c) What is electromagnetic force? Give its properties. **[4]**

d) A film of soap solution is formed in a metal ring of radius 1.5 cm. Find potential energy stored in the film, if surface tension of soap solution is 0.035 J/m^2. **[4]**

P.T.O.

e) Two horizontal pipes of diameter 40 cm and 60 cm are joined together. The speed and pressure of water flowing in the first pipe are 9 m/s and 2×10^4 N/m^2. Calculate these quantities in the second pipe. (Density of water = 10^3 kg/m^3) **[4]**

f) A position of a car on straight road with time is given by the equation $x(t) = 10 + 25t + 5t^2$ in meters. When time is in second find instantaneous velocities at

i) t = 1 sec.

ii) t = 5 sec.

iii) t = 10 sec. **[4]**

Q3) Attempt any four of the following :

a) Derive an expression for workdone during an adiabatic process. **[4]**

b) Explain four thermodynamic functions U, H, F and G. **[4]**

c) Explain otto cycle with an indicator diagram. **[4]**

d) A reversible engine converts $\frac{1}{6}^{th}$ of heat in to work. When the temp. of the sink is decreased by 62°K its efficiency is doubled. Find the temperatures of source and sink. **[4]**

e) Calculate the pressure exerted by one mole of water vapour in a 0.01 m^3 container at 423°K assuming if to obey Van der waal's equation. given $a = 0.364$ Nm^4 mole^{-2},

$b = 3.05 \times 10^{-5}$ m^3 mole^{-1}. **[4]**

f) One mole of oxygen at 0°C is compressed until the volume reduces to $\frac{1}{4}^{th}$ of its initial value at the same temperature. Calculate the workdone. **[4]**

Q4) Attempt any two of the following :

a) State and prove Archimede's principle. **[8]**

b) i) Define surface tension and explain the effect of temperature on the surface tension. **[4]**

ii) Find the workdone in moving a particle along a vector $\vec{v} = \left(3\vec{s} - \vec{j} + 6\vec{k}\right)$ meter, If the applied force is $\vec{F} = \left(\vec{s} + 3\vec{j} + 2\vec{k}\right)$ newton. **[4]**

c) i) State the principle of conservation of energy. Give one example. **[4]**

ii) Two blocks of mass $m_1 = 10$ kg, and $m_2 = 20$ kg are tied together by light string and are placed on frictionless horizontal surface.

when m_1 is pulled by a force $\vec{F}$ an acceleration 10 m/s^2 is produced in both masses.

Calculate

1) The magnitude of the force.

2) Tension in the string. **[4]**

Q5) Attempt any two of the following :

a) Describe the Carnot's engine and show that its efficiency is function of working temperature only. **[8]**

b) i) State advantages of mercury thermometer. **[4]**

ii) The expansion ratio and compression ratio are 5 and 10 respectively. If the value of $\gamma = 1.4$ for working substance in a diesel engine then determine its efficiency. **[4]**

c) i) Give any four applications of Air conditioning. **[4]**

ii) Determine critical temperature for Helium from the following data

$a = 3.44$ J m^3 K mole^{-2}

$b = 0.0234$ m^3 K mole^{-1}

R = 8.315 J mole^{-1} K^{-1} **[4]**

Total No. of Questions : 6] **[Total No. of Pages : 3**

P214 **[3717] - 37**

F.Y. B.Sc.

BIOTECHNOLOGY (Vocational)

Microbiology and Mathematics, Statistics and Computer for Biologist

(Paper - II) (New Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

1) ***All questions are compulsory.***
2) ***Draw neat labelled diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use seperate answer books for Section I and II.***

SECTION - I

(Microbiology)

Q1) Answer the following questions in short : **[16]**

a) What is selective and differential media. Give example.

b) Describe moist heat sterilization.

c) Enlist Koch's postulates.

d) What is a Viroid? What kinds of diseases do Viroides cause?

e) What is axenic culture? What are two basic steps involved in obtaining it?

f) Give the important features of Fungi.

g) Enlist the steps involved in acid fast staining technique.

h) What is commensalism? Give example.

Q2) Attempt any four questions : **[16]**

a) Write short notes on :

i) Pone plate technique.

ii) Heat sterilization.

b) Diagramatically show the steps involved in the test for coliforms. Describe presumptive test.

c) Write short notes on :

i) Mutualism.

ii) Amensalism.

P.T.O.

d) For each of the following give the mode of action to kill microbes and give examples of its use

i) Hydrogen peroxide.

ii) Alcohols.

e) Discuss the process of filteration in brief.

Q3) Attempt any two questions : **[8]**

a) In detail describe Gram staining technique.

b) What was the controversy over spontaneous generation?

c) Enlist the factors involved in establishing the pathogenicity by the pathogen.

SECTION - II

(Mathematics, Statistics and Computer for Biologist)

Q4) Attempt each of the following : **[8]**

a) If $y = 2x^{\frac{5}{2}} - \cos x + e^{-x} + 7$, find $\frac{dy}{dx}$.

b) Evaluate $\int (2x+5)(x^2+5x+3)^2\,dx$.

c) Define Binomial distribution.

d) Define standard deviation.

Q5) Attempt any four of the following : **[16]**

a) If $y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$, find $\frac{dy}{dx}$.

b) Evaluate $\int \frac{1}{1+\sin x}\,dx$.

c) Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{3^n + 1}$.

d) Describe the test for goodness of fit with suitable example.

e) What is type-I and type-II error?

f) What is RAM and ROM?

Q6) Attempt any two of the following : **[16]**

a) i) Evaluate $\int \frac{x^3}{1+x} dx$.

ii) Evaluate $\lim_{x \to 5} \frac{x^3 - 125}{x^2 - 25}$.

b) i) If $y = \frac{1}{\sqrt{2x+3} - \sqrt{2x-3}}$, find $\frac{dy}{dx}$.

ii) A number of five different digits is to be formed with the help of the digits 1, 2, 3, 4, 5, 6, 8 in all possible ways. How many such numbers can be formed?

c) Draw histogram and frequency polygon to present following data

Income (Rs.)	No. of individuals
100 - 149	02
150 - 199	04
200 - 249	11
250 - 299	15
300 - 349	25
350 - 399	18
400 - 449	15
450 - 499	04

d) Arrange the given data in ascending order. Calculate mean, mode, median and standard deviation.

14, 15, 13, 12, 11, 14, 10, 13, 14, 15, 16, 12, 13, 14.

Total No. of Questions : 5] **[Total No. of Pages : 3**

P182

[3717] - 4

F.Y. B.Sc.

PHYSICS - II

Emerging Physics and Electricity and Magnetism

(Paper - II) (New Course) (11220)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

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

Q1) Attempt all of the following :

a) What is population inversion? **[2]**

b) The distance between two consecutive R peaks on the electro cardiograph is 40 mm. If the paper speed of recorder is 48 mm/sec, what is the heat rate? **[2]**

c) Give in short, the contributions of Marie Curie in physics. **[2]**

d) Define a transducer and give two examples. **[2]**

e) Explain Electric Intensity. **[2]**

f) A proton of mass 1.67×10^{-27} kg experiences a force of 3.34×10^{-15}N. Calculate the acceleration produced. **[2]**

g) Define magnetic susceptibility. **[2]**

h) Explain time constant in LR circuit. **[2]**

Q2) Attempt <u>any four</u> of the following :

a) Write a note on contributions of C.V. Raman and S.Chandrasekhar in development of physics. **[4]**

b) Explain the characteristics of a laser beam. **[4]**

c) Explain photodiode sensors. **[4]**

d) The energy difference between two laser levels is 0.117 eV. Determine the frequency and wavelength of the radiation.

[Given : $h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^{8}$ m/s] **[4]**

P.T.O.

e) A nanoparticle with drift velocity 2×10^3 m/s experiences a scattering after 2 picosecond. What will be the mean free path of that particle? **[4]**

f) The intracellular K^+ concentration of group of cell averages 160×10^{-6} moles/cm^3. The extra cellular concentration of K^+ averages 6×10^{-6} moles/cm^3. Calculate Nernst potential. **[4]**

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

a) State principle of superposition in electrostatics and obtain an expression for force on any one charge due to all other charges. **[4]**

b) Using Biot-Savart's law, obtain an expression for magnetic field produced by long straight conductor. **[4]**

c) Explain magnetization and magnetic intensity. **[4]**

d) Calculate the electric intensity and potential due to a point charge 3×10^{-8} Coulomb at a point 25 cm away from it.

[Given : $\in_0 = 8.85 \times 10^{-12}$ c^2/N - m^2] **[4]**

e) An electric dipole consisting of two opposite charges each of magnitude 2μc is separated by a distance of 3 cm. The dipole is placed in an external field of intensity 2×10^5 N/C. Calculate the maximum torque on the dipole. **[4]**

f) A solenoid of length 100 cm is wound uniformly with 12,000 turns of wire. It carries a current of 3 ampere. What is the value of magnetic field on the axis of the solenoid at the centre?

[Given : $\mu_0 = 4\pi \times 10^{-7}$ Wb/A – m]. **[4]**

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

a) Explain bottom-up approach for synthesis of nanoparticles. What are its advantages and applications? **[8]**

b) i) Describe the contributions of Einstein in physics. **[4]**

ii) The resistance of a platinum wire is 5 ohms at 0°C and 7 ohms at 100°C. Calculate the temperature coefficient of resistance (α). **[4]**

c) i) Explain Sodium and Potassium transport in a cell. **[4]**

ii) At what wavelength, the rates of spontaneous and stimulated emission are equal at 585°K?

[Given : h = 6.626×10^{-34} Js, k = 1.38×10^{-23} J/°K] **[4]**

Q5) Attempt any two of the following :

a) What is electric dipole and dipole moment? Obtain an expression for electric potential at any point due to an electric dipole. **[8]**

b) i) State Coulomb's law in electrostatics. Discuss its vector form. **[4]**

ii) The maximum value of the permeability of some metals is 0.12 T.m/A. Find the value of maximum relative permeability and susceptibility. **[4]**

c) i) What is magnetic flux? Explain Gauss's law for magnetism. **[4]**

ii) A capacitor of capacitance 0.2 μF is discharged through a resistance of 10^7 ohm. Find the time taken for half the charge on the capacitor to escape. **[4]**

Total No. of Questions : 5] **[Total No. of Pages : 3**

P183 **[3717] - 5**

F.Y. B.Sc.

CHEMISTRY - I

Physical & Inorganic Chemistry

(Theory) (Paper - I) (New Course) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

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 logarithmic table / calculator is allowed.***

Q1) Attempt the following : **[16]**

a) Calculate the hydroxyl ion concentration if POH of the solution is 2.54.

b) State and explain the units of Vander Waal's constants '*a*' and '*b*'.

c) What are the micells? Give two examples.

d) Give characteristics of enzyme catalysis.

e) State and explain second law of thermodynamics on the basis of entropy.

f) Convert 0.82 moles of NaOH in gms. (At. wt. of Na = 23, O = 16, H = 1).

g) Define "Hydrogen bond".

h) Define metallic bond and covalent bond.

Q2) a) Attempt any four of the following : **[8]**

i) Find the value of P if $\log e^{6.321} = P$.

ii) State any four rules of logarithm.

iii) Find the equation of a line that is parallel to $3y = 6x + 8$ and which passes through the point (4, 3).

iv) If the equation of line is $y = -3x - 5$. Find the slope and intercept.

v) If $y = e^{ax}$ find dy/dx.

vi) If $y = \dfrac{x}{1-x}$ find dy/dx.

vii) $\int \left(4x^3 + 7x^2 + 3\right) dx = ?$

viii) $\int_1^2 4x^3\, dx = ?$

P.T.O.

b) What is vapour pressure of liquid? Describe any one method for measurement of vapour pressure. **[4]**

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

i) The vapour pressure of water at 293 K and 313 K are 2.34 x 10^3 Nm^{-2} and 7.38 x 10^3 Nm^{-2} respectively. Calculate the heat of vapourization of water. (Given : R = 8.314 J $mole^{-1}$ K^{-1}).

ii) A heat engine operates between 0°C and 100°C. It absorbs 45.36 Kcal of heat from the source. Calculate the maximum work done by the engine. (Given 1 cal = 4.184 J).

Q3) a) Attempt any three of the following : **[12]**

i) Write a note on Ritz combination principle and explain hydrogen spectrum.

ii) Explain spontaneous and nonspontaneous process with the help of suitable examples.

iii) What is compressibility factor? Discuss the variation of it with pressure of gases.

iv) Explain the general characteristics of catalytic reaction.

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

i) Calculate the frequency and wave number associated with the radiation of wavelength 750 nm and 300 nm.

ii) Calculate the energy of the electron in the second orbit of hydrogen atom. (Given : h = 6.626 x 10^{-34} Joule.sec.me = 9.109 x 10^{-31} kg $\frac{e^2}{4\pi \in_0} = 2.307 \times 10^{-28}$ Nm^2).

Q4) a) Attempt any three of the following : **[12]**

i) What is a colloid? Distinguish between Lyophilic and lyophobic colloids.

ii) How does the concept of activation energy explain the role of catalysis?

iii) Explain various properties of gels.

iv) Explain the assumptions of Bohr's theory and give its limitations.

v) Describe Millikan's method for determination of charge on the electron.

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

i) Explain, effect of hydrogen bonding on properties of compounds.

ii) What is Hybridisation? Give its hypothetical sequence of steps involved in the formation of hybrid orbital?

Q5) a) Attempt any two of the following : **[6]**

i) Discuss the statement "No proper place can be assigned to hydrogen in the periodic table".

ii) How will you prepare

1) 300 ml 0.5N NaCl sol^{n}.

2) 700 ml 0.2M, Na_2SO_4 sol^{n}.

(At. wt. of Na = 23, Cl = 35.5, S = 32, O = 16)

iii) Define "Overlap" and explain which factor affect the extent of overlap of atomic orbital.

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

i) State the postulates of Pauling-Slater theory.

ii) Explain the bonding and shape of H_2O and H_2S molecules on the basis of VSEPR theory.

iii) When 3.19 gm of sulphur vapourised at 450^{o}C and 723 mm pressure, the vapour occupies a volume of 780 ml. What is molecular weight of sulphur vapour under these condition. If atomic weight of sulphur is 32, what is the molecular formula of sulphur vapour under these condition.

Total No. of Questions : 5] **[Total No. of Pages : 3**

P219

[3717] - 51

F.Y. B.Sc.

MATHEMATICS

Algebra

(Paper - I) (Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

1) ***Candidates are advised to see the relevent question paper and solve the same.***
2) ***All questions are compulsory.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt all the subquestions: **[16]**

a) Consider the set N x N of all ordered pairs of natural numbers. For (a, b), (c, d) in N x N define an equivalence relation.

$(a, b) \sim (c, d)$ if $ad = bc$ then find the equivalence class of (3, 5).

b) Let A = $\{a, b, c\}$, B = $\{1, 2\}$. Find a possible function f from A to B which is onto but not one

c) Let a, b, c, d be integers. If $a \mid b$ and $c \mid d$ then prove that $ac \mid bd$.

d) Find $\phi(7) + \phi(12)$, where ϕ is Euler's ϕ - function.

e) Find real and imaginary part of z, where $z = \left(\frac{2+i}{3-2i}\right)$.

f) If $z = 3\left[\cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)\right]$, then by using De-Moivre's theorem prove that $z^4 = 3^4\left[-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right]$

g) If the equation $x^3 - x^2 - 8x + 12 = 0$ has one root -3 then find the other roots.

h) If $f(x) = 2x^3 + 4x^2 + 3x + 2$ and $g(x)$ and $g(x) = 3x^4 + 2x + 4$ then find the deg $[f(x) + g(x)]$ and deg $[f(x) \quad g(x)]$.

P.T.O.

Q2) Attempt any four of the following: **[16]**

a) Let ~ be an equivalence relation on a set S. For $a, b \in S$ prove that $b \in \bar{a}$ if and only if $\bar{a} = \bar{b}$.

b) Find the greatest common divisor of the integers 847 and 203 and express it in the form $847m + 203n$ where m and n are integers.

c) If a is any odd integer, then prove that $a^2 \equiv 1 \pmod 4$.

d) Show that for $\bar{i} \in Z_n$, there exists $\bar{j} \in Z_n$ with $\bar{i}\,\bar{j} = \bar{1}$ if and only if $(i, n) = 1$.

e) Compute $\sigma^{-1}\tau\sigma$, where $\sigma = (1,4,5)(2,1)$ and $\tau = (1,3,6,2)$ in S_6.

f) Show that $(a, b) = (a, b + ax)$, for any integer x.

Q3) Attempt any two of the following: **[16]**

a) Prove that any two non-zero integers a and b have a unique positive g.c.d. $d = (a, b)$ and 'd' can be expressed in the form $d = ma + nb$ for some $m, n \in Z$.

b) Prepare the composition tables for addition and multiplication in Z_8. Also find the elements which have multiplicative inverses and evaluate $-\bar{8} + \left(\bar{7} + 1\bar{3}\right)^{-1}$ in Z_9.

c) Define congruence relation of integers modulo n. Prove that (i) If $ax \equiv bx \pmod n$ and $(x, n) = 1$ then $a \equiv b \pmod n$, where $a, b, x \in Z$, $n \in N$. (ii) If $(x, n) = d$ and $ax \equiv bx \pmod n$ then $a \equiv b \pmod w$, where $n = dw$, $n \in N$ and a, b, x, d, w are integers.

d) i) Let P(X) be the power set of X = {a, b, c}. Then show that the relation on P(X) defined by '$A \leq B$' means 'A is a subset of B' is a partial order relation. Also draw the Hasse diagram for it.

ii) Let $f : R \to R$ be defined by $f(x) = \dfrac{2x - 5}{3}$. Then show that f is bijective. Also find the formula for f^{-1}.

Q4) Attempt any four of the following: **[16]**

a) If $z_1, z_2 \neq 0$, then prove that if $|z_1 + z_2| = |z_1| + |z_2|$, then $\arg(z_2) \pm 2n\pi = \arg(z_1)$, where $n = 0, 1, 2, \ldots\ldots$

b) Solve the equation $x^3 - x^2 + x - 1 = 0$, by using De-Moivre's theorem.

c) If z_1 and z_2 are any two complex numbers, then prove that,

$$|z_1 - z_2| \geq ||z_1| - |z_2||.$$

d) If α, β, γ are the roots of the equation $x^3 - 5x^2 + 7x - 5 = 0$, then find the value of $\sum \alpha^2\beta$.

e) Find the equation of the lowest degree with rational coefficients, having $2 + \sqrt{3}$ and $-2 + \sqrt{7}$ as two of its roots.

f) If $\alpha = u + iv$ is a root of a real polynomial equation $f(x) = 0$ then show that $\bar{\alpha} = u - iv$ is also a root of $f(x) = 0$.

Q5) Attempt any two of the following: **[16]**

a) Solve the equation $x^4 - 3x^2 - 4x - 3 = 0$ by Ferrari's method.

b) Explain Cardan's method for solving a cubic equation.

c) State and prove De-Moivre's theorem.

d) i) Prove using De-Moivre's theorem that

$$\cos 4\theta = \cos^4\theta - 6\cos^2\theta \sin^2\theta + \sin^4\theta.$$

ii) If $|z| = 1$ and $\arg z = \theta$, then show that

$$\frac{1+z}{1-z} = i \cot\left(\frac{\theta}{2}\right).$$

Total No. of Questions : 5] **[Total No. of Pages : 4**

P220 **[3717] - 52**

F.Y. B.Sc.

