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F.Y. B.Sc.

BOTANY

BO - 111 : Fundamentals of Botany (Plant Diversity,

Plant Morphology and Anatomy)

(2013 Pattern) (Theory) (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) Neat labelled diagrams must be drawn wherever necessary.

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

a)   What are Algae?

b)   Give any two characters of Gymnosperms.

c)   Mention any two classes of Algae proposed by G.M. Smith (1955).

d)   Mention any two types of Lichens based on thallus structure.

e)   Write any two characters of Angiosperms.

f)   What is descriptive morphology?

g)   What is placentation?

h)   Mention any two importance of Anatomy.

Q2) Attempt Any Four of the following: **[16]**

a)   Write the symptoms of 'white rust' disease.

b)   Give general characters of Lichens.

c)   Write general characters of pteridophytes.

d)   Write importance of morphology in nomenclature.

e)   Describe any two modifications of leaf with examples.

f)   Describe types of meristem based on position.

P.T.O.

Q3) Write short notes on Any Four of the following: **[16]**

   a)   Structure of mycelium in Albugo (cystopus).

   b)   Prothallus in Nephrolepis.

   c)   Characters of Monocotyledons.

   d)   Bulb.

   e)   Functions of Roots.

   f)   Drupe.

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

   a)   Write general characters of Algae.

   b)   Describe Antheridium and Archegonium in Riccia.

   c)   Define aestivation and describe any four types of aestivation.

   d)   Define tissue. Explain characters and functions of collenchyma.

Q5) Describe male cone and megasporophyll with structure of ovule in Cycas.
[16]

<div align="center">OR</div>

Describe internal structure of Dicotyledon stem and monocotyledon stem.

<div align="center">●●●●●</div>

F.Y. B.Sc.

BOTANY

BO - 112 : Industrial Botany-I & II

(2013 Pattern) (Paper-II) (New)

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) Enlist any two resources used in timber industry.

    b) What is green house technology?

    c) Enlist methods of plant propagation.

    d) What is hardening in plant tissue culture?

    e) Define biofuel.

    f) What is Integrated pest management?

    g) Give any two products of penicillium.

    h) What is canning?

Q2) Attempt Any Four of the following: [16]

    a) Write the limitations of green house technology.

    b) What is the commercial significance of plant tissue culture?

    c) Write about plant resources used in mushroom cultivation.

    d) What is the source and applications of Indiara?

    e) What are the products and applications of yeast?

    f) Describe cold storage in fruit processing.

P.T.O.

Q3) Write short notes on Any Four of the following: [16]

    a)   Forest nursery.

    b)   Preparation of culture media for plant tissue culture.

    c)   Commercial significance of mushrooms.

    d)   Concept of biofuel.

    e)   Azadiractin.

    f)   Fungal genera used in enzyme and food industries.

Q4) Attempt Any Two of the following: [16]

    a)   Describe the cultivation practices in Rose.

    b)   What is layering? Give an account of air layering?

    c)   What are the types of pharmaceutical products? Add a note on churna, Asava and Arista.

    d)   What is fruit processing? Add a note on concept and need of fruit processing.

Q5) What is seed production? Write a note on seed processing and seed marketing with reference to cotton. [16]

OR

What are biofertilizers? Describe it's need and write about Nitrogen fixing biofertilizers.

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SEAT No. :

[Total No. of Pages : 2

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F.Y. B.Sc.

ZOOLOGY

ZY - 101 : Animal Systematics and Diversity-I & II

(2013 Pattern) (Paper-I)

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: [16]

a) Cytopyge.

b) Nomenclature.

c) Clitellum.

d) Nematoda.

e) Nictitating membrane.

f) Anura.

g) Urochordata.

h) Vocal sacs.

Q2) Write short notes on (Any Four): [16]

a) Salient features of class Cestoda.

b) Distinguishing characters of protista.

c) Morphology of Paramoecium.

d) Systematic position of frog.

e) Salient features of class - Pisces.

f) General characters of Hemichordata.

P.T.O.

Q3) Attempt the following (Any Four): [16]

    a)   Give the distinguishing characters of porifera.

    b)   State the distinguishing characters of phylum protozoa.

    c)   With the help of suitable diagrams describe the structure and functions of spermatheca in Earthworm.

    d)   Write note on neoteny in amphibia.

    e)   Describe the general characters of cephalochordata.

    f)   Sketch and label internal structure of Heart of Frog.