MATHEMATICS

Calculus

(Paper - II) (Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

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

Q1) Attempt all the subquestions: **[16]**

a) Solve : $|X-2|<|x|, \quad x \quad R.$

b) Show that the series

$$\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots\ldots\ldots+\frac{1}{2^n}+\ldots\ldots \text{ is convergent.}$$

c) If the function $f : R \rightarrow R$ is defined as

$$f(x)=\frac{x^2-9}{x-3}, \quad 0 \le x < 3$$

$$= 4x-6, \quad 3 \le x \le 6$$

then discuss the continuity of the function $f(x)$ at $x = 3$.

d) Draw the graph of the function $f(x) = -x + 3$.

e) Evaluate $\lim_{x \to 0} \frac{xe^x - \log(1+x)}{x^2}$.

f) State Maclaurin's theorem with Lagrange's form of remainder.

g) Prove that the function $f(x)=|x-1|, x \quad [0,2]$ is not differentiable at $x = 1$.

h) Find the volume of the solid formed by the revolution about x - axis of the curve $y^2 = x(1 - x)$ between $x = 0$ and $x = 1$.

P.T.O.

Q2) Attempt any FOUR of the following: **[16]**

a) Prove that $|x + y| \leq |x| + |y|, \quad x, y \quad R$.

b) Show that sequence $\langle x_n \rangle$ defined by $X_1 = \sqrt{2}$, $X_{n+1} = \sqrt{2\ x_n}$, $n \quad N$ is convergent.

c) Draw the graph of the function $f(x) = \frac{1}{4}x^2 - x$.

d) Discuss the continuity of the function defined as:

$$f(x) = \frac{x^2}{a} - a, \text{ for } 0 < x < a$$

$$= a \quad , \text{ for } x = a$$

$$= a - \frac{a^3}{x^2}, \text{ for } x > a$$

e) Discuss the convergence of the series

$$\frac{1}{2} + \frac{\sqrt{2}}{5} + \frac{\sqrt{3}}{8} + \ldots\ldots\ldots\ldots$$

f) Prove that every convergent sequence is bounded.

Q3) Attempt any TWO of the following: **[16]**

a) Prove that the series

$$\sum_{n=1}^{\infty} \frac{1}{n^p} \text{ is divergent, if } p \leq 1.$$

b) Prove that the sequence $\langle X_n \rangle$ where

$$X_n = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \ldots\ldots\ldots \pm \frac{1}{n!}$$

is convergent.

c) i) State the Field axioms for the set of real numbers.

ii) Evaluate, $\lim_{x \to a} \frac{e^{1/x} - 1}{e^{1/x} + 1}$, if it exist.

d) State D' Alembert's ratio test and using it, test the convergence of the series.

$$2x + \frac{3}{8}x^2 + \frac{4}{27}x^3 + \ldots\ldots\ldots\ldots + \frac{(n+1)}{n^3}\ x^n + \ldots\ldots\ldots$$

Q4) Attempt any FOUR of the following: **[16]**

a) State and prove Cauchy's Mean value theorem.

b) Verify Rolle's theorem for the function $f(x) = \log \left[\frac{(x^2 + ab)}{(a+b)x}\right]$ on $[a, b]$.

c) Verify Lagrange's mean value theorem for the function $f(x) = 2x^2 - 7x - 10$ on [2, 5].

d) Evaluate $\lim_{x \to \frac{\pi}{2}} (\sin x)^{\tan x}$.

e) Obtain the expansion of $e^{\sin x}$ upto first four terms.

f) Find the maximum and minimum values of the function

$$f(x) = (x-3)^2\ (x+3).$$

Q5) Attempt any TWO of the following: **[16]**

a) i) State and prove Leibhitz's theorem.

ii) If $y = \frac{x+1}{x^2 - 4}$, then find y_n.

b) Find the expression for the volume of the solid of revolution obtained by revolving the region bounded by the X - axis, the curve $y = f(x)$ and the lines $x = a$, $x = b$, about the X - aixs.

c) Find the surface area of the solid generated by the revolution of the ellipse $x^2 + 4y^2 = 16$ about it's major axis.

d) i) Find the area bounded by the curve $y = 3x - x^2$, X - axis and the lines $x = 0$ and $x = 3$.

ii) Find the length of the arc of the curve $y = \log \cos x$ from $x = 0$ to $x = \frac{\pi}{4}$.

Total No. of Questions : 5] **[Total No. of Pages : 4**

P221 **[3717] - 53**

F.Y. B.Sc.

MATHEMATICS

Analytical Geomery and Differential Equations

(Paper - III) (Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

1) ***All questions are compulsory.***

2) ***Figures to the right indicate full marks.***

Q1) Attempt all the subquestions: **[16]**

a) Find the centre of the conic

$$x^2 + 12xy - 4y^2 - 6x + 4y + 9 = 0.$$

b) Find the equation of the plane making intercepts 4, 2, –3 on the co-ordinate axes.

c) Find the equation of the sphere described on the join of the points A(2, –4, 3) and B(1, 0, –2) as a diameter.

d) Find the angle through which the axes should be rotated so as to remove the xy term in the equation $4x^2 - \sqrt{3}xy + y^2 = 5$.

e) Find the order and degree of the differential equation

$$\int \sqrt{\left(\frac{dy}{dx}\right)^2 + 4}\ dx = \frac{d^3y}{dx^3} + x.$$

f) Solve $p = \log(px - y)$.

g) Find orthogonal trajectories of the family $e^x + e^{-y} = c$ where c is a parameter.

h) Find integrating factor of the differential equation

$$(2x^2y - 3y^3 + 6x^3)\,dx + (3xy^2 - 2x^3)dy = 0$$

P.T.O.

Q2) Attempt any four of the following: **[16]**

a) The direction ratios of two lines are 1, 2, –1 and 3, 1, –2. Find the direction cosines of a normal to the plane containing them.

b) If due to translation of axes, the expression $2x^2 - 3y^2 + 4y + 5$ is transformed into $2x'^2 - 3y'^2 + 4x' - 8y' + 3$ then find the co-ordinates of new origin with respect to old one.

c) Find the equation of the tangent plane to the sphere

$x^2 + y^2 + z^2 - 6x + 5y + 4z - 5 = 0$ at the point (2, –1, 3).

d) Show that the line $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$ intersects the sphere

$x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$

in atmost two points.

e) Prove that a general equation of first degree in x, y and z represents a plane.

f) Find the symmetric form of equations of the line

$x + y + z - 1 = 0$, $4x + y - 2z + 2 = 0$.

Q3) Attempt any two of the following: **[16]**

a) Prove that the general equation of second degree in x and y represents a conic.

b) i) Find the direction ratios of two lines whose direction cosines are connected by the relations $l - m + n = 0$, $l^2 + m^2 - 5n^2 = 0$.

ii) Find the equation of the plane to which the foot of the perpendicular from the origin is (3, –2, 5).

c) i) Find the co-ordinates of foot of the perpendicular from the point (1, –3, 2) to the line $\frac{x}{2} = \frac{y+1}{3} = \frac{z-2}{-1}$.

ii) Find the angle between the line $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$ and the plane $ax + by + cz + d = 0$.

d) i) Find the equation of the sphere containing the circle $x^2 + y^2 + z^2 = 9$, $2x + 3y + 4z = 5$ and passing through the point (1, 2, 3).

ii) Show that the two spheres x2 + y2 + z2 – 2x – 6y – 15 = 0 and

$$5x^2 + 5y^2 + 5z^2 - 10x + 26y + 42z + 107 = 0$$

touch each other.

Q4) Attempt any four of the following: **[16]**

a) From the differential equation by eliminating arbitrary constants from $y = e^x$ (A cos$x$ + B sin$x$).

b) Define homogeneous differential equation and explain the method of solving it.

c) Solve $\frac{dy}{dx} = \frac{x - y}{x - y + z}$.

d) Solve $(xy^2 + 2x^2y^3)dx + (x^2y - x3y^2)dy = 0$

e) Explain the method of solving the differential equation

$$p^n + p_1, p^{n-1} + p_2\, p^{n-2} + \text{- - - - } p_{n-1}\, p + p_n = 0,$$

where $p = \frac{dy}{dx}$ and $p_1, p_2, \text{- - - - } p_n$ are functions of x and y, which is solvable for x.

f) A body is heated to 110ºC and placed in air at 10ºC. After one hour its temperature was noted 60ºC. Find how much additional time will it require to cool to 30ºC.

Q5) Attempt any two of the following: **[16]**

a) Define linear differential equation and explain the method of solving it.

Hence solve $\left(1 + x^2\right)\frac{dy}{dx} + 2xy - 1 = 0$.

b) i) Solve $xp^2 - 3yp + 9x^2 = 0$.

ii) Solve $xy(p^2 + 1) + (x^2 + y^2)p = 0$

c) i) Find the orthogonal trajectories of the family of curves $x^2 + 2y^2 = c$, where c is a parameter.

ii) The population of a town increases at a rate proportional to the population at that time. If the population increases from 40 lakhs to 60 lakhs in 40 years, wheat will be the population in another 40 years?

d) i) Sole $(y^2 + 2xy + 6x)\,dx - (2 - 2xy - x^2)\,dy = 0$

ii) Solve $6y^2dx - x\,(2x^3 + y)dy = 0$.

Total No. of Questions : 5] **[Total No. of Pages : 4**

P184

[3717] - 6

F.Y. B.Sc.

CHEMISTRY - II

Organic and Inorganic Chemistry

(Paper - II) (New Course) (2008 Pattern) (Theory)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

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

Q1) Answer the following questions : **[16]**

a) Hexane is soluble in benzene while ethyl alcohol is soluble in water. Explain.

b) Give important sources of organic compounds.

c) Alcohols have higher boiling point than hydrocarbons of comparable molecular weight. Explain.

d) Define the following terms :

i) Asymmetric carbon atom.

ii) Specific rotation.

e) In benzene all C – C bond lengths are identical. Explain.

f) What is oxidation number of

i) Si in Na_2SiO_3

ii) P in $(PO_4)^{3-}$

g) Write names and symbols of group - IA elements in S block of periodic table.

h) Draw the structures of following

i) XeF_2

ii) $XeOF_4$.

Q2) a) Attempt <u>any</u> <u>two</u> of the following : **[8]**

i) What are phenols? What is the action of following reagents on phenol?

1) Dil. HNO_3

2) Br_2 / water.

P.T.O.

ii) What is inductive effect? Explain, why chloroacetic acid is stronger acid than acetic acid?

iii) What is conformational isomerism? Discuss the conformational isomerism in n-butane.

b) Attempt any two of the following : **[8]**

i) What are alcohols? Give classification of alcohols. How will you prepare ethyl alcohol from acetaldehyde?

ii) What is Friedel-craft reaction? Explain F.C. alkylation and acylation with one example each.

iii) What are alkanes? How will you prepare propane from

1) Propene

2) Grignard's reagent.

Q3) a) Answer any two of the following : **[8]**

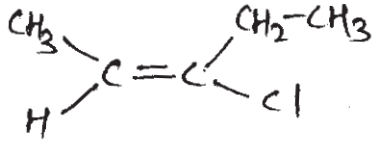
i) What are ethers? How will you prepare diethyl ether from

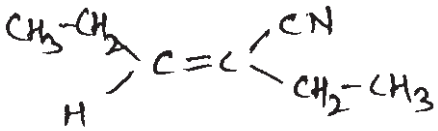
1) Ethyl bromide.

2) Ethanol.

ii) What is hybridisation? Discuss the formation of methane molecule using concept of hybridisation.

iii) Assign E and Z configuration of following compounds.

1) 

2) 

iv) What are alkynes? How will you prepare propyne from

1) 1, 2 dibromo propane.

2) Acetylene.

b) Attempt any two of the following : **[8]**

i) What is resonance effect? What are conditions necessary for resonance? Explain with suitable examples.

ii) What are alkyl halides? How are they classified? What is the action of alcoholic KOH on 2-bromopropane?

iii) Write short note on

1) Ozonolysis.

2) Markovnikoff rule.

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

i) Draw the structures for the following compounds.

1) 2 - jodo - 3 - methylbutane.

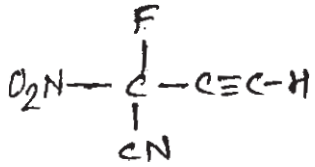
2) 2, 2, 3, 3 - tetramethyl pentane.

ii) Define the following :

1) Bond angle.

2) Steric effect.

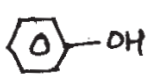
iii) Assign R or S configuration of following compound.



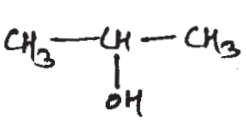
iv) Draw all possible isomers of the compound having molecular formula C_3H_6O.

b) Identify the products A and B and rewrite the reactions. (Any two) **[4]**

i) $CH_3-CH=CH_2 \xrightarrow[THF]{B_2H_6} A \xrightarrow[NaOH]{H_2O_2} B.$

ii)  $\xrightarrow{NaOH} A \xrightarrow{CH_3I} B.$

iii) $CH_3-CH_2-Br \xrightarrow[Ether]{Mg} A \xrightarrow{H_2O} B.$

iv)  $\xrightarrow[KOH]{Alc.} A \xrightarrow{HBr} B.$

c) Attempt any one of the following : **[6]**

i) What is long form of the periodic table and what are types of elements according to their number of electrons in the outermost shell?

ii) Draw the structures of 12-crown-4 and 15-crown-5. Explain their use in the separation of alkalimetals.

Q5) a) Attempt any two of the following : **[6]**

i) Calculate the screening constant and hence Z* for the valance electron of Nitrogen Z = 7.

ii) Define the following terms with suitable example.

1) Reduction.

2) Reducing agent.

3) Oxidation number.

iii) What are the noble gases? Write their electronic configuration.

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

i) Discuss the bonding and shape of

1) XeF_4.

2) $[XeO_6]^{-4}$.

ii) Define periodicity. Discuss the periodicity in the properties related to

1) Size of atoms and ions.

2) Ionisation energy.

iii) What are the applications of alkalimetals and their compounds?

Total No. of Questions : 5] **[Total No. of Pages : 5**

P233 [3717] - 65

F.Y. B.Sc.

STATISTICS / STATISTICAL TECHNIQUES

Discrete Probability & Probability Distributions

(Old Course) (Paper - II)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates :

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

Q1) Attempt the following: **[8 x 2 = 16]**

a) Write down the sample space for the following random experiments.

i) Counting of number of defective bulbs in a sample of 10 bulbs.

ii) A student appears for an examination till he passes.

b) What is probability of getting at least one head when two fair coins are tossed.

c) Explain : Discrete random variable.

d) Prove that variance of a constant is zero.

e) State axioms of probability.

f) Let A and B be two independent events, such that P(A) = $\frac{1}{4}$, P(B) = $\frac{1}{3}$, find $P(A \cup B)$.

g) Determine K, such that the following function is probability mass function (P.m.f.) of r.v.X.

$$P(X = x) = \frac{Kx}{5}, \quad x = 1, 2, 3, 4, 5$$

$$= 0, \text{ otherwise.}$$

h) Define Bernoulli distribution with parameter P, state mean of Bernoulli distribution.

P.T.O.

Q2) Attempt any four of the following: **[4 x 4 = 16]**

a) Explain the following terms with one illustration each:

i) Union of two events.

ii) Intersection of two events.

iii) Mutually exclusive events.

b) If A and B are any two events defined on a sample space Ω, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

c) For the following probability distribution of r.v.x.

X	-2	-1	0	1	2	3	4
P(X = *x*)	0.10	0.10	0.10	0.20	0.30	0.15	0.05

Find :

i) P (1 x 1 < 2)

ii) $P(x \geq 3 / x > 0)$

iii) Mode of *x*.

d) Define:

i) Pairwise independence of three events.

ii) Mutual independence of three events.

e) Given $P(A \quad B) = \frac{5}{6}, P(A \cap B) = \frac{2}{6}$ and $P(A) = \frac{1}{2}$

Find

i) P(B) ii) $P(A \cap B')$

iii) $P(A' \quad B')$ iv) $P(A' \cap B')$.

f) A random variable X has discrete uniform distribution with parameter *n*. Find mean and variance of X.

Q3) Attempt any four of the following: **[4 x 4 = 16]**

a) Let X be a discrete random variable with p.m.f.

$$P(X = x) = \frac{x}{15}; \; x = 1, 2, 3, 4, 5.$$

$$= 0, \text{ otherwise}$$

Find V(*x*).

b) Let X $\rightarrow$ H (N, M, *n*); find E(X).

c) If X and Y are two discrete random variables, prove that

E(X + Y) = E(X) + E(Y).

d) Obtain recurrence relation for Binomial probabilities.

e) For the following joint probability distribution:

X \ Y	1	2	3	4
1	$\frac{1}{9}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{9}$
2	$\frac{2}{9}$	0	$\frac{1}{9}$	$\frac{1}{9}$
3	0	0	$\frac{1}{9}$	$\frac{4}{27}$

Find i) Marginal distribution of X and Y.

ii) Conditional distribution on of X/Y = 3.

f) For a bivariate discrete r.v. (x, Y):

V(X) = 9, V(Y) = 4 and Cov (X, Y) = 4.

Find i) V(2X + 3Y)

ii) V(4X – 3Y).

Q4) Attempt any <u>two</u> of the following: **[2 x 8 = 16]**

a) Define partition of a sample space. State and prove Baye's theorem.

b) Define conditional probability P(A/B).

Show that:

i) $P\left(\frac{A'}{B}\right) = 1 - P\left(\frac{A}{B}\right)$.

ii) $P(A/A \quad B) = \frac{P(A)}{P(A) + P(B)}$ if A and B are mutually exclusive events.

c) Suppose A, B and C be three events defined on Ω, such that

$$P(A) = P(B) = P(C) = \frac{1}{4}$$

$$P(A \cap B) = P(B \cap C) = 0, P(A \cap C) = \frac{1}{6}$$

Calculate

i) $P(A \quad B \quad C)$.

ii) $P(A \quad B)$

iii) $P(A' \cap B' \cap C')$

iv) $P(A \cap C')$

d) A fair coin is tossed three times. If X and Y denote the number of heads and number of runs respectively.

i) Obtain joint probability distribution of (X, Y).

ii) Obtain $E(X/Y = 1)$.

Q5) Attempt any <u>two</u> of the following: **[2 x 8 = 16]**

a) Define the following terms with one illustration each:

i) Discrete sample space.

ii) An event.

iii) Complement of an event.

iv) Impossible event.

b) The joint probability distribution of (X, Y) is given below:

X \ Y	0	1
–1	1/8	1/8
0	1/8	2/8
1	2/8	1/8

Find correlation coefficient between X and Y.

c) The probability distribution of a discrete r.v.X is given below:

X	–2	–1	1	2
P(X)	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$

Find i) first three raw moments.

ii) first three central moments also comment on the nature of skewness.

d) i) State and prove additive property of Binomial distribution. **[5]**

ii) A box contains 4 red and 6 blue balls. 2 balls are chosen at random from the box without replacement. Find the probability that: **[3]**

1) No red ball is chosen.

2) Exactly 2 red balls are chosen.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P185

[3717] - 7

F.Y. B.Sc.

BOTANY

Plant Diversity

(Paper - I) (New Course) (41410)

Time : 3 Hours] ***[Max. Marks : 80***

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 : **[16]**

a) What are annuals?
b) What is anisogamy?
c) Give any two characteristics of fungi.
d) Mention the types of rhizoids in Bryophytes.
e) What is heterospory?
f) What is manoxylic wood?
g) Give any two characteristics of Angiosperms.
h) What is conservation?

Q2) Attempt any four of the following : **[16]**

a) Explain five Kingdom system of classification.
b) Comment on occurrence of Algae.
c) Write about nutrition in Fungi.
d) Describe the structure of antheridium in Bryophytes.
e) Explain organisation of plant body in Angiosperms.
f) Describe any one male cone in Gymnosperms studied by you.

Q3) Write short notes on any four of the following : **[16]**

a) Eukaryotic cell in Algae.
b) Foliose lichen.
c) Life cycle pattern in pteridophyte.
d) Leaves in Gymnosperms.
e) Habitat diversity in Angiosperms.
f) Importance of conservation of plant diversity.

P.T.O.

Q4) Attempt any two of the following : **[16]**

a) Describe asexual reproduction in Algae.

b) Describe vegetative reproduction in fungi.

c) What is stele? Describe any three types of protostele in pteridophytes.

d) What is ex-situ conservation? Describe any two methods of ex-situ conservation of plant diversity.

Q5) Describe life cycle patterns in cystopus and Agaricus. **[16]**

OR

Sketch, label and describe internal structure of dicot leaf and stem.

Total No. of Questions : 5] **[Total No. of Pages : 3**

P224

[3717] - 56
F.Y. B.Sc.
CHEMISTRY - I
Physical and Inorganic Chemistry
(Paper - I) (2004 Old Course) (Theory)

Time : 3 Hours] ***[Max. Marks :80***

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 logarithmic table/calculator is allowed.***

Q1) Attempt the following: **[16]**

a) Explain the terms.

i) Open system ii) Entropy.

b) List the different parts of computer.

c) State and explain Pauli's exclusion principle.

d) Calculate the pH of 1.2×10^{-3} M HCl solution.

e) Explain the terms.

i) Catalytic poisons. ii) Auto catalysis.

f) Define the following terms with suitable examples.

i) Oxidising agent. ii) Reducing agent.

g) Convert the following quantities into moles.

i) 18 gms of CH_4. ii) 90 gms of $C_6H_{12}O_6$.

h) Define: i) Covalent bond ii) Co-ordinate bond.

Q2) a) Attempt any four of the following: **[8]**

i) State any four rules of logarithm.

ii) Find the value of x if $10^x = 33.48$.

iii) Find the equation of line that passes through the point $(-3, -2)$ and has slope 2.

P.T.O.

iv) What is the slope and intercept if the equation of line is $5x + \frac{7}{2}y - 11 = 0$.

v) If $y = x^3 - 5x + 3$ Find $\frac{dy}{dx}$.

vi) If $y = a^{x^2}$. Find $\frac{dy}{dx}$.

vii) $\int(2x^2 + 12x^3 + 15)\, dx = ?$

viii) $\int_2^4 x^2\, dx = ?$

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

i) Floppy disk ii) Magnetic tape.

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

i) Calculate the RMS velocity of oxygen gas molecules at 37ºC.
(Given : Atomic wt. O = 16, R = 8.314×10^7 erg $mole^{-1}$ k^{-1}).

ii) Calculate the wave number and frequency of radiation with wave length. 1) 250 nm 2) 470 nm.

Q3) a) Attempt any three of the following: **[12]**

i) State and explain the different assumptions of kinetic gas theory.

ii) Describe homogeneous and heterogeneous catalysis giving one example each.

iii) State and explain first law of thermodynamics. Write its mathematical expression.

iv) Explain the set of four quantum numbers.

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

i) Three moles of an ideal gas expands reversibly at constant temperature of 10ºC from 2.2×10^5 Nm^{-2} to 2.2×10^4 Nm^{-2}.Calculate maximum work done during the change. (Given R = 8.314 Joules $mole^{-1}$ k^{-1})

ii) Calculate the velocity of the electron in the first orbit of hydrogen atom. (Given : h = 6.62×10^{-27} erg.sec, e = 4.80×10^{-10} esu).

Q4) a) Attempt any three of the following: **[12]**

i) Explain the lock and key model of enzyme catalysis.

ii) Define:

1) Surface tension

2) Coefficient of viscosity, mention their units.

iii) Explain the causes for deviation of real gases from ideal behaviour.

iv) Describe the Rutherford's atomic model with the help of α - ray scattering experiment.

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

i) Balance the following reaction by Ion-electron method.

$$Cr_2O_7^{2-} + H^+ + Fe^{2+} \rightarrow Cr^{3+} + Fe^{3+}$$

ii) Explain the bonding and shape of PCl_5.

Q5) a) Attempt any two of the following: **[6]**

i) What volume of carbon dioxide gas will be evolved at NTP by heating 7.3 gms of $Mg(HCO_3)_2$? (Given : Mol.wt. of $Mg(HCO_3)_2$ = 146).

ii) Explain the formation of O_2 molecule on the basis of valence bond theory.

iii) Explain "volcanoes are a major sources of atmospheric pollutants."

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

i) How Oxygen plays an important role in the troposphere and Ozone in stratosphere?

ii) What is hybridization? Explain formation of CH_4 molecule.

iii) State postulates of VSEPR thoery.

❄❄❄

Total No. of Questions : 5] **[Total No. of Pages : 4**

P225

[3717] - 57
F.Y.B.Sc.
CHEMISTRY - II
Organic and Inorganic Chemistry
(Theory) (Paper - II) (Old Course) (2004 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

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

Q1) Answer the following: **[16]**

a) Alkanes are water insoluble but alcohols are water soluble. Explain.

b) What is dehydrogenation? Explain with suitable example.

c) Draw structures of cis and trans isomers of 2-butene.

d) Explain plane of symmetry with suitable examples.

e) What is Friedel - Craft acylation? Give one example.

f) Give disadvantages of hard water.

g) Write electronic configuration of elements having atomic number 11 and 28.

h) Draw the structures of XeF_4 and XeF_6.

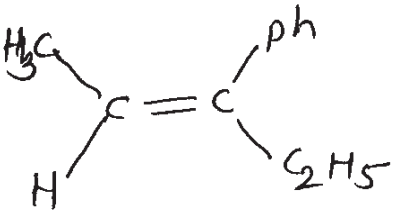
Q2) a) Answer any <u>two</u> of the following: **[8]**

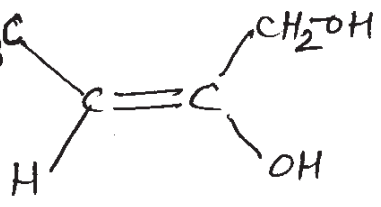
i) What are conformations? Discuss the conformational isomerism in ethane using energy profile diagram.

ii) What is hybridisation? Explain the formation of ethane using concept of hybridisation.

iii) What are alkanes? Discuss any two methods of preparation of alkanes.

iv) Assign E and Z configuration of the following.

1. 

2. 

P.T.O.

b) Attempt any two of the following: **[8]**

i) What are alcohols? Give their classification. How is ethyl alcohol prepared from ethyl chloride.

ii) State and explain Saytzeff rule with suitable examples.

iii) What is electrophilic substitution reaction? Explain the following reactions of benzene.

1) Halogenation 2) Sulphonation.

Q3) a) Answer any two of the following: **[8]**

i) What are aromatic compounds? Discuss Huckel's rule of aromaticity with suitable examples.

ii) What is Grignard reagent? How will you prepare primary, secondary and tertiary alcohols using Grignard reagent?

iii) Give any two methods of preparation of ethyl bromide. What is the action of following reagents on ethyl bromide?

1) Sodium metal 2) Alc. KoH.

b) Attempt any two of the following: **[8]**

i) What is resonance effect? Draw resonating structures of

1) Aniline 2) Nitrobenzene.

ii) Define the following terms.

1) Dihedral angle. 2) Chiral centre.

3) Centre of symmetry. 4) Enantiomers.

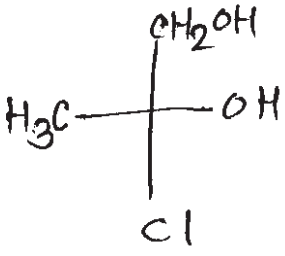
iii) Give applications of organic compounds in our daily life.

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

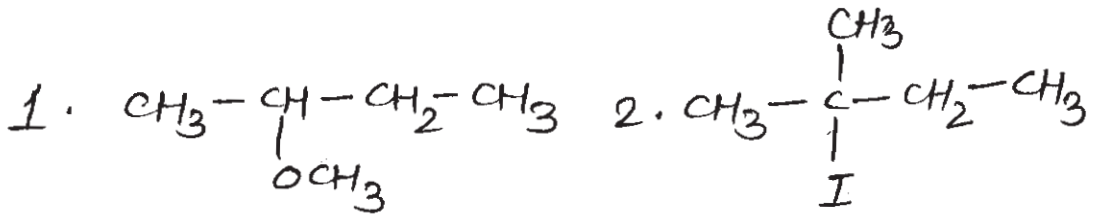
i) Explain the following terms with suitable examples.

1) Electrophiles 2) Nucleophiles.

ii) Assign R or S configuration of the following compound.



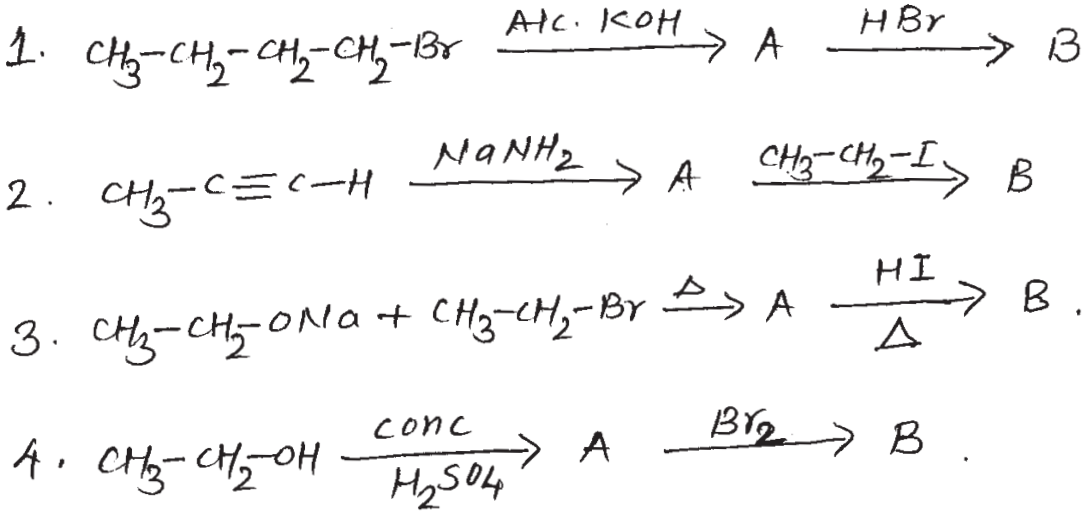
iii) Give IUPAC names of the following compounds.



iv) Write short note on "Homologous Series".

v) Trans isomer is more stable than cis isomer. Explain.

b) Identify products A and B and rewrite the reactions (Any two) **[4]**



c) Attempt any <u>one</u> of the following: **[6]**

i) What is heavy water? Explain preparation and applications of heavy water.

ii) The First element in a group behaves abnormally in certain respects and resembles an element diagonally related to it. Explain the above statement, taking beryllium as an example.

Q5) a) Attempt any <u>two</u> of the following: **[6]**

i) Calculate screening constant 'S' and hence Z_{eff} for valence electron of helium.

ii) Explain the trends in Ionisation energy across the period and group of the periodic table.

iii) Give the names and write electronic configuration of alkali metals.

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

i) Explain the structure and bonding of XeO_2F_2.

ii) Draw the skeleton of periodic table. Give location of following in it.

1) IV A 2) Li

3) O 4) III B

iii) What are alkali metals? Explain the trends in following properties of alkali metals.

1) Size of atom and ion.

2) Oxidation state.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P228

[3717] - 60
F.Y. B.Sc.
ZOOLOGY
Animal Systematics and Diversity - I and Medical Zoology
(11510) (Theory) (Paper - I) (Old Course) (2004 Pattern)

Time : 3 Hours] ***[Max. Marks :80***

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) Define / Explain the following. (Any Eight) **[16]**

a) Genus.

b) Binomial Nomenclature.

c) Cyclosis.

d) Osmoregulation.

e) Cocoon.

f) Medical Zoology.

g) Endoparasites.

h) Antibody.

i) Host Specificity.

j) Forensic entomology.

Q2) Write notes on Any Four of the following. **[16]**

a) Economic importance of Earthworm.

b) Functions of coelomic fluid in Earthworm.

c) Ultrastructure of cilium.

d) Mechanical vector.

e) Intermediate host.

f) Humoral immunity.

P.T.O.

Q3) Attempt Any Four of the following. **[16]**

a) Give diagnostic features of Animalia.

b) Describe the binary fission in Paramoecium.

c) Sketch and label T.S. of body wall of Earthworm.

d) Give different modes of transmission of cholera.

e) Give the pathogenicity of Mycobacterium tuberculae.

f) Comment on prophylaxis of syphilis.

Q4) Attempt Any Two of the following. **[16]**

a) Describe the animal diversity of any four marine coelenterates with reference to habit and habitat.

b) Describe structure of septal nephridium of Earthworm with the help of neat labelled diagram.

c) Give an account of causative agent, spread of infection and pathogenesis of typhoid.

d) Give the signs and symptoms of Malaria. Add a note on control measures.

Q5) Describe the digestive system of Earthworm. Add a note on food, feeding and physiology of digestion. **[16]**

OR

Describe the external morphology, life cycle, pathogenicity and control measures of Head louse.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P229

[3717] - 61
F.Y. B.Sc.
ZOOLOGY
Genetics, Animal Systematics & Diversity - II
(11520) (Theory) (Paper - II) (2004 Old Course)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

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

Q1) Define / Explain the following. (Any Eight): **[16]**

a) Genotype.

b) Chromonemata.

c) Lethal genes.

d) Muton.

e) Hypertrichosis.

f) Gnathostomata.

g) Hibernation.

h) Camouflage.

i) Ultrafiltration.

j) Oviparous.

Q2) Write short notes on any FOUR of the following. **[16]**

a) Cytoplasmic inheritance in Paramecium.

b) Klinefelter's syndrome.

c) Albinism.

d) General characters of Reptilia.

e) Functions of skin in frog.

f) Reflex action in frog.

P.T.O.

Q3) Attempt any FOUR of the following. **[16]**

a) Explain complementary factors (9 : 7) with a suitable example.

b) A man with blood group 'AB' marries a woman having blood group 'AB'. Give the possible genotypes and blood groups of their children.

c) What types of blood groups are possible in the offsprings of the following crosses with reference to ABO blood group system in man.

i) $I^A I^A \times I^B I^B$ ii) $I^A I^O \times I^A I^O$.

iii) $I^O I^O \times I^A I^B$ iv) $I^A I^O \times I^B I^O$.

d) Describe pulmonary respiration in frog.

e) Sketch and label dorsal view of brain of frog.

f) Sketch and label internal structure of heart of frog.

Q4) Attempt any TWO of the following. **[16]**

a) What is engenics? Explain any six factors contributing to positive engenics.

b) Explain with suitable examples, XX - Xo and ZZ - ZW methods of sex-determination.

c) Describe the female reproductive system of frog.

d) Describe with any four examples, the diversity in cartilagenous fishes with reference to habits and habitat.

Q5) What is chromosomal aberration? Explain any three structural changes in chromosomes with suitable examples. **[16]**

OR

Describe digestive system of frog with a neat labelled diagram. Add a note on physiology of digestion.

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Total No. of Questions : 5] **[Total No. of Pages : 4**

P233

[3717] - 65

F.Y.B.Sc.

STATISTICS / STATISTICAL TECHNIQUES

Discrete Probability and Probability Distributions

(Paper - II) (Old Course)

Time : 3 Hours] ***[Max. Marks :80***

Instructions to the candidates:

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

Q1) Attempt the following: **[8 × 2 = 16]**

a) Write down the sample spaces for the following random experiments:

i) Counting of number of defective bulbs in a sample of 10 bulbs.

ii) A student appears for an examination till he passes.

b) What is probability of getting at least one head when two fair coins are tossed..

c) Explain: Discrete random variable

d) Prove that variance of a constant is Zero.

e State axioms of probability.

f) Let A and B be two independent events such that P(A) = $\frac{1}{4}$, P(B) = $\frac{1}{3}$, find P(A$\cup$B)

g) Determine k, such that the following function is probability mass function (p.m.f.) of r.v.x.

$$p(X = x) = \frac{kx}{5}, \quad x = 1,2,3,4,5$$
$$= 0, \qquad otherwise$$

h) Define Bernoulli distribution with parameter p,state mean of Bernoulli distribution.

P.T.O.

Q2) Attempt any <u>four</u> of the following: **[4 × 4 = 16]**

a) Explain the following terms with one illustration each.

i) Union of two events.

ii) Mutually exclusive events.

b) If A and B are any two events defined on a sample space W, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

c) For the following probability distribution of r.v.x.

X	–2	–1	0	1	2	3	4
P(X=*x*)	0.10	0.10	0.10	0.20	0.30	0.15	0.05

Find:

i) $P(1 \times 1 < 2)$ ii) $P(x \geq 3 / x > 0)$

iii) Mode of x.

d) Define:

i) Pariwise independence of three events.

ii) Mutual independence of three events.

e) Given P(AÇB) = , P(AÈB) = and P(A) = find

f) Define the following terms:

i) Bivariate discrete random variable,

ii) Conditional probability distribution of $Y/X = x$.

Q3) Attempt any <u>four</u> of the following: **[4 × 4 = 16]**

a) Let A, B and C be three events defined on the sample space Ω such that, A and B are mutually exclusive; A and C are independent, B and C are independent. If $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$, $P(C) = \frac{1}{6}$ then find

(i) $P(A \cup B \cup C)$ (ii) $P(A \cap B \cap C)$.

b) Give the following distribution function of a random variable X:

X	-3	-2	-1	0	1	2	3
F(*x*)	0.05	0.15	0.38	0.57	0.72	0.88	1.0

Obtain i) Probability Distribution of X

ii) $P(|x| \geq 1)$.

c) Show that variance is invariant to the change of origin but not to scale.

d) There are 4 boys and 2 girls in Room No.1 and 5 boys and 3 girls in

Room No. 2. A girl from one of the two rooms laughed loudly. What is the probability that the girl who laughed loudly was from Room No. 1.

e) The joint probability distribution of a bivariate discrete random variable (X,Y) is as given below:

X \ Y	-1	0	1
0	0.1	0.1	0.1
2	0.1	0.2	0.1
4	0.1	0.1	0.1

i) Are X and Y independent?

ii) Find $P(X \leq Y)$.

f) If X and Y are two independent discrete uniform random variables with parameter (n), then obtain the probability distribution of X+Y.

Q4) Attempt any <u>two</u> of the following. **[2 × 8 = 16]**

a) i) Distinguish between deterministic and non-deterministic experiments. Give two illustrations of each.

ii) State and prove the addition theorem of probability of two events.

b) i) A card is drawn at random from a well shuffled pack of playing cards. Let A_1,A_2 and A_3 be the events as below:

A_1 : the card is an ace,

A_2 : the card is a spade,

A_3 : the card is a club.

Verify whether A_1,A_2&A_3 are pairwise independent?

ii) A discrete random variable X assumes *n* values 1,2,3,.....*n* with equal probability. If V(X) = E(X) then find the value of *n*.

c) Joint p.m.f. of (X,Y) is

$$P(x,y) = \frac{xy}{36}; \; x = 1,2,3.$$
$$y = 1,2,3.$$
$$= 0 \quad ; \text{otherwise.}$$

Obtain (i) P(X+Y > 5), (ii) Conditional probability distribution of Y given X = 2.

d) i) Define Bernoulli distribution with parameter p and find its mean and variance.

ii) State and prove additive property of Binomial distribution.

Q5) Attempt any Two of the following: **[2 × 8 = 16]**

a) i) Define Hypergeometric distribution.

ii) A box contains 6 blue and 3 red balls. 3 balls are chosen at random from the box without replacement. Find the probability distribution of number of red balls in the sample.

b) i) If $X \rightarrow B(n = 6, p)$ with $P(X = 2) = P(X = 4)$ then find the value of p.

ii) For a two - dimensional discrete random variables (X,Y), if X and Y are independent then prove that $E(XY) = E(X) \cdot E(Y)$.

c) Following is the joint probability distribution of (X,Y)

X \ Y	-1	0	1
0	0.1	0.1	0.2
2	0.1	0.05	0.1
4	0.15	0.15	0.05

Find Cov (X,Y), Cov(5+3X, 5-2Y).

d) i) If V(X) = V(Y) then prove that U = X+Y and V = X-Y are uncorrelated.

ii) Define the following terms:

Partition of a sample space,

Equiprobable sample space.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P234

[3717] - 66
F.Y. B.Sc.
GEOGRAPHY - I
Gg. 110: Morphology and Landscape
(Paper - I) (Old Course)

Time :3 Hours] ***[Max. Marks :80***

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat diagrams and sketches wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in two to four sentences.

a) Define physical Geography.

b) What is sial?

c) What is symmetrical folds?

d) What is mean by geosyncline?

e) What is rift valley?

f) What is mean by erosion?

g) What is biological Weathering?

h) List the first order landforms.

Q2) Explain the following in brief (Any Four)

a) Volcano.

b) Folded mountain.

c) Barchan.

d) Sea cliff.

e) Formation of metamorphic rocks.

f) Drumlins.

P.T.O

Q3) Answer the following (Any Four)

a) Characteristic of Igneous rock.

b) U shaped valley.

c) Action of sea waves.

d) Artesian well.

e) Nife.

f) Effects of earthquake.

Q4) Attempt the following (Any Two)

a) Nature of physical Geography.

b) Mechanical weathering.

c) Explain evidences of 'Wegeners Continental Drift Theory:

d) Explain erosional work of wind and associated landforms.

Q5) Describe the erosional work of river and its associated landforms with neat diagrams.

OR

Explain "Plate Tectonic Theory" in detail.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P235

[3717] - 67
F.Y. B.Sc.
GEOGRAPHY - II
Gg - 120: Climatology and Oceanography
(Paper - II) (Old Course)

Time :3 Hours] ***[Max. Marks :80***

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat diagrams and sketches wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in two to four sentences:

a) Define Insolation.

b) Define Humidity.

c) What is mean by dust particles?

d) Define Isosaline.

e) What is an Island?

f) What is mean by wavelength?

g) What is mean by emergence of coasts?

h) What is mean by oceanic deeps?

Q2) Explain the following in brief (Any Four):

a) Troposphere.

b) Polar winds.

c) Cyclones.

d) Continental shelf.

e) Ria coasts.

f) Causes of tides.

P.T.O.

Q3) Answer the following in brief (Any Four)

a) Scope of climatology.

b) Land and Sea breezes.

c) Tropical Air-mass

d) Importance of oceanography.

e) Compound waves.

f) Salinity of dead sea.

Q4) Attempt the following (Any Two):

a) Explain the nature of climatology.

b) Explain the trade winds and its characteristics.

c) Explain the scope of oceanography.

d) Explain the causes of ocean currents.

Q5) Explain the distribution of pressure belts on the earth's surface.

OR

What is mean by salinity? Explain the factors affecting the distribution of salinity.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P236

[3717] - 68
F.Y. B.Sc.
MICROBIOLOGY
Introduction to Microbiology
(Paper - I) (Old Course)

Time :3 Hours] ***[Max. Marks :80***

Instructions to the candidates:-

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

Q1) Attempt the following: **[16]**

a) Match the following:

	'A'		'B'
i)	Na	A)	Anion
ii)	$C_6H_{12}O_6$	B)	Atom
iii)	Cl^-	C)	Cation
iv)	H^+	D)	Molecule

b) Who published microscopic observations in book called " Micrographia"?

c) The vaccine against rabies was developed by ————————.

d) Write the composition of phospholipids.

e) The building blocks of proteins are ————————.

f) Define peritrichous flagella.

g) Define microbial leaching of metals.

h) State true / false - Polio virus contains ssDNA.

Q2) Attempt any four of the following: **[16]**

a) Enlist different classes of algae with examples.

b) Draw the structure of typical fermenter.

c) Explain ionic bond formation with example.

d) Define acids and bases with examples.

e) Define viruses. Write their distinguishing characters.

f) What is genetic engineering? Enlist the steps involved.

P.T.O

Q3) Attempt any four of the following: **[16]**

a) Draw the structure of prokaryotic cell.

b) Diagramatically elaborate the life cycleof Saccharomyces.

c) Write the functions of cytoplasmic membrane in bacteria.

d) Explain the beneficial role of microorganisms in agriculture.

e) How do algae differs from other microorganisms.

f) Explain the beneficial role of microorganisms in dairy industry.

Q4) Attempt any two of the following: **[16]**

a) Describe the general characters and life cycle of Plasmodium.

b) Describe Koch's and River's Postulates.

c) What is medical microbiology? Explain the methods of treatment & prevention of diseases.

d) Describe various classes and functions of carbohydrates.

Q5) Describe the various experiments performed to disprove the theory of spontaneous generation. **[16]**

OR

Describe the major structures present in bacterial cell cytoplasm.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P237

[3717] - 69
F.Y. B.Sc.
MICROBIOLOGY
Basic Techniques in Microbiology
(Paper - II) (Old Course)

Time :3 Hours] ***[Max. Marks :80***

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: **[16]**

a) Define mordants with suitable example.

b) ———— maintains the isotonicity in nutrient agar.

i) Peptone ii) Yeast extract

iii) Sodium chloride iv) Water.

c) Define zoonotic infection.

d) Enlist the stains used for endospore staining by Schaffer & Fulton's method.

e) Enlist any two gases used for disinfection.

f) Define opportunistic pathogens.

g) State true or false.

i) Ionizing radiations have more penetration power than nonionizing radiations.

ii) Use of moist heat is more beneficial than dry heat in sterilization process.

h) ———— enzyme is present in saliva.

Q2) Attempt any four of the following: **[16]**

a) Enlist various safety precautions to be taken in microbiological laboratory.

b) Enlist various media used for cultivation of fungi. Describe any one in detail.

c) Explain the role of rumen microflora in symbiotic association.

d) With suitable example give nutritional classification of bacteria based on 'C' & 'E' source.

e) Describe the role of various secretions in defense mechanism.

f) Give the formula to calculate phenol coefficient. How will you comment on value of phenol coefficient?

P.T.O

Q3) Attempt any four of the following: **[16]**

a) How will you cultivate alkalophiles in laboratory? Give any two examples of alkalophilic organisms.

b) Describe the mode of action of chlorine as a disinfectant.

c) Describe mycorrhiza as symbiotic association.

d) Enlist various methods for isolation of bacteria. Describe any one in detail.

e) Describe the principle of differential staining with suitable example.

f) Define normal flora. Describe beneficial aspects of normal flora.

Q4) Attempt any two of the following: **[16]**

a) Give source, chemical nature & function of yeast extract & peptone. in bacteriological media.

b) What are aberrations in objectives? Explain chromatic aberrations in detail.

c) Explain the principle & observation for demonstration of capsule by Maneval's method.

d) Describe the role of biological vectors in transmission of diseases.

Q5) Attempt any one of the following: **[16]**

a) Define disinfection. Explain the use of formaldehyde & halogens in disinfection procedure.

b) With the help of ray diagram, explain the principle & working of dark field. Microscope.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P186

[3717]-8
F.Y. B.Sc.
BOTANY
Plant Resources-Management and Utilization
(Paper-II) (New Course) (41420)

Time : 3 Hours] ***[Max. Marks : 80***

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: **[16]**

a) Define biological resource.

b) Enlist types of nurseries.

c) Name any two crop plants grown in green house.

d) Mention any two advantages of fruit packing.

e) Write two examples of weeds.

f) Enlist types of social flower arrangement.

g) What is biocontrol?

h) Enlist two examples of plants used in herbal cosmetics.

Q2) Answer <u>any four</u> of the following: **[16]**

a) Describe any four methods of seed treatment.

b) Write advantages of green house cultivation.

c) Describe harvest technology applied for vegetables.

d) Explain need of weed management.

e) Write principles of flower arrangement.

f) Describe advantages of biocontrol.

P.T.O.

Q3) Write short notes on <u>any four</u> of the following : **[16]**

a) Methods of irrigation used in nursery.

b) Site selection for green house.

c) Artificial ripening.

d) Invasive weeds.

e) Plant material used in flower arrangement.

f) Pyrethrins.

Q4) Answer <u>any two</u> of the following : **[16]**

a) What is bioenergy? Explain sources of bioenergy with examples.

b) Describe biochemical resources obtained from fungi.

c) Describe timber and fuel as major forest products.

d) Describe any four methods of extraction of herbal preparations.

Q5) Define grafting. Draw and describe types of grafting. **[16]**

OR

Explain the concept of phytoremediation and add a note on its applications.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P187

[3717] - 9
F.Y. B.Sc.
ZOOLOGY
Non - Chordates and Chordates
(Theory) (2008 Pattern) (New Course) (Paper-I)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the Candidates:

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

SECTION - I

Non-Chordates

Q1) Define / Explain (Any ten) : **[10]**

a) Entomology.
b) Genus.
c) Cyclosis.
d) Spicules.
e) Radial Symmetry.
f) Regeneration.
g) Vermiculture.
h) Mimicry.
i) Foodvacuole.
j) Systematics.
k) Monera.
l) Osmoregulation.

Q2) Write short notes on (Any three) : **[15]**

a) Diagnostic features of plantae.
b) Pearl formation in Mollusca.
c) Leuconoid type of canal system in sponges.

P.T.O

d) Biotechnology.

e) Binary fission in Paramoecium.

Q3) Attempt the following : **[15]**

a) Mention the general characters of Arthropoda.

b) Economic importance of Helminthes.

c) Give general characters of class Hydrozoa.

OR

Mention the distinguishing characters and classification of phylum Annelida. Give suitable examples and characters of each class.

SECTION - II

Chordates

Q4) Define/Explain (Any ten) : **[10]**

a) Hemichordata.

b) Anadromous migration.

c) Divergent evolution.

d) Monotremes.

e) Vocal sac.

f) Aestivation.

g) Acrodont teeth.

h) Pace maker.

i) Acraniata.

j) Urodela.

k) Agranulocytes.

l) Brow spot.

Q5) Write short notes on (Any three) **[15]**

a) Terrestrial adaptations of reptiles.

b) Habits and habitat of Myxine.

c) Diversity of placental mammals in aquatic habitat.

d) Marsupial mammals.

e) Sexual dimorphism in frog.

Q6) Attempt the following. **[15]**

a) Sketch and label female reproductive system of frog.

b) Explain general organization of fishes.

c) Give general characters of cephalochordata.

OR

Describe the central nervous system of frog.

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Total No. of Questions :5] **[Total No. of Pages : 2**

P189

[3717]-11
F.Y. B.Sc.
GEOLOGY -I
Mineralogy and Petrology
(Paper-I) (Revised Course)(2008 Pattern)

Time :3Hours] ***[Max. Marks : 80***

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 questions: **[16]**

a) What is 'Hardness'?

b) What is Sublimation?

c) Define the term Isomorphism.

d) What is rock?

e) What is Phyllosilicate structure.

f) What are dykes?

g) State the branches of mineralogy.

h) What is Isotropism?

Q2) Answer the following questions (any four) **[16]**

a) Explain the Ionic bonding in minerals with suitable examples.

b) Explain the process of crystallization of magma in the formation of minerals.

c) Describe the cyclosilicate structure with suitable examples.

d) What is Petrological microscope? Differentiate between petrological microscope and other microscope.

e) Explain the Electrical Properties of minerals.

f) Give an account of minerals used in Cement Industry.

P.T.O.

Q3) Answer the following questions (any four) **[16]**

a) What is magma? Give the composition of magma.

b) Describe the Arenaceous sedimentary rocks.

c) Give the classification of Igneous rocks based on silica content.

d) Give diagnostic characters of Metamorphic rocks.

e) Explain the various modes of transportation of sediments.

f) Explain 'Rock Cycle'.

Q4) Answer the following questions: (any two) **[16]**

a) Explain the various optical properties of minerals seen in plane polarized light.

b) What is texture? Explain equigranular texture in Igneous rocks with suitable examples.

c) Describe the various agents of metamorphism.

d) Give the silicate structure, chemical composition, physical and optical properties of 'Olivine'.

Q5) Give the crystallographic axes, Elements of symmetry, definition with indices of various forms present in Orthorhombic system, type Baryte. **[16]**

OR

a) State the different physical properties of minerals. Explain cleavage and Fracture with suitable examples. **[8]**

b) Explain Laccolith and phacolith forms of Igneous rocks. **[8]**

# # # #

Total No. of Questions : 5] **[Total No. of Pages : 2**

P190

[3717]-12
F.Y. B.Sc.
GEOLOGY - II
General Geology and Palaeontology
(Paper - II) (New Revised Course) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

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 questions:- **[16]**

a) Define Palaeontology.

b) Mention all the erosional landforms formed by the action of glaciers.

c) Draw diagram to show the internal structure of the earth.

d) What are Imprints?

e) Draw diagram to show the various type of septas in corals.

f) Mention the processes of chemical weathering.

g) Define Focus and Epicentre of earthquake.

h) Mention all the major tectonic plates of the Earth.

Q2) Answer Any Four questions from the following:- **[16]**

a) Describe the Lithosphere and Hydrosphere of the earth.

b) Define Geology and describe its various fundamental branches.

c) Define Denudation. Describe a Soil profile.

d) Explain the conditions necessary for fossilization.

e) Explain the Pratt's Hypothesis of Isostacy.

f) Describe the types of brachial skeleton in Brachiopod shell.

P.T.O

Q3) Answer Any Four questions from the following :- **[16]**

a) Describe Potholes and waterfalls formed by the erosional action of Rivers.

b) Explain the Encounter Theory for the origin of the Solar System.

c) Describe the hard part morphology of a Nautilus shell.

d) Differentiate between Regular and Irregular Echinoids with diagrams.

e) Describe the Fold and Fault Block Mountains.

f) Explain any four types of hingelines in lamelli branch shells.

Q4) Answer Any Two questions from the following :- **[16]**

a) Explain the evidences of continental drift.

b) Describe the different types of sand dunes formed by the action of wind.

c) With neat diagrams explain the different types of suture lines in Ammonoids.

d) Describe the hard part morphology of a Trilobite.

Q5) Define a Volcano. Explain the Structure of a typical central type of volcano. Add a note on earth's volcanic belts. **[16]**

OR

a) Define fossil. Give the techniques used in collection preservation and illustration of fossils. **[8]**

b) Describe the hard part morphology of a typical Gastropod shell. **[8]**

# # # #

Total No. of Questions :5] **[Total No. of Pages : 2**

P193

[3717]-15
F.Y. B.Sc.
GEOGRAPHY-I
Gg-110 : Physical Geography
(Paper-I) (New Course)

Time :3Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat diagrams and sketches wherever necessary.***
4) ***Use of map stencils is allowed.***

Q1) Answer the following questions in two to four sentences :

a) Geomorphology.

b) What is Minerals?

c) Isostacy.

d) What is fold?

e) Sea platform.

f) What is forewash.

g) Weathering.

h) What is river delta?

Q2) Explain the following in brief (Any Four) :

a) Characteristics of sedimentory rock.

b) Mass movements.

c) Sea floor spreadings.

d) Formation of stages of ox-bow lake.

e) Importance of plate Tectonic Theory.

f) Difference between rock and minerals.

P.T.O.

Q3) Answer the following (Any four) :

a) Origin of continents & Ocean basins.

b) Rift Valley.

c) Chemical weathering.

d) Zeugen.

e) Erosional features of sea waves.

f) Effects of earthquake.

Q4) Attempts the following (Any two) :

a) Landforms associated with erosional work of river.

b) Holme's convection current theory.

c) Landforms associated with depositional work of wind.

d) Geological Time Scale.

Q5) What is physical Geography, Explain importance and branches of physical Geography.

OR

Explain Davisian cycle of erosion.

# # # #

Total No. of Questions : 5] **[Total No. of Pages : 2**

P195

[3717] - 17
F.Y. B.Sc.
MICROBIOLOGY
Introduction to Microbiology
(Paper - I) (2008 Pattern) (New Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Attempt the following : **[16]**

a) Define Viroids.

b) Match the following :

i)	Paramoecium	1)	Pseudopodia
ii)	Plasmodium	2)	Cilia
iii)	Entamoeba	3)	Flagella
iv)	Trypanosoma	4)	Non-motile

c) State true or false-Pili helps in the motility of bacteria.

d) _____group of bacteria contain lipopolysaccharide (LPS) in their cell wall.

i) Gm +Ve bacteria ii) Gm–Ve bacteria
iii) Staphylococcus iv) Bacillus

e) _____are water insoluble biomolecules that are soluble in non-polar solvents.

i) Carbohydrates ii) Lipids
iii) Proteins iv) Nucleic acids.

f) Electron spins around nucleus of an atom in a space called as_____

i) Electron Orbital ii) Electron Space
iii) Molecular Space iv) Atomic Orbital

g) The bond present between two amino acids is called as peptide bond-state true or false.

h) Who is known as 'Father of Antiseptic Surgery'?

P.T.O.

Q2) Attempt any four of the following : **[16]**

a) What are eubacteria and archaebacteria?

b) Write a short note on 'Rickettsia'.

c) Explain covalent bond formation with suitable example.

d) Write any four differences between prokaryotes and eukaryotes.

e) Describe Redi's three jar experiment.

f) Write in short about structure and features of TMV.

Q3) Attempt any four of the following : **[16]**

a) Write the contribution of Antomy van Leeuwenhoek in the discovery of microbial world.

b) Write the significance of buffers in biology.

c) Explain the structure of Penicillium.

d) Write morphological and physiological characters of Staphylococcus.

e) Write the functions of plasma membrane in bacterial cell.

f) Draw the structure of bacterial endospore and give any two examples of endospore formers.

Q4) Attempt any two of the following : **[16]**

a) Draw neat labelled diagram representing life cycle of Plasmodium.

b) With the help of a suitable diagram explain the structure of flagella in Gram negative bacteria.

c) Describe the general characters of algae and give any four examples.

d) Describe the work of Robert Koch and state Koch's postulates.

Q5) Attempt any one of the following : **[16]**

a) What are carbohydrates? Explain their classification with suitable examples and add a note on their biological functions.

b) Describe the contribution of Louis Pasteur in the field of Microbiology.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P196

[3717] - 18
F.Y. B.Sc.
MICROBIOLOGY
Basic Techniques in Microbiology
(Paper - II) (New Course) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Attempt the following : **[16]**

a) $\eta \sin\theta$ is the formula to calculate_____

i) Resolving power. ii) Numerical aperture.

iii) Angular aperture. iv) Total magnification.

b) What is the role of Z.N.C.F. in spore staining.

c) Give the formula for determining phenol coefficient of an unknown disinfectant.

d) Name any two examples of photosynthetic bacteria.

e) Give any two examples of Fluorescent dyes used in fluorescent microscopy.

f) Glass lenses are used in electron microscope state whether true or false.

g) Graphically show diauxic growth curve.

h) What are accentuators.

Q2) Attempt any four of the following : **[16]**

a) Enlist different methods of preservation of pure culture. Describe any one in detail.

b) Define selective media. Explain any one in detail.

c) Draw and label various symbols to represent laboratory hazards.

d) Describe the role of U.V. rays as sterilizing agent.

e) What are mordants. Explain the role of mordants in staining procedure with example.

f) Draw properly labelled ray diagram of dark field microscope.

P.T.O.

Q3) Attempt any four of the following : **[16]**

a) Describe any one method of cultivation of chemolithotrophs.

b) Describe the mode of action of halogen and halogen compounds as disinfectant.

c) Define generation time. Derive the equation for its calculation.

d) Explain the principle, methodology and application of negative staining.

e) Justify : Blood agar is a enriched and differential media.

f) Explain the various types of condensers used in bright field microscope.

Q4) Attempt any <u>two</u> of the following : **[16]**

a) Describe the nutritional classification of bacteria on the basis of carbon and Energy source.

b) Enlist the different methods of enumeration of bacteria. Describe any one method in detail for counting cell number of bacteria.

c) Enlist the different characteristics of ideal disinfectant.

d) Define lense aberration. Describe chromatic aberration with diagramatic representation.

Q5) Attempt any <u>one</u> of the following : **[16]**

a) Explain principle, construction, working and applications of Transmission Electron Microscope.

b) Define pure culture. Enlist different methods of getting pure culture. Describe any two in detail.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P197

[3717] - 19
F.Y. B.Sc.
PSYCHOLOGY
General Psychology
(Paper - I) (New)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Draw the figures and diagrams wherever necessary.***
3) ***All questions carry equal marks.***

Q1) Attempt all 8 questions in one or two sentences : **[16]**

a) Define Psychology.

b) Define experiment.

c) Define Motivation.

d) Define Emotion.

e) Define Memory.

f) What is declarative memory?

g) Define Intelligence.

h) Define Mental retardation.

Q2) Answer the following questions in 6/8 sentences (any 4) : **[16]**

a) State the sensory adaptation.

b) Describe Maslow's hierarchy of needs.

c) Explain the physiology of emotion.

d) Explain Rorschach's Ink-Blot Test.

e) State the organization of lecture notes.

f) Explain the short-term memory.

P.T.O.

Q3) Attempt the following questions in 6/8 sentences (any 4) : **[16]**

a) Describe observation in brief.

b) Discuss the perceptual illusion.

c) Explain the types of frustration.

d) State the big-five model of personality.

e) Explain Ebbinghaus forgetting curve.

f) Explain Weschler's Intelligence scale for children.

Q4) Answer any two of the following questions : **[16]**

a) Explain the goals and types of psychological professionals.

b) Explain Gestalt principles of perception.

c) Explain the assessment of personality.

d) Describe the concepts in Measurement of Intelligence.

Q5) Describe the structure and function of Neuron **[16]**

OR

Define learning. Explain the concepts of classical conditioning.

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Total No. of Questions : 5] **[Total No. of Pages : 3**

P199

[3717] - 21
F.Y. B.Sc.
ELECTRONICS
EL1 - T1 : Principles of Analog Electronics
(New Course) (2008) (Paper - I)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Attempt the following questions in brief : **[16]**

a) Wire wound resistors are inductive 'comment'.

b) Draw circuit symbols of

i) SPDT

ii) DPDT

c) Explain meaning of

i) STP

ii) FRC

d) Give two types of signals with wave forms used in Electronics.

e) Define

i) Input offset voltage.

ii) Slew rate.

f) Draw circuit symbols of

i) SCR

ii) Triac

g) State

i) KCL

ii) Superposition theorem.

h) A typical transistor has $\beta = 90$, $I_C = 15mA$ calculate I_B.

P.T.O.

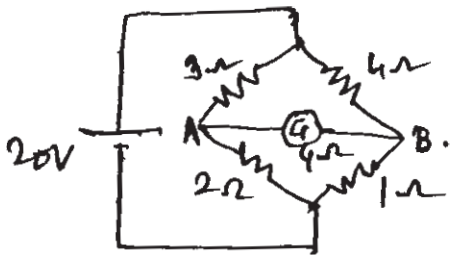
Q2) Attempt any Four questions : **[16]**

a) Describe construction and working of e.m. relay.

b) Draw bridge rectifier circuit with proper waveforms

c) Write a short note on step response of RC circuit.

d) Use Thevenin's theorem to find current flowing through galvanometer



e) What are clippers? Explain series +ve clipper.

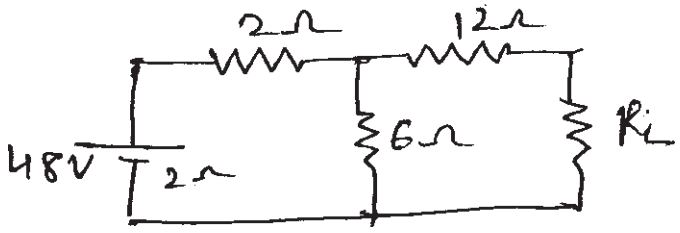
f) Explain working of opamp an adder.

Q3) Attempt any Four of the following : **[16]**

a) What is battery? Explain construction and working of lead acid accumulator.

b) Obtain an expression for resonant frequency of series LCR circuit.

c) Obtain Norton equivalent of the following



d) Explain construction and working of zener diode.

e) Draw CB, CC, CE configuration of transistor which configuration is mostly used.

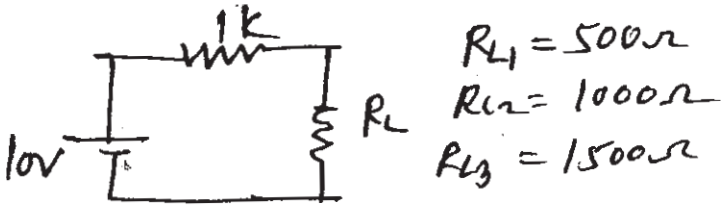
f) Explain working of opamp as non inverting amplifier.

Q4) Attempt any Two of the following : **[16]**

a) i) Draw circuit symbols of
   1) TDR
   2) Step down Transformer
   3) Fuse
   4) Iron core Inductor

   ii) In capacitive circuit show that current leads applied voltage.

b) i) Verify maximum power transfer theorem for following



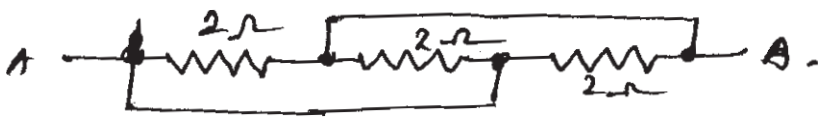
ii) With the help of equivalent circuit, explain working of UJT.

c) i) Draw circuit symbols of n & p channel enhancement and depletion type MOSFETs.

ii) Write a short note on transistor as a switch.

Q5) Attempt any two questions : **[16]**

a) i) Find equivalent resistance between terminals A & B



ii) The arms of π network has following values
Ra = 10Ω Rb = 20Ω Rc = 30Ω find equivalent T Network

b) i) Draw I-V characteristics of
1) JFET
2) n-p-n transistor

ii) With the help of forward biased rectifying diode circuit explain its I-V characteristics.

c) i) Define :
1) Voltage gain
2) Current gain
3) Power gain
4) Input resistance of an amplifier.

ii) Find α of a transistor for β = 50 & 190.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P200

[3717] - 22
F.Y. B.Sc.
ELECTRONIC SCIENCE
EL1T2 : Principles of Digital Electronics
(Paper - II) (New Course) (2008)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat labelled diagram must be drawn wherever necessary.***
3) ***Use of calculators and log tables is allowed.***
4) ***Figures to the right indicates full marks.***

Q1) Answer the following questions in brief : **[16]**

a) Define positive logic and negative logic.
b) What is hexadecimal number system? Give its examples.
c) Draw logic symbol of following gates : AND, NAND, NOR, NOT.
d) Write 2's complement of binary number-101011.
e) Define combinational and sequential logic circuits.
f) What is decade counter? Name the IC which contain decade counter.
g) Define logic families.
h) Define memory capacity.

Q2) Attempt <u>any Four</u> of the following : **[16]**

a) Draw the logic circuit of two input AND gate using transistors. Write its truth table and explain it.
b) Explain the method of converting Gray code to binary code and convert $(101011)_{Gray} = (.....)_2$.
c) Convert the following
   i) $(35)_{10} = (\quad)_2 = (\quad)_{16}$
   ii) $(1110.10)_2 = (\quad)_{10} = (\quad)_8$.
d) What is parity bit? Explain how Ex-OR gate can be used as parity generator.
e) Draw the logic circuit for the following boolean equations using basic gates
   i) $y = AB + BC + CD$;
   ii) $y = (A + B)(\overline{A} + C)$;
f) Simplify the given boolean equation and draw the logic circuit using basic logic gates $y = AB\overline{C} + ABC + BC$.

P.T.O.

Q3) Attempt <u>any four</u> of the following : **[16]**

a) Why NAND gate is called basic building block? Design OR gate using only NAND gates.

b) What is Half Adder? Draw its logic circuit using gates. Write its truth table.

c) Draw logic diagram of 3-bit universal adder/subtractor. Explain the action with suitable example.

d) Explain 2 : 1 multiplexer with logic diagram & truth table.

e) What is encoder? Draw logic diagram of decimal to BCD encoder.

f) Define the term modules of a counter. Design mod 12 counter using Flip-Flops.

Q4) Attempt any four of the following : **[16]**

a) Draw logic diagram of 1 to 4 line demultiplexer. Explain its action with truth table.

b) What is decoder? Explain BCD to 7 segment decoder.

c) What is synchronous counter? State its advantages and disadvantages over asynchronous counter.

d) Draw logic circuit of JKFF. Write its truth table.

e) Explain serial in serial out shift register with proper circuit.

f) What do you mean by down counter? Explain 3-bit up-down counter using proper diagram.

Q5) Attempt any four of the following : **[16]**

a) Write a short note on noise immunity.

b) Draw the circuit of CMOS NAND gate. Explain its action.

c) Describe the operation of 2 input DTL NAND gate.

d) Explain sequential memory and read write memory.

e) What do you mean by volatile and nonvolatile memories?

f) What is full adder? Draw its logic circuit. Write its truth table and boolean equation.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P204

[3717] - 26

F.Y. B.Sc.

ENVIRONMENTAL SCIENCE

ENV - 101 Life Sciences : Basic Biology and Natural Resources (Paper - I) (New) (2008 Pattern) (Theory)

Time : 3 Hours] ***[Max. Marks : 80***

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 : **[16]**

a) What are mesophytes?

b) Define nomenclature.

c) What is biology?

d) Give two examples of non renewable resources.

e) What is coal?

f) Define soil.

g) Give any two factors responsible for distribution of life.

h) Write about natural resources in short.

Q2) Answer <u>any four</u> of the following : **[16]**

a) Describe sources of water for terrestrial life.

b) Explain human relation with natural resources.

c) Give effects of modern agriculture.

d) Explain concept of species.

e) Describe importance of renewable resources.

f) Give four ecological adaptations of xerophytes.

P.T.O.

Q3) Write short notes on <u>any four</u> of the following : **[16]**

a) Mass extinction.

b) Fossil fuels.

c) Branches of biology.

d) Continental drift.

e) Global status of mineral resources.

f) Objectives of taxonomy.

Q4) Attempt <u>any two</u> of the following : **[16]**

a) Describe global distribution of fresh water.

b) Explain various steps of herbarium preparation.

c) What is evolution? Describe palaentological evidences of animal evolution.

d) Describe forest wealth of India.

Q5) What are energy resources? Describe in detail non conventional energy resources. **[16]**

OR

What are life forms? Enlist various plant forms and explain any three of them.

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P206

[3717]-28

F.Y. B.Sc.

FOUNDATION COURSE

(Restructuring)

Time : 3 Hours*]** **[*Max. Marks : 80

Instructions:

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

Q1) Explain the following concepts in 50 words each : (any two) **[10]**

i) Religion

ii) Democracy

iii) Superstitions

iv) Global Warming

Q2) Write the following short notes in 100 words each : (any four) **[20]**

i) Self Employment

ii) Reservation

iii) Culture

iv) Liberalization

v) Basic Human Values

vi) State and Nation

P.T.O.

Q3) Write answers of the following questions in 200 to 250 words each : (any three) **[30]**

i) Explain the causes of sickness of Indian Industries.

ii) Explain the importance of Agriculture in Indian Economy.

iii) Write the classification of Science.

iv) Suggest the measures to reduce Unemployment.

v) Write the meaning and types of Liberty.

Q4) Write the answer of any one of the following in 500 words : **[20]**

i) What is National Integration? Suggest the measures to remove the obstacles in the way of National Integration.

ii) Explain the effects of science and technology on Communication, Industries and Productivity.

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P206

[3717]-28

F.Y. B.Sc.

पायाभूत अभ्यासक्रम

(मराठी रूपांतर)

वेळ : 3 तास] **[एकूण गुण : 80**

सूचना :– 1) सर्व प्रश्न सोडविणे आवश्यक आहेत.

2) उजवीकडील अंक पूर्ण गुण दर्शवितात.

3) संदर्भासाठी मूळ इंग्रजी प्रश्नपत्रिका पहावी.

प्रश्न 1) पुढील संकल्पना 50 शब्दांत स्पष्ट करा. (फक्त दोन) **[10]**

i) धर्म

ii) लोकशाही

iii) अंधश्रद्धा

iv) जागतिक तापमान वाढ

प्रश्न 2) पुढील टिपा प्रत्येकी 100 शब्दांत लिहा. (फक्त चार) **[20]**

i) स्वयं रोजगार

ii) आरक्षण

iii) संस्कृती

iv) उदारीकरण

v) मुलभूत मानवी मुल्य

vi) राज्य आणि राष्ट्र

P.T.O.

प्रश्न 3) पुढील प्रश्नांची उत्तरे 200 ते 250 शब्दांत लिहा. (फक्त तीन) **[30]**

i) भारतीय उद्योगांच्या आजारपणाची कारणे स्पष्ट करा.

ii) भारतीय अर्थव्यवस्थेतील शेतीचे महत्त्व स्पष्ट करा.

iii) विज्ञानाचे वर्गीकरण लिहा.

iv) बेकारी कमी करण्यासाठी उपाय सुचवा.

v) स्वातंत्र्याचा अर्थ व प्रकार लिहा.

प्रश्न 4) पुढीलपैकी एका प्रश्नाचे उत्तर 500 शब्दांत लिहा. **[20]**

i) राष्ट्रीय एकात्मता म्हणजे काय ? भारतातील राष्ट्रीय एकात्मतेच्या मार्गातील अडथळे दुर करण्यासाठी उपाय सुचवा.

ii) दळणवळण, उद्योग आणि उत्पादकता यावरील विज्ञान आणि तंत्रज्ञानाचे परिणाम स्पष्ट करा.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P207

[3717] - 29
F.Y. B.Sc.
INDUSTRIAL CHEMISTRY
(Theory Paper - I) (Vocational Course) (2008 New Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***All questions are compulsory.***

SECTION - I

Q1) Answer the following : **[8]**

a) Define Catalyst.

b) Adsorption of gases on solid does not depend on

i) Temperature

ii) Molecular weight.

c) Define Sols.

d) What is isoelectric point?

Q2) Answer any <u>two</u> of the following : **[8]**

a) Differentiate between homogeneous and heterogeneous catalysis with example.

b) Derive expression for Lengmuir adsorption isotherm.

c) Explain auto catalysis.

P.T.O.

Q3) Answer any two of the following : **[8]**

a) Explain Phenomenon of Electro phorasis.

b) Define Gels and give its classification.

c) Explain how extent of adsorption increases on heating and increase in pressure.

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

a) Explain Characterstics of catalytic reaction in detail.

b) Define adsorption. Differentiate between physical and chemical adsorption. Give one example of each.

Q5) Write short note on any two : **[8]**

a) Pramoters.

b) Negative catalysis.

c) Aerosol

d) Brownian movement.

SECTION - II

Q6) Define and explain the following terms : **[8]**

a) Degrees of freedom.

b) Specific heat.

c) Latent heat of sublimation.

d) Power.

Q7) Answer any two of the following : **[8]**

a) What is standard heat of reaction? How it is determined from heats of combustion?

b) Outline the general methods of solving material balance problems for systems involving no chemical reactions.

c) What do you understand by excess reactant? Illustrate with suitable example.

Q8) Write short notes on <u>any two</u> of the following : **[8]**

a) Conversion.

b) Recycling operations : applications

c) Triple point of water.

Q9) Answer <u>any one</u> of the following : **[8]**

a) State and explain Gibbs phase rule. How it is applied in one component system?

b) State and explain Raoult's Law and Henry's Law. Illustrate with example.

Q10)Solve <u>any two</u> of the following : **[8]**

a) Calculate the standard heat of reaction for the following conversion

$$2FeS_2(s) + \frac{11}{2}O_2(g) \rightarrow Fe_2O_3(s) + 4SO_2(g)$$

Given : $\Delta H_f^o\ FeS_2(s) = -42520$ cal. $\Delta H_f^o\ Fe_2O_3(s) = -196500$cal, $\Delta H_f^o\ SO_2(g) = -70960$cal.

b) Calculate the volume occupied by 20kg of chlorine at 745mm pressure at 25°C.

c) Carbon monoxide is reacted with hydrogen to produce methanol calculate

i) Stoichiometric ratio of H_2 to CO.

ii) The quantity of CO required to produce 1000kg of CH_3OH.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P209

[3717] - 32

F.Y. B.Sc.

ELECTRONIC EQUIPMENT MAINTENANCE

Test and Measuring Instruments and consumer products

(Paper - I) (New Course) (Vocational Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Attempt the following : **[16]**

a) What is service manual? Explain an importance of it in brief.

b) What is PMMC mechanism? Draw DC Ammeter diagram.

c) Explain importance of AC Bridges and applications.

d) Compare Maxwell bridge with Hay bridge by Q factor.

e) What is Q meter? Write relation of Q with inductive reactance.

f) What is mean by full scale deflection accuracy? Give example.

g) Differentiate precision and resolution term.

h) What is autoranging? Give example.

Q2) Answer any <u>four</u> : **[16]**

a) Explain advantages of digital meters over analog meters.

b) Explain multirange voltmeter with neat diagram.

c) Draw block diagram of semi-automatic washing machine diagram.

d) Explain in details electronic ignition system.

e) Give advantages of Electronic volt meter (EVM) over conventional meter.

P.T.O.

Q3) Answer any <u>four</u> : **[16]**

a) What is spike guard? Explain with the help of circuit diagram.

b) Compare MCB with fuse.

c) What is magnetron? Elaborate it's importance in microwave oven.

d) Draw block diagram of CRO and explain role of delay line in CRO.

e) Explain precautions to eliminate HF noise pick-up.

Q4) Attempt any <u>two</u> of the following : **[16]**

a) Explain Digital Storage Oscilloscope (DSO) in details. Compare analog CRO with Digital Storage Oscilloscope.

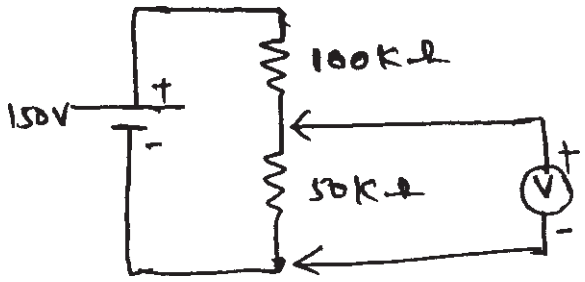
b) What is Digital Clock? Draw neat circuit diagram of digital clock shows seconds, min, hours; and explain each block in brief.

c) Explain working of ON-line UPS and compare ON-line UPS with OFF-line UPS technically.

Q5) Answer any <u>two</u> of the following : **[16]**

a) What is stabilizer? Explain general type of stabilizer and compare it with servo stabilizer.

b) What is loading effect? How it is avoided? The two voltmeters are available with sensitivity of 1000 Ω/v, 20,000 Ω/v both meter uses 50v range. Which meter gives less error for following circuit for voltage measurement.



c) Explain home protector system in details and compare it with stabilizer.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P210

[3717] - 33

F.Y. B.Sc.

INDUSTRIAL MICROBIOLOGY

Instrumentation and Materials & Design

(Theory Paper - I) (Vocational Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***All questions are compulsory.***

SECTION - I

Q1) Attempt the following : **[8]**

a) Give composition of various supports used in thin layer chromatography.

b) Define bed volume and void volume.

c) Define Rf value.

d) State Beers-Lambert's law.

Q2) Attempt any <u>two</u> of the following : **[8]**

a) Explain the detection limits and sensitivity in instrumentation.

b) Describe the technique of nephlometry

c) Describe the methods of pH and Eh measurements.

P.T.O.

Q3) Attempt any <u>two</u> of the following : **[8]**

a) Describe the working of conveyer discharge centrifuge.

b) Differentiate between paper chromatography and thin layer chromatography.

c) Give the principle of polarimetry and describe the working in details.

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

a) Describe the method of purification and characterisation of a protein from a sample.

b) Differentiate between preparative centrifuge and analytical centrifuge.

Q5) Attempt any <u>one</u> of the following : **[8]**

a) Describe the role of isotopes in biological research.

b) Describe in details the technique of HPLC.

SECTION - II

Q6) Attempt the following : **[8]**

a) What is metal alloy?

b) Define 'Biofouling'.

c) Enlist various types of lives used in engineering drawing.

d) What is "Auto-CAD"?

Q7) Attempt any <u>two</u> of the following : **[8]**

a) Describe die making for plastic molding.

b) Explain heavy metal toxicity in aquatic environment.

c) Describe sectional lines & sectional views.

Q8) Attempt any <u>two</u> of the following : **[8]**

a) Describe the application of various ferrous and non ferrous metal alloys in biotechnological processess.

b) What is difference between Pyramid and Prism.

c) Describe the phenomenon of 'Oligo dynamic action'.

Q9) Attempt any <u>two</u> of the following : **[8]**

a) The major and minor axis of an ellipse measures 100mm and 70mm respectively. Draw an ellipse by rectangle method.

b) Describe the plastic molding techniques used with respect to production of :

i) Bottles

ii) Pipettes.

iii) Tubings.

iv) Plates.

c) Name different methods of drawing an ellipse.

Q10) Attempt any <u>one</u> of the following : **[8]**

a) Describe advantages of Auto CAD over manual drawing methods.

OR

b) Describe the microbial leaching of manganeese.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P211

[3717] - 34
F.Y. B.Sc.
COMPUTER HARDWARE AND NETWORK ADMINISTRATION
Paper - I : Essentials of Computers
(Vocational) (New) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

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 the following : **[16]**

a) Distinguish between primary and secondary memory.

b) How microprocessors work as CPU?

c) What is MODEM?

d) What is the difference between heads of CD ROM and CD R/W?

e) Write full forms of : BCD, UPC, LCD, ISR.

f) What is DMA?

g) What is nested interrupt?

h) If there are 3 discs in HDD how many R/W heads will be required? Explain it.

Q2) Attempt any Four : **[16]**

a) What is the difference between Hardware and Software?

b) Write a short note on 'Mouse'.

c) Explain in brief main and Auxiliary memory.

d) What is SMPS? Explain it in brief.

e) Write a short note on 'Memory modules'.

f) What are different utility tools? Explain 'formatting' in brief.

P.T.O.

Q3) Attempt any Four : **[16]**

a) Write a short note on 'Plotter'.

b) Explain CPUs bus system.

c) What do you mean by device Controllers? Explain their use.

d) What is a pen drive? Explain it with it's connector.

e) Comment on 'Memory hierarchy'.

f) What is timing diagram? Show rise and fall time and it's effect in clock signal.

Q4) Attempt any Two : **[16]**

a) What is 'Motherboard'? Explain all the components and devices related to motherboard.

b) Write a note on 'Intel Microprocessors'.

c) i) Distinguish between Maskable and Non-maskable interrupts.

ii) Explain the role of RAM in computer and how the data is saved on computer. Why the unsaved data is lost when power goes off?

Q5) Attempt any Two : **[16]**

a) Explain different types of keyswitches used in keyboard.

b) Write a note on 'Printers'. Explain Dot Matrix and Inkjet printers.

c) i) What is hardwired control unit? Explain it with diagram.

ii) Write a short note on 'Registers'.

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Total No. of Questions :5] **[Total No. of Pages : 2**

P212

[3717] - 35
F.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
Morphology, Seed Development, Testing for Cultivar Genuineness and Plant Breeding for Crop Improvement
(New Course) (Paper - I)

Time :3 Hours] ***[Max. Marks : 80***

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) Attempt the following **[16]**

a) What is a Flower?.

b) Define megagame togenesis.

c) What do you mean by autogamy?.

d) Define an embryo.

e) What is a grain?

f) What do you mean by a legume type of Fruit?

g) Define plant breeding.

h) State the Law of Segregation.

Q2) Attempt any four of the following : **[16]**

a) Sketch and label the structure and T.S. of a typical anther.

b) Give the diagnostic characters of Family Papilionaceae.

c) Describe the process of double fertilization with neat labelled diagram.

d) What is a clone? Give the characters of a clone.

e) What is introduction? Give the objectives of introduction.

f) Comment on Dus system.

P.T.O.

Q3) Write notes on (any four): **[16]**

a) Advantages and limitations of hybridization in self pollinated crops.

b) Classification of Mutation.

c) Characters of Pureline.

d) Anther culture.

e) Natural Vegetative Propagation.

f) Scope and application of plant breeding for disease resistance.

Q4) Attempt any two of the following : **[16]**

a) Explain the role of phenol colour and peroxidase test in establishing cultivar genuineness.

b) Describe the development of dicotyledonous embryo.

c) What is heterosis? Give the causes of heterosis.

d) Explain the development of single cross and double cross hybrids.

Q5) Give the distinguishing characters, floral formula, floral diagram of Family Malvaceae & Liliaceae. **[16]**

OR

Define mutation. Describe different kinds of mutagens. Add a note on artificial induction of mutation.

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Total No. of Questions :10] **[Total No. of Pages : 2**

P213

[3717] - 36
F.Y. B.Sc.
INDUSTRIAL CHEMISTRY - II
(New- 2008 Pattern) (Vocational) (Paper-II)

Time :3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables, slide rule, calculator is allowed.***
6) ***Assume suitable data if necessary.***
7) ***All questions are compulsory.***

SECTION I

Q1) Answer the following : **[8]**

a) Define calorific value

b) List two disadvantages of bio-gas.

c) Give any two - properties of a solid fuel.

d) Explain what is meant by flash point of a fuel.

Q2) Attempt any two of the following : **[8]**

a) Give the classification of industrial fuels.

b) Explain the destructive distillation of wood.

c) Describe the process of catalytic cracking giving appropriate examples.

Q 3) Attempt any two of the following : **[8]**

a) What are the properties of a good fuel?

b) Describe in brief the properties and uses of coke.

c) Discuss in detail any one theory of the origin of petroleum.

Q 4) Attempt any one of the following : **[8]**

a) What is meant by Reforming? Compare the processes of thermal and catalytic reforming.

b) Give a brief account of the petrochemicals derived from allcanes.

P.T.O.

Q5) Attempt any one of the following : **[8]**

a) Write a descriptive account of the manufacture and treatment of coal-gas and coke-oven gas.

b) Explain the process of proximate analysis of coal in detail.

SECTION II

Q6) Answer the following : **[8]**

a) Define ore - dressing.

b) What is a flux? List the types of fluxes.

c) Give any two applications of zeolites.

d) Give any two uses of clay.

Q7) Attempt any two of the following : **[8]**

a) What is meant by an ore? Explain the composition of different types of ores.

b) Define metallurgy. Discuss the different divisions of metallurgy.

c) What is a slag? Give the composition and the classification of different types of slags.

Q8) Attempt any two of the following : **[8]**

a) Write a short note on mica.

b) What is a furnace? Describe any two types of furnaces used in metallurgy.

c) Discuss the process of roasting in detail. Enlist the types of roasting.

Q9) Attempt any one of the following : **[8]**

a) What is meant by an allotrope? Give a detailed account of the different allotropes of carbon.

b) Define Refining and describe the different processes used for refining of metals.

Q10) Attempt any one of the following : **[8]**

a) Discuss the physico - chemical principles of extraction of metals from oxide ores.

b) Describe in detail the thermodynamics of reduction.

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Total No. of Questions :5] **[Total No. of Pages : 2**

P215

[3717] - 39
F.Y. B.Sc. (Vocational)
ELECTRONIC EQUIPMENT AND MAINTENANCE
Maintenance concepts and Assembly Methods
(New) (Paper- II)

Time :3 Hours] ***[Max. Marks : 80***

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 the following :- **[16]**

a) Explain different types of losses in transformer.

b) Explain efficiancy of transformer.

c) Explain the term absolute maximum rating.

d) Explain Electric shock.

e) What are different tools required for desoldering.

f) Explain common faults that occur in inductors.

g) Explain noise in resistances.

h) Explain common faults that occur in capacitors.

Q2) Answer any four : **[16]**

a) Explain the difference between good & bad solder joint.

b) Explain different safety devices used for domestic purpose.

c) Explain the difference between cold and dry solder joint.

d) Explain electrical wiring of a fan & regulator.

e) Explain the advantages of ultrasonic soldering.

Q3) Answer any four **[16]**

a) Explain the importance of Earthing and explain the procedure of Earthing.

b) Explain the role of flux in a good solder joint.

c) Explain different precautions to be taken while handling electrical instrument.

P.T.O.

d) With the help of a neat diagram explain soldering Iron.

e) Enlist tools required for soldering and desoldering.

Q4) Answer any two of the following : **[16]**

a) Draw the diagram of a typical stair case wiring and Explain.
b) With the help of a neat diagram explain the working of a M.C.B.
c) What do you understand by 60 : 40 & 40 : 60 compositions of the solder wire also explain their advantages & disadvantages

Q5) Answer any two of the following : **[16]**

a) With the help of a neat diagram explain the construction of IFT? What does tuning of IFT means?

b) Write a note on different wire harnessing techniques.

c) With the help of a neat diagram. Explain the use of Bread board.

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Total No. of Questions :5] **[Total No. of Pages : 2**

P-218

[3717] - 42
F.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
Seed Physiology and Seed Production
(New Course) (Paper- II)

Time :3 Hours] ***[Max. Marks : 80***

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) Attempt the following :- **[16]**

a) What are recalcitrant seeds?

b) Define seed vigour.

c) What is seed ageing?

d) What are synthetic seeds?

e) Define genetic purity of seed.

f) What is roughing?

g) Enlist the crops require transplantation of seedlings.

h) What are breeder's seeds?

Q2) Attempt any four of the following :- **[16]**

a) Give chemical composition of seed.

b) Comment on seed deterioration during storage.

c) Explain Factors affecting seed vigour.

d) Comment on methods of maintenance and enrichment of soil Fertility.

e) Explain methods of sowing for straight varieties.

f) Describe the sources and methods of irrigation.

Q3) Write notes on (any Four) **[16]**

a) Orthodox seeds.

b) Seed pelleting and coating.

P.T.O.

c) Seed village concept.

d) Harvesting and threshing of seeds.

e) Synthesis of food reserves.

f) Soil types.

Q4) Attempt any two of the following :- **[16]**

a) Explain invigoration treatment to improve seedling establishment.

b) Describe types of seed germination. Add a note on seedling abnormalities.

c) Comment on importance of quality sowing and methods of sowing for hybrid and transplanting crops.

d) Explain importance of agronomic management in high value seed production.

Q5) Define seed dormancy. Explain various causes and methods to break seed dormancy. **[16]**

OR

Explain systems and methods of production of nucleus, breeder, Foundation and certified seeds.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P238

[3717] - 70
F.Y. B.Sc.
EXPERIMENTAL PSYCHOLOGY
General Psychology (Basic Psychological Processes)
(Paper - I) (Old Syllabus)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Draw the figures and diagrams wherever necessary.***
3) ***All questions carry equal marks.***

Q1) All sub questions are compulsory : **[16]**

a) What is Experiment?

b) Define Psychology.

c) What is emotion?

d) Define motivation.

e) Define Attention.

f) Enlist the types of taste.

g) Define learning.

h) What is classical conditioning.

Q2) Attempt any Four questions in 6 to 8 lines each : **[16]**

a) State the importance of sexual motivation.

b) State the importance of emotional Intelligence.

c) Describe the Anger emotion.

d) State the function of Rods and Cones.

e) State the selectivity of Attention.

f) Describe the method of Insight learning.

P.T.O.

Q3) Attempt any four questions in 6 to 8 lines each : **[16]**

a) Describe the method of case study.

b) Explain the sources of frustration.

c) State the fundamental emotion of love.

d) Describe the type of voluntary attention.

e) Describe the method of trial and error learning.

f) Explain the basic concept of classical conditioning.

Q4) Answer any Two of the following : **[16]**

a) Describe any four fields of Psychology.

b) Describe the structure and function of human ear.

c) Explain the types of social motives.

d) Explain the determinants of Attention.

Q5) Describe the structure and function of Neuron. **[16]**

OR

Define perception. Explain the principles of perceptual organization.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P239

[3717] - 71
F.Y. B.Sc.
EXPERIMENTAL PSYCHOLOGY
(Paper - II) (Old Syllabus)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Draw the figures and diagrams wherever necessary.***
3) ***All questions carry equal marks.***

Q1) All subquestions are compulsory : **[16]**

a) Define sensitivity.

b) Define absolute threshold.

c) Define reaction time.

d) Define foreperiod.

e) Define Psychological test.

f) Define reliability.

g) Define memory.

h) What is Forgetting.

Q2) Attempt any Four questions in 6 to 8 sentences : **[16]**

a) Explain the variable error.

b) State the advantages of group test.

c) Explain the nature of validity.

d) Explain the types of simple reaction time.

e) Explain the recognition methods of measuring memory.

f) State Declarative memory.

P.T.O.

Q3) Attempt any four questions in 6 to 8 sentences : **[16]**

a) State 'Fechner's law'.

b) Explain the performance test.

c) State the characteristics of psychological test.

d) Explain the application of reaction time.

e) Explain the short term memory.

f) State the mnemonic devices.

Q4) Attempt any Two of the following : **[16]**

a) Explain the basic concepts of psychophysics.

b) Explain the uses of psychological test.

c) Explain the determinants of reaction time.

d) Describe theories of Forgetting.

Q5) Define variable. Explain the various types of variable. **[16]**

OR

What is problem? Describe the methods of representing the problem solving.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P240

[3717] - 72
F.Y. B.Sc.
ELECTRONIC SCIENCE - I
EL1-T1 : Principles of Analog Electronics
(Paper - I) (Old Course) (2004)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Answer the following questions in brief (any eight) : **[16]**

a) Draw square waveform with 50% duty cycle.

b) Write the applications of P-N junction diode.

c) Enlist important members of thyristor family.

d) Draw I-V characteristics of triac.

e) Define tolerance term and give tolerance for different colors.

f) Numerical codes on ceramic disc capacitor is 102. Write value in terms of farad.

g) Write advantages of fixed biasing for BJT.

h) What is small signal amplifier?

i) An Electric current of 20 mA was found to flow through a resistor when potential difference of 2Volt was applied across it. Determine the resistance of the network.

Q2) Answer the following (any four) : **[16]**

a) What is resistor? Draw its symbol. Classify it and explain any one in brief.

b) State Kirchoff's Current Law (KCL) and Voltage Law (KVL).

c) What is T & π network? Give its conversion formulae for T and π networks.

d) Draw IV characteristics of linear and nonlinear devices.

e) Explain field effect transistor as voltage variable resistor (VVR).

P.T.O.

Q3) Answer the following (any four) : **[16]**

a) Explain RC low pass filter with suitable diagram.

b) Define α and β of BJT. Obtain relationship between them.

c) Explain diode clipping circuit with applications.

d) Draw full wave rectifier and explain in brief.

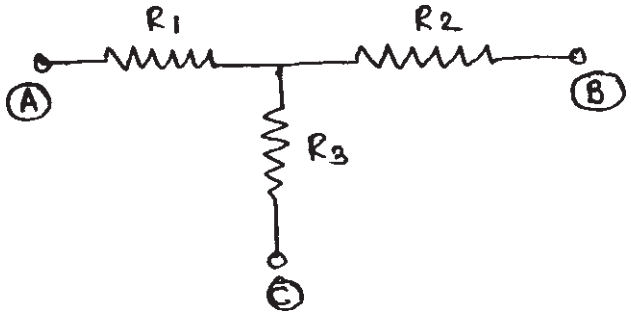
e) What is fuse? Draw its symbol and write technical terms associated with it.

Q4) Answer any <u>two</u> of the following : **[16]**

a) What is MOSFET? Explain types of MOSFET with IV characteristics curve.

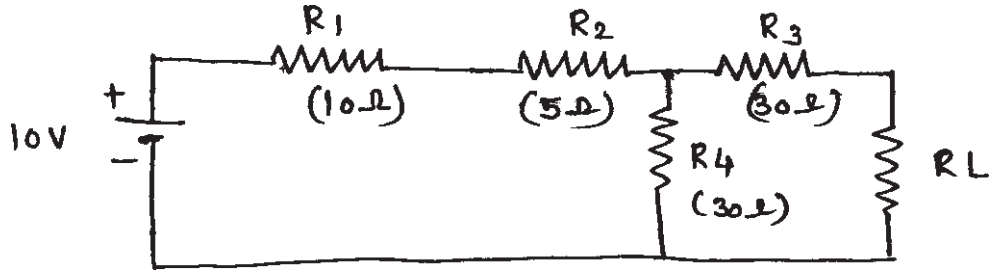
b) Compare FET and BJT. Give FET specification parameters and applications of FET.

c) The resistance in a T network shown below has $R_1 = 10\Omega$, $R_2 = 15\Omega$ and $R_3 = 6\Omega$. Obtain Ra, Rb and Rc. Draw π network equivalent to T network.



Q5) Answer any <u>two</u> of the following : **[16]**

a) Find the value of load resistance for following network, such that maximum will be delivered to the load resistance (RL). For the same network find current flows thr' R_1 and R_2.



b) What is biasing of the transistor? Describe fixed biasing and potential divider biasing with the help of suitable diagram. Give disadvantages of fixed biasing.

c) List and draw different types of Independent sources and dependent sources. State applications of independent source.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P241

[3717] - 73

F.Y. B.Sc.

ELECTRONIC SCIENCE

EL1-T2 : Principles of Digital Electronics

(Paper - II) (2004 Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) All questions are compulsory : **[16]**

a) What is Multiplexer?

b) Name the following IC'S.

i) 7400 ii) 7402

c) Convert the following decimal to hexadecimal number

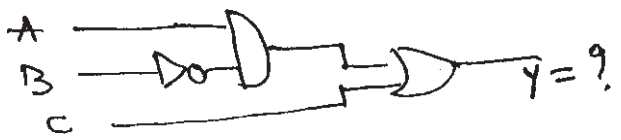
i) $(12)_{10}$ ii) $(20)_{10}$

d) Write full form of BCD and ASC II code.

e) Write 1's complement for following numbers

i) 1010011 ii) 1110001

f) Write output (y) equation for following circuit.



g) Draw the symbol of EX-OR gate.

h) What is decoder?

P.T.O.

Q2) Attempt any four of the following : **[16]**

a) Explain how pair quad octet can help for simplifying K-Map.

b) Explain the basic circuit diagram for transistor NOT GATE.

c) State and verify Demorgan's theorems.

d) Convert the following

i) $(101101)_2$ ii) $(11001)_2$ in to gray code.

e) Draw logic circuit of 2 : 1 line multiplexer, explain its action with truth table.

f) What is meant by half subtractor? Explain half subtractor in detail.

Q3) Attempt any four of the following : **[16]**

a) Simplify the expression $AB + ABC + \overline{A}B$ using boolean algebra.

b) Draw logic diagram of 1:4 line Demultiplexer explain its action with truth table.

c) Draw AND GATE, NOT GATE and OR GATE using NAND GATES only.

d) What is flip-flop? What are the limitations of S-R flip-flop.

e) Perform the following subtraction $(18)_{10}$-$(15)_{10}$ using 2's complement.

f) Explain with logic diagram decimal to BCD encoder.

Q4) Attempt any two of the following : **[16]**

a) i) Write a note on Priority encoder.

ii) Draw three input OR GATE using diode circuit, explain its working.

b) What is decade counter? Name the IC which contain the decade counter. Explain the function of Ro(1) and Ro(2) and Rg(1) and Rg(2).

c) Explain with logic diagram SISO and SIPO shift register.

Q5) Attempt any two of the following : **[16]**

a) i) Write the use of ring counter using shift register.

ii) Draw the circuit of three bit down counter. Explain its working.

b) i) Distinguish between sycronous and Asycronous counter.

ii) Explain the working of J-K flip-flop with logic diagram and truth table.

c) Describe BCD to seven segment display driver.

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P242

[3717] - 74
F.Y. B.Sc.
DEFENCE & STRATEGIC STUDIES
DS-1 : Contemporary Warfare
(Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Answer in 20 words (Any Ten) : **[20]**

a) Define "War".

b) What do you mean by "Economic Sanction"?

c) State the basic aim of Economic warfare.

d) When & by whom psychological warfare introduced firstly?

e) What do you mean by Naxalism?

f) State the origin of "Nuclear Warfare".

g) Write any two causes of war as per Quency wright.

h) Do you know any historical example of chemical attack.

i) Define "Guerila warfare"

j) State any four principles of war.

k) What do you know about general Giap?

l) What do you understand by conventional warfare?

m) State any two names of chemical agents.

Q2) Answer in 50 words (Any Two) : **[10]**

a) Explain the concept of total war.

b) Write in brief functions of war.

c) Write in short "Strategic propaganda"

d) Explain the objectives of chemical warfare.

P.T.O.

Q3) Answer in 150 words (Any Two) : **[20]**

a) Explain in detail "Morale" as a principle of war.

b) Distinguish between limited & total war.

c) Highlight on views of Mao-Tse-Tung on Guerila Warfare.

d) Write a note on "Nuclear Warfare".

Q4) Answer in 300 words (Any Two) : **[30]**

a) Describe the Indias case of L.I.C. with special reference to the internal security problem of Indias North-East region.

b) "In war I-Money, II-Money and even III-Money" explain this statement in the context of economic warfare.

c) Analyse the significance & utility of Guerila warfare in the present context with examples.

d) Write a note on "Biological Warfare".

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P243

[3717] - 75
F.Y. B.Sc.
DEFENCE & STRATEGIC STUDIES
DS-2 : India's National Security
(Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Answer in 20 words (Any Ten) : **[20]**

a) Define 'Terrorism'.

b) Write objectives of India's Foreign Policy.

c) What are the aims of SAARC.

d) When did America send her seventh flect to the Bay of Bengal.

e) Define National Interest.

f) What do you mean by determinants of Foreign Policy.

g) Define Naval strategy.

h) Explain the meaning of 'Cross border Terrorism'.

i) What do you mean by peaceful uses of 'Nuclear Energy'.

j) Explain the meaning of 'Ideology'.

k) State the meaning of Non-military treats.

l) What do you mean by strategic planning.

m) Explain the meaning of military power.

Q2) Answer in 50 words (Any Two) : **[10]**

a) Explain determinants of defence policy.

b) Discuss about the objectives of 'Diplomacy'.

c) Explain relation between Economy & National Security.

d) Discuss problems of SAARC.

P.T.O.

Q3) Answer in 150 words (Any Two) : **[20]**

a) Write a note on Internal security problems of India.

b) Analyse India's defence policy since - 1962.

c) Discuss role of intelligence in National security.

d) Explain Nuclear strategy of India since 1970's.

Q4) Answer in 300 words (Any Two) : **[30]**

a) Explain Indo-Pakistan Relations with special reference to Kashmir issue.

b) Discuss Military presence of major powers in Indian ocean and it's implications on Indian security.

c) Explain India's relations with Russia.

d) Discuss national security challenges to south Asian countries / Region.

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P244

[3717] - 76
F.Y. B.Sc.
DEFENCE & STRATEGIC STUDIES
DS-3 : Defence Organisation in India
(Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Answer in 20 words (Any Ten) : **[20]**

a) What is meant by 'Armed Forces'?

b) What is meant by combat branches?

c) Who is supreme commander?

d) Name all the commands of IAF.

e) Name all the commands of Navy.

f) Name all the commands of Army.

g) Write the aim of SRPF.

h) Write the aim of CRPF.

i) Define 'Intelligence'.

j) Define 'Counter Intelligence'.

k) What is 'Division'?

l) What is 'Battallion'?

m) What is 'Section'?

Q2) Answer in 50 words (Any Two) : **[10]**

a) Explain the role of Intelligence.

b) Why Civil-Defence is important?

c) Explain the significance of BSF.

d) Write about defence committee of the cabinet.

P.T.O.

Q3) Answer in 150 words (Any Two) : **[20]**

a) Explain the development of Army after 1947.

b) Explain the development of Air Force after 1947.

c) Explain the development of Navy after 1947.

d) Explain about history and scope of Intelligence.

Q4) Answer in 300 words (Any Two) : **[30]**

a) Explain the principles of defence organisation.

b) Explain the organisational structure of ministry of defence.

c) Write an essay on Administrative services of Army.

d) Explain the feature, role and limitations of Artillery.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P245

[3717] - 77
F.Y. B.Sc.
ENVIRONMENTAL SCIENCE - I
Introduction to Environmental Science
(Paper - I) (Old Course) (2004 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

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 : **[16]**

a) Define term 'Environment'.

b) What is food-web?

c) Give any two names of aquatic cosystem.

d) Define autecology.

e) Name the sources of non-conventional energy.

f) What are metamorphic rocks?

g) Give any two scopes of environmental science.

h) Mention any two physical properties of water.

Q2) Attempt <u>any Four</u> of the following : **[16]**

a) What are ecological pyramids? Describe pyramid of energy.

b) Give sources & importance of non-renewable energy resources.

c) Describe any two chemical properties of water.

d) What is mesozoic era? Describe periods in mesozoic era.

e) Describe different types of soils.

f) Write an account on earthquake.

P.T.O.

Q3) Write short notes on Any Four of the following : **[16]**

a) Industrilization.

b) Food chain of aquatic ecosystem.

c) Forest ecosystem.

d) Sedimentary rocks.

e) Renewable resources.

f) Typhoon.

Q4) Attempt Any Two of the following : **[16]**

a) Describe quantitative characters of community.

b) What is population? Explain impact of increasing population on environment.

c) Write an essay on palaeozoic era.

d) Explain energy flow in the ecosystem with suitable examples.

Q5) What is atmosphere? Describe structure and characteristics of atmosphere. **[16]**

OR

What is soil profile? Explain structure and characteristics of atmosphere.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P246

[3717] - 78
F.Y. B.Sc.
ENVIRONMENTAL SCIENCE - II
Introduction to Environmental Pollution
(Paper - II) (Old Course) (2004 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

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 : **[16]**

a) Define Pollution.

b) Give any two sources of air pollution.

c) Define Smog.

d) What is chernobyl disaster?

e) Define detergents.

f) What are pesticides?

g) Give any two remedial measures of Oil Spill.

h) Give any two Environmental laws in India.

Q2) Answer any Four of the following : **[16]**

a) Explain the process of acid rain formation.

b) What is thermal pollution? Describe its effects on aquatic ecosystem.

c) Describe effect of pesticides on man and birds.

d) What is Global warming? Explain its effects.

e) Describe effects of radiation pollution.

f) Explain plant as indicators of pollution.

P.T.O.

Q3) Write short notes on any four of the following : **[16]**

a) Green House effect.

b) Nuclear Power Plants.

c) Effect of marine pollution on microbes and coral reefs.

d) Blue baby syndrome.

e) Salinization of soil.

f) Effect of sound pollution.

Q4) Attempt any Two of the following : **[16]**

a) Write an essay on Bhopal gas tragedy.

b) Describe environmental awareness to control pollution.

c) Explain remedial and control measures of soil pollution.

d) Describe the methods of self purification of polluted water.

Q5) What is water pollution? Describe different types of water pollution and its effects. **[16]**

OR

What is soil pollution? Explain effects and sources of soil pollution. Add a note on soil erosion.

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P247

[3717]-79

F.Y. B.Sc.

FOUNDATION COURSE

(Restructuring) (Old Pattern)

Time : 3 Hours*]** **[*Max. Marks : 80

Instructions:

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

Q1) Answer in 20 words each : (Any Ten) **[20]**

i) What is Religion?

ii) Define 'Economic Inequality'.

iii) What is Population Explosion?

iv) Define Food problem.

v) Define Science.

vi) What is Hypothesis?

vii) Define Society.

viii) Define Nation.

ix) What is Equality.

x) What is Rule of Law?

xi) What is Cast system?

xii) What is Globalization?

xiii) What is Liberalization?

P.T.O.

Q2) Answer in 50 words each : (Any Two) **[10]**

i) Write a short note on Self employment.

ii) State the meaning of culture.

iii) Explain the concept of Fraternity.

iv) Explain the concept of Privatization.

Q3) Answer in 150 words each : (Any Two) **[20]**

i) State the importance of Religion in Indian Society.

ii) Write a effects of Poverty.

iii) Explain the merits of Indian Democracy.

iv) State the effects of science and technology on Education and Employment.

Q4) Answer in 300 words each : (Any Two) **[30]**

i) Explain the causes and effects of growing population in India.

ii) Discuss the various obstacles to achieving the goal of National Integration.

iii) Explain the various types of Democracy.

iv) Explain the causes and effects of Pollution.

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P247

[3717]-79

F.Y. B.Sc.

पायाभूत अभ्यासक्रम

(मराठी रूपांतर) (जुना अभ्यासक्रम)

वेळ : 3 तास] **[एकूण गुण : 80**

सूचना :– 1) सर्व प्रश्न सोडविणे आवश्यक आहेत.

2) उजवीकडील अंक पूर्ण गुण दर्शवितात.

3) संदर्भासाठी मूळ इंग्रजी प्रश्नपत्रिका पहावी.

प्रश्न 1) खालीलपैकी कोणत्याही दहा प्रश्नांची उत्तरे प्रत्येकी 20 शब्दांत लिहा. **[20]**

i) धर्म म्हणजे काय ?

ii) 'आर्थिक विषमता' व्याख्या द्या.

iii) लोकसंख्या विस्फोट म्हणजे काय ?

iv) 'अन्न समस्या' व्याख्या द्या.

v) 'विज्ञान' व्याख्या द्या.

vi) गृहितक म्हणजे काय ?

vii) समाजाची व्याख्या सांगा.

viii) 'राष्ट्र' व्याख्या द्या.

ix) समता म्हणजे काय ?

x) 'कायद्याचे अधिराज्य' म्हणजे काय ?

xi) जातीव्यवस्था म्हणजे काय ?

xii) जागतिकीकरण म्हणजे काय ?

xiii) उदारीकरण म्हणजे काय ?

P.T.O.

प्रश्न 2) खालीलपैकी कोणत्याही दोन प्रश्नांची उत्तरे प्रत्येकी **50** शब्दांत लिहा. **[10]**

i) 'स्वयंरोजगार' टिप लिहा.

ii) संस्कृतीचा अर्थ सांगा.

iii) बंधुता ही संकल्पना स्पष्ट करा.

iv) खाजगीकरण ही संकल्पना स्पष्ट करा.

प्रश्न 3) खालीलपैकी कोणत्याही दोन प्रश्नांची उत्तरे प्रत्येकी **150** शब्दांत लिहा. **[20]**

i) भारतीय समाजातील धर्माचे महत्त्व सांगा.

ii) दारिद्र्याचे परिणाम लिहा.

iii) भारतीय लोकशाहीचे गुण स्पष्ट करा.

iv) विज्ञान व तंत्रज्ञानाचे शिक्षण आणि रोजगारावरील परिणाम सांगा.

प्रश्न 4) खालीलपैकी कोणत्याही दोन प्रश्नांची उत्तरे प्रत्येकी **300** शब्दांत लिहा. **[30]**

i) भारतातील वाढत्या लोकसंख्येची कारणे व परिणाम स्पष्ट करा.

ii) भारतातील राष्ट्रीय एकात्मता साध्य करण्यात येणाऱ्या अडथळ्यांची चर्चा करा.

iii) लोकशाहीचे विविध प्रकार स्पष्ट करा.

iv) प्रदुषणाची कारणे व परिणाम स्पष्ट करा.

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Total No. of Questions : 10] **[Total No. of Pages : 3**

P248

[3717] - 80

F.Y. B.Sc.

INDUSTRIAL CHEMISTRY - I

(Theory Paper - I) (Vocational Course) (2004 Old Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***All questions are compulsory.***

SECTION - I

Q1) Answer the following : **[8]**

a) Define catalyst.

b) Define Adsorption.

c) What is coagulation.

d) Define active centers.

Q2) Answer any <u>two</u> of the following : **[8]**

a) Differentiate between homogeneous and heterogeneous catalysis.

b) Explain Autocatalysis.

c) Write two characterstics of catalytic reaction.

P.T.O.

Q3) Answer any two of the following : **[8]**

a) What are gels? How they are classified? Explain Phenomenon of Tixotrophy.

b) Explain adsorption indicators.

c) Derive expression for Langumuir adsorption isotherm.

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

a) Explain in detail mechanism of enzyme catalysis. Give two examples of enzyme catalysis.

b) Explain Electrophorasis and Electro Osmosis.

Q5) Write short note on any two : **[8]**

a) Chemisorption.

b) Emulsion.

c) Pramoters.

d) Negative catalysis.

SECTION - II

Q6) Define and explain following terms : **[8]**

a) Limiting reactants.

b) Derived quantities.

c) Heat capacity.

d) Kinetic energy.

Q7) Answer any two of the following : **[8]**

a) Explain the material balance in distillation operation.

b) Describe the different types of latent heats involved in phase changes.

c) Define standard heat of reaction. How it is calculated from heats of combustion.

Q8) Write short notes on <u>any two</u> of the following : **[8]**

a) Average molecular weight of gas mixture.

b) Excess reactant and percent excess.

c) Yield and selectivity.

Q9) Answer <u>any one</u> of the following : **[8]**

a) State and explain Henry's Law and Raoult's Law.

b) State and explain Amagats Law.

Q10)Solve <u>any two</u> of the following : **[8]**

a) Calculate standard heat of reaction in the following reaction

$$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$$

Given ΔH_f^o cal / gmole

$NH_3(g) = -11020$ $NO(g) = 21570$ $H_2O(g) = -57796$.

b) 98 gms of H_2SO_4 is dissolved in water to prepare 1 litre solution. Find normality and molarity of solution.

c) Calculate volume occupied by 20kg of chlorine at a pressure 745mm Hg and 25°C.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P249

[3717] - 81

F.Y. B.Sc.

BIOTECHNOLOGY

Biochemistry, Mathematics and Computers

(Vocational) (Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

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) ***Answers to the two sections should be written in separate answer books.***

SECTION - I

Q1) Attempt the following questions in short : **[8]**

a) Enlist the factors affecting enzyme activity.

b) What is reannealing?

c) What are metaloenzymes? Give example.

d) Define hormones with example.

Q2) Answer any four of the following : **[16]**

a) Differentiate between nucleoside and nucleotide.

b) Give two structural differences between DNA and RNA.

c) What is mutarotation?

d) Why proline is called as unusual amino-acid.

e) What are triacylglycerols? Give their significance.

P.T.O.

Q3) Attempt any two of the following : **[16]**

a) Discuss in brief the structure and function of DNA.

b) Comment on the different forces that stabilize the tertiary structure of proteins.

c) Define the terms K_m and V_{max} and give X's significance.

SECTION - II

Q4) Attempt the following : **[8]**

a) If A = $\{x \in N / 3 < x < 9\}$ and B = $\{x \in N / 6 \leq x \leq 10\}$, find $A \cup B$ and $A \cap B$.

b) If $f(x) = \frac{x+3}{4x-5}$, $y = \frac{3+5x}{4x-1}$, find $f(y)$.

c) If $y = x^4 + 2e^x + 3$, find $\frac{dy}{dx}$.

d) Evaluate $\int \sqrt{x}(1+x)dx$.

Q5) Attempt any four of the following : **[16]**

a) If $y = x^2 \cos x - 4x^4 \tan x$, find $\frac{dy}{dx}$.

b) Evaluate $\int \frac{1}{1+\sin x} dx$.

c) Find the coefficient of x^7 in the expansion of $\left(x^2 + \frac{1}{x}\right)^{11}$.

d) Evaluate $\lim_{x \to 2} \frac{x^2 - 5x + 6}{x^2 - 7x + 10}$.

e) A bag contains 4 white, 5 black and 3 red balls. Two balls are drawn at random. Find the probability that one ball is red and other is white.

f) Explain main units of computers.

Q6) Attempt any two of the following : **[16]**

a) i) If $y = \dfrac{e^x + e^{-x}}{e^x - e^{-x}}$, find $\dfrac{dy}{dx}$.

ii) Evaluate $\int\left[\sqrt{4x+3} + \dfrac{1}{\sqrt{4x+3}}\right]dx$.

b) i) Solve $\dfrac{\log x}{\log 2} = \dfrac{\log 27}{\log 9}$.

ii) Prove that $\dfrac{\log\sqrt{27} + \log 8 + \log\sqrt{1000}}{\log 120} = \dfrac{3}{2}$.

c) i) By using venn diagram verify

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

ii) Two fair dice are thrown. Find the probability that the sum of the points is multiple of 5.

d) i) Calculate the mean of the following frequency.

Observations (x)	0	1	2	3	4
Frequency (f)	8	20	36	24	12

ii) Calculate the standard deviation of the following data :
55, 58, 60, 66, 71, 68, 63.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P250

[3717] - 83
F.Y. B.Sc.
ELECTRONIC EQUIPMENT MAINTENANCE
Test and Measuring Instruments and Consumer Products
(Paper - I) (Old Course) (Vocational)

Time : 3 Hours] ***[Max. Marks : 80***

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 the following : **[16]**

a) What is loading effect?

b) What is accuracy and precision?

c) What is dynamic accuracy and response time?

d) Show different faults in pulse.

e) Explain the function of triggering circuit in CRO.

f) What are different parts of electric Iron?

g) What is typical current consumption for digital clock?

h) How to test transistor by using multimeter?

Q2) Attempt any Four of the following : **[16]**

a) What are advantages of digital meter over analog meter?

b) What is ground? Explain concept of ground using neat labelled diagram.

c) Explain the working of a permanent magnet moving coil type current meter. How is its current range increased?

d) Describe CRO probes.

e) Write a short note on distortion factor meter.

P.T.O.

Q3) Attempt any <u>four</u> of the following : **[16]**

a) Explain "automatic ranging" of digital instrument.

b) Explain typical faults in hearing aid.

c) Describe the working of multirange Ohmmeter. Explain why zero resistance gives full scale deflection.

d) Write a short note on microwave oven.

e) What is home protector? Explain.

Q4) Attempt any <u>two</u> of the following : **[16]**

a) Explain various applications of frequency counter.

b) What is electronic ignition system? Explain with neat diagram.

c) What are precautions and remedial measures to eliminate Hf noise pick up?

Q5) Attempt any <u>two</u> of the following : **[16]**

a) Enlist typical controls on front panel of dual trace CRO.

b) With the help of block diagram, explain the working of circuit breaker.

c) Explain different types of errors.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P251

[3717] - 85
F.Y. B.Sc.
COMPUTER MAINTENANCE
Computer Fundamentals
(Paper - I) (Old) (Vocational)

Time : 3 Hours] ***[Max. Marks : 80***

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 the following : **[16]**

a) State function of CPU of computer.

b) What is BIOS? What is its function?

c) Define - Memory word, word length.

d) Distinguish between volatile & non-volatile memory.

e) State function of modem in internet.

f) Define-Microprocessor. List some microprocessors used in todays computer.

g) What is meant by disabling of interrupt?

h) Write full form of abbreviations - CDROM, MDR, LCD, DVD.

Q2) Attempt any four : **[16]**

a) What is multimedia? What are its applications?

b) Discuss structure of floopy disk.

c) Write short note on-Internet protocol.

d) Explain computer generation in brief.

e) Explain - Microprocessor as CPU.

f) State limitations of computer.

P.T.O.

Q3) Attempt any four : **[16]**

a) Draw & explain block diagram of ALU of computer.

b) Explain working principle of mouse.

c) What is device controller? State different types of device controller.

d) Explain programmed mode of data transfer to i/o device.

e) Distinguish between maskable and non-maskable interrupts.

f) Draw block diagram of hardwired control unit of computer.

Q4) Attempt any two : **[16]**

a) Discuss different types of memory used in organisation of main memory.

b) What is motherboard? Explain any eight components of motherboard.

c) Write short note on :

i) Cache memory.

ii) Light pen as pointing device.

Q5) Attempt any two : **[16]**

a) What is virtual memory? Explain paging and segmentation methods used in virtual memory management.

b) What is internet? Explain main utilities provided by internet.

c) i) Distinguish between-Dot matrix printer and Inkjet printer.

ii) Write short note on different types of connectors in computer.

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Total No. of Questions : 5] [Total No. of Pages :2

P252

[3717] - 86
F.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
Seed Development, Morphology and Plant Breeding for Crop Improvement
(Paper - I) (Old Course)

Time : 3 Hours] *[Max. Marks : 80*

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) Attempt the following : **[16]**

a) Define allogamy.

b) What is Dus system?

c) Sketch and label T.S. of microsporangium.

d) What is megasporangium?

e) Give any one method of breeding for disease resistance.

f) What is mass selection?

g) What is apomixis?

h) Define micropropagation.

Q2) Attempt the following (any four) : **[16]**

a) What is heterosis? Give the causes of heterosis.

b) What is a clone? Describe the advantages of clonal selection.

c) Explain the procedure for development of double cross hybrid.

d) Define a fruit. Give the classification of fruit with the suitable examples.

e) Explain the role of phenol colour in establishing cultivar genuineness.

f) Comment on advantages & limitations of pureline selection.

P.T.O.

Q3) Write notes on (any four) : **[16]**

a) Typical flower.

b) Development of Dicot embryo.

c) Grow out test in cotton.

d) Polyploidy.

e) Scope and objectives of plant breeding.

f) Sexual reproduction.

Q4) Attempt any two of the following : **[16]**

a) Define poly embryony. Describe various routes of poly embryony.

b) Give distinguishing characters, floral formula and floral diagram of any one family from dicotyledons.

c) What is introduction? Give the objectives for introduction.

d) State the law of segregation and explain it with suitable example.

Q5) Define fertilization. Describe the detail procedure of double fertilization in angiosperms. **[16]**

OR

Define mutation. Give the classification of mutation. Add a note on spontaneous and induced mutations.

Total No. of Questions : 10] **[Total No. of Pages :2**

P253

[3717] - 87
F.Y. B.Sc. (Vocational)
INDUSTRIAL CHEMISTRY - II
(Old 2004 Pattern) (Paper - II)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***Asnwer to the two section should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***All questions are compulsory.***

SECTION - I

Q1) Answer the following : **[8]**

a) Give any two uses of kerosene.

b) Enlist any four fractions of fractional distillation of coal.

c) Give two properties of coal-tar.

d) What is aviation gasoline?

Q2) Answer any two of the following : **[8]**

a) Write a brief account of classification of coal.

b) List the advantages and disadvantages of a solid fuel.

c) Give one method of synthesis of Gobar gas.

Q3) Attempt any two of the following : **[8]**

a) Describe any one theory of the origin of petroleum.

b) Write a short note on calorific value of coals.

c) Describe the properties and uses of coke.

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

a) Give a brief account of petrochemicals derived from alkanes.

b) Write a short note on analysis of fuel gases.

P.T.O.

Q5) Answer any one of the following : **[8]**

a) Define cracking. Give a comparative account of types of cracking.

b) Write a descriptive account on processing of industrial fuels.

SECTION - II

Q6) Answer the following : **[8]**

a) Define ore-dressing. Give one example.

b) Give one difference between calcination and roasting.

c) Give two properties of mica.

d) Define smelting. Give one example.

Q7) Attempt any two of the following : **[8]**

a) What is a slag? Give the classification of silicate slags.

b) Write a short note on pyrometallurgy.

c) What is alumina? Discuss the various forms of alumina.

Q8) Attempt any two of the following : **[8]**

a) Write a short note on clay.

b) Give any two applications of zeolites.

c) What is a flux? Discuss different types of fluxes used in metallurgy.

Q9) Answer any one of the following : **[8]**

a) Discuss the physico-chemical principles of extraction of any two metals from sulphide ores.

b) Discuss the thermodynamics of roasting.

Q10) Answer any one of the following : **[8]**

a) What are silicates? Give a comparative account of different silicates.

b) What is meant by refining of metals? Discuss different processes of refining.

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Total No. of Questions : 5] **[Total No. of Pages :2**

P254

[3717] - 88
F.Y. B.Sc. (Vocational)
BIOTECHNOLOGY
Cell Biology, Genetics and Microbiology
(Paper - II) (Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Attempt the following : **[16]**

a) Define mutant.

b) What is nucleo side?

c) Define numerical aperture.

d) Give two functions of chloro plast.

e) What is Lophotti chaisflagella?

f) Define chemoheterotroph. Give one example.

g) What is the function of objective?

h) Give 2 examples of radiations used for sterilisation.

Q2) Answer any four of the following : **[16]**

a) Discuss various morphological forms of bacteria with suitable examples.

b) Distinguish between moist heat and dry heat sterilisation.

c) Describe spontaneous and induced mutations.

d) What are Lamp Brush chromosomes?

e) Discuss Mendels Law of Independent Assortment.

f) Explain Population Genetics.

P.T.O.

Q3) Write short notes on <u>any four</u> of the following : **[16]**

a) Function of Ribosome.

b) Glant chromosomes.

c) Different stages of meiosis.

d) Symbiosis.

e) Chemical methods of sterilisation.

f) Salient features of procaryotic cell.

Q4) Answer <u>any two</u> of the following : **[16]**

a) Describe chromosomal abberations with 2 examples.

b) With the help of neat labelled diagram. Discuss eucaryotic cell structure.

c) Explain nutritional classification of bacteria.

Q5) Attempt <u>any two</u> of the following : **[16]**

a) Explain principle, construction and working of an optical compound microscope.

b) Explain structure and function of Golgi Apparatus.

c) Explain Kreb's cycle with detailed biochemical structures.

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Total No. of Questions : 5] **[Total No. of Pages :2**

P255

[3717] - 90
F.Y. B.Sc. (Vocational)
ELECTRONIC EQUIPMENT AND MAINTENANCE
Maintenance Concepts and Repairs
(Paper - II) (Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

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

Q1) Attempt the following : **[16]**

a) Explain efficiency of transformer.

b) What is Q of a coil?

c) What is reactance of capacitor?

d) "Inductor is wattless component". Comment.

e) Explain the term absolute maximum rating.

f) Explain the difference between AF and RF transformer.

g) Explain common faults that occur in capacitors.

h) Explain the term "DIN RAIL Mounting".

Q2) Answer any four of the following : **[16]**

a) Name different tools required for desoldering & explain them.

b) Explain the role of flux in a good solder joint.

c) Explain the importance of data sheets.

d) Explain the function of choke in tube light.

e) Explain JEDEC scheme of numbering of semiconductor components.

P.T.O.

Q3) Attempt any four of the following : **[16]**

a) Draw the neat diagram of typical stair case wiving and explain.

b) Write a short note on ultrasonic soldering.

c) "For Instrument standardisation is necessary". Comment. List different standards which are commonly used.

d) Write a short note on different soldering techniques.

e) Name various types of capacitors used on the basis of the material used.

Q4) Attempt any two of the following : **[16]**

a) Explain "Electric Shock". What precautions should be taken to avoid Electric Shock?

b) What do you understand by 60 : 40 and 40 : 60 compositions of the solder wire? What are their advantages and disadvantages?

c) With the help of neat diagram explain IFT . What is mean by tuning of IFTs?

d) Explain the causes and remedies of dry solder and cold solder joint.

Q5) Attempt any two of the following : **[16]**

a) Explain good and bad solder joints.

b) Write a short note on desoldering techniques.

c) What are applications of registers in Electronic circuits?

d) What are common faults in capacitors?

Total No. of Questions : 5] **[Total No. of Pages :2**

P256

[3717] - 92
F.Y. B.Sc.
COMPUTER MAINTENANCE
Computer Organisation
(Paper - II) (Old Course) (Vocational)

Time : 3 Hours] ***[Max. Marks : 80***

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 the following : **[16]**

a) What are scroll bar? What is their use?

b) State function of ALU of computer.

c) What is POST?

d) Define - Compiler and Linker.

e) What is task of operating system?

f) List steps to start MS-Excel.

g) What is chipset?

h) List any four internal DOS Commands.

Q2) Attempt any four of the following : **[16]**

a) Distinguish between system software and application software.

b) List the steps to create table in MS-word.

c) Explain math coprocessor 8087.

d) Explain evolution of microprocessor.

e) Explain need of networking.

f) List any four external DOS Commands with their use.

P.T.O.

Q3) Attempt <u>any four</u> of the following : **[16]**

a) Distinguish between LAN & WAN.

b) Draw block diagram of clock generator & state where it is used in computer.

c) Write short note on Assembler.

d) Explain steps to develop power point presentation.

e) Explain Programmable Interrupt controller with block diagram.

f) What is spreadsheet? Explain its uses.

Q4) Attempt <u>any two</u> of the following : **[16]**

a) List different topologies of network. Explain any one in detail.

b) Draw architecture of 8086 microprocessor. Explain its execution unit.

c) Draw block diagram of FDC & explain function of each in brief.

Q5) Attempt <u>any two</u> of the following : **[16]**

a) What is UART? Explain it in detail.

b) Explain the utilities of control panel setting in MS-window.

c) i) What is buffer? Explain tristate buffer.

ii) Explain role of BIOS in booting of computer.

Total No. of Questions : 5] **[Total No. of Pages :2**

P257

[3717] - 93
F.Y. B.Sc. (Vocational)
SEED TECHNOLOGY
Seed Physiology and Seed Production
(Paper - II) (Old Course)

Time : 3 Hours] ***[Max. Marks : 80***

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) Attempt the following : **[16]**

a) What are germination stimulators.

b) Enlist causes of dormancy.

c) Define seed vigour.

d) What is seed ageing?

e) What are orthodox seeds?

f) What are nucleus seeds?

g) Define male sterility.

h) What is emasculation?

Q2) Attempt <u>any four</u> of the following : **[16]**

a) Explain any two factors affecting physiological changes of seeds during storage.

b) Comment on recalcitrant seeds.

c) Distinguish between seed and grain.

d) Give chemical composition of seed.

e) Comment on effect of previous crop on seed production.

f) Comment on compact area approach in seed production.

P.T.O.

Q3) Write notes on (Any four) : **[16]**

a) Synthetic seeds.

b) Germination stimulators and inhibitors.

c) Enzymatic activity during seed germination.

d) Indian seed Industries.

e) Selection of land for seed production.

f) Characteristics of sowing quality seed.

Q4) Attempt any two of the following : **[16]**

a) Explain invigoration treatment to improve seedling establishment.

b) Describe various respiratory pathways during seed germination.

c) Comment on systems of release and notification of varieties for general cultivation.

d) Explain role of anthesis and pollen viability in seed production.

Q5) Give an account of synthesis of food reserves. **[16]**

OR

Describe in detail the procedure for seed production in Maize/Potato.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P477 **[3717] - 31**

F.Y. B.Sc. (Vocational)
PHOTOGRAPHY & AUDIO - VISUAL PRODUCTION
Basic Photography and Appreciation of Media
(New) (Paper - I)

Time : 3 Hours] ***[Max. Marks : 80***

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 the following : **[16]**

a) Mention any four features of an ideal shutter.

b) Write two equivalent exposures for : f 5.6 @ 1/60 sec.

c) Mention at least four technical qualities of a photographic image.

d) Draw a diagram to show the difference between diffraction and refraction of light.

e) What is the function of the mirror used in a SLR camera?

f) What is the difference between the chromatic aberration and the spherical aberration?

g) What is the function of the pentaprism used in a SLR camera?

h) What does the focal length of a lens mean?

Q2) Answer any four of the following : **[16]**

a) Discuss the advantages and disadvantages of a focal plane shutter.

b) Draw a diagram and explain what you mean by the 'distortions' produced by a simple lens how are these corrected.

c) What do you mean by f number? Write down the f number scale and differentiate between small and large f number.

d) Draw a diagram and explain the rule of the thirds used in photographic composition.

e) Explain the difference between the highlights and the shadows in a photographic image.

P.T.O.

Q3) Answer any four of the following : **[16]**

a) Draw a diagram and show how an unsharp image looks with the different focusing aids.

b) What are the ethical norms that should be observed while shooting pictures for a news paper?

c) Explain what are the various controls of the lens of a SLR camera.

d) Differentiate between a 'news' and a 'photo news'.

e) Give at least four points of comparison between a painting and a photograph.

Q4) Answer any two of the following : **[16]**

a) Discuss the importance of photography in various fields.

b) Discuss the role of photography as a medium of mass communication. Give suitable examples.

c) Draw neat diagrams and discuss the working of a focal plane shutter. Why this shutter is called a focal plane shutter? Write down two points of merit and two points of demerit of the focal plane shutter.

Q5) Answer any one of the following : **[16]**

a) You are asked to work as jury in a photography competition. Which elements of composition will you consider as the most important? Justify your answer.

b) Draw a neat diagram and discuss the construction and working of a SLR camera.

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P478

[3717] - 38

F.Y. B.Sc. (Vocational)

PHOTOGRAPHY & AUDIO - VISUAL PRODUCTION

Introduction to Mass Communication and Media Scene in India

(New) (Paper - II)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Give suitable examples and draw neat and labeled diagrams wherever necessary.***

Q1) Attempt any two of the following : **[16]**

a) Discuss 'Radio' as a medium of communication. Compare its role with television with reference to developing country like India.

b) What is news? Explain the difference between news and feature. Give suitable examples to support your answers.

c) Write and explain different characteristics of mass communication. Illustrate your answer with suitable examples.

Q2) Attempt any four of the following : **[16]**

a) With an appropriate example, explain the 5Ws and 1H in a news report.

b) Discuss the internet as a medium of mass communication.

c) Write a short note on 'inverted pyramid'.

d) What are the different Elements of News? Give suitable examples.

e) 'Communication is a process and not an event'. Explain this statement with suitable examples.

f) An interviewer should be "Jack of All". Explain with examples.

Q3) Attempt any four of the following : **[16]**

a) Describe in brief the Editorial department and the role of an Editor.

b) Explain the skills required for a television news anchor.

c) What do you understand by interpersonal and intrapersonal communication? Explain with suitable examples.

P.T.O.

d) Explain with diagram Newcomb's model of communication.

e) What is a tabloid and a daily? Discuss with a suitable examples.

f) Explain, with suitable example, the difference between interpersonal and intra personal communication.

Q4) Attempt any two of the following : **[16]**

a) Discuss the role of a subeditor and the chief sub editor in the news room.

b) Explain different types of communication based on number of participants with suitable examples.

c) Explain with diagram Shannon and Weaver's model of communication.

Q5) Write short notes on any four of the following : **[16]**

a) Seven 'C's of communication.

b) Phone in programs on radio.

c) Daily soaps.

d) Radio Jockey.

e) Inverted pyramid.

f) Regional television.

g) Role of editor in a news paper.

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