Q4) Attempt the following (Any Two): [16]

    a)   Describe the process of conjugation in paramoecium.

    b)   Describe the digestive system of Earthworm.

    c)   What is parental care? Give an account of parental care in any two amphibians.

    d)   With the help of labeled diagram describe the brain of frog.

Q5) Describe the central nervous system of Earthworm. [16]

<div align="center">OR</div>

Describe the sexual dimorphism in Frog. Explain in detail the male reproductive system of Frog.

<div align="center">●●●●●</div>

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F.Y. B.Sc.

ZOOLOGY

ZY - 102 : Fundamentals of Cell Biology and Genetics

(2013 Pattern) (Theory) (Paper-II)

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: **[16]**

    a)   Phenotype.

    b)   Cytoplasmic inheritance.

    c)   Complementary factor.

    d)   Incomplete dominance.

    e)   Peroxisomes.

    f)   Endoplasmic reticulum.

    g)   Cell cycle.

    h)   Mitochondrion.

Q2) Write short notes on (Any Four):   **[16]**

    a)   Phenyl ketonuria.

    b)   What are lethal Genes? Explain lethal genes in Mus musculus.

    c)   What is genetic counseling? Explain its importance.

    d)   Describe various branches of Cell Biology.

    e)   What are lysosomes? Give the functions of Lysosomes.

    f)   Define cytoplasm. Give its composition.

P.T.O.

Q3) Attempt the following (Any Four):   [16]

   a)   Describe the "Law of Dominance".

   b)   Write a note on Hypertrichosis.

   c)   Describe Down's Syndrome (Mongolism).

   d)   Sketch and label the "Structure of Mitochondrion".

   e)   Write a short note on "Eukaryotic cell".

   f)   Distinguish between "cytoplasmic stain and nuclear stain".

Q4) Attempt the following (Any Two):   [16]

   a)   What is sex determination? Explain XX-XY and ZZ-ZW methods of sex determination.

   b)   What is polygenic inheritance? Explain it with reference to skin colour in man.

   c)   Describe the ultrastructure of nuclear membrane with special reference to 'nuclear pore complex'.

   d)   Describe 'Fluid Mosaic Model' with the help of suitable figure.

Q5) Describe the morphological structure of a chromosome and add a note on various types of chromosomes.   [16]

<div align="center">OR</div>

Define Mitosis. Describe the process of mitosis with suitable figures.

<div align="center">●●●●●</div>

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F.Y. B.Sc.

MATHEMATICS

MT - 101 : Algebra and Geometry

(2013 Pattern) (Paper-I)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

1) All questions are compulsory.

2) Figures to right indicate full marks.

Q1) Attempt Any Eight of the following: [16]

a) Define partition of a non-empty set.

b) Compute addition table for Z_6.

c) Find the value of a, if $x + 2$ is a factor of $x^2 - ax + 6$.

d) Find the eigen values of a matrix $A = \begin{bmatrix} 2 & 3 \\ 0 & 4 \end{bmatrix}$.

e) Is system of following linear equations consistent? Justify your answer.

$$x + y = 1$$
$$2x + 2y = 1$$

f) Find the centre of conic $3x^2 - 4xy + 6y^2 + 11x - 17y + 13 = 0$.

g) Find the joint equation of the planes $2x + 3y - z = 0$ and $x - y + 5z = 0$.

h) Find the equations of the line through $(3, 1, 2)$ and perpendicular to the plane $2x - 2y + z + 3 = 0$.

P.T.O.

i) Find the centre and radius of the sphere

$$x^2 + y^2 + z^2 + 6x - 4y + 2z + 5 = 0.$$

j) Define cylinder.

Q2) Attempt Any Four of the following: **[16]**

a) Using principle of mathematical induction prove that 3 divides $n^3 + 2n$, where $n \in \mathbb{N}$.

b) If p is a prime integer and $a, b \in \mathbb{Z}$ such that $p \mid (a \cdot b)$, then prove that either $p \mid a$ or $p \mid b$.

c) Le $\sim$ be an equivalence relation on X. Prove that any two equivalence classes are either identical or disjoint.

d) Solve $x^3 - 9x^2 + 23x - 16 = 0$, whose roots are in A.P.

e) Find the eigen values and eigen vectors of $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$.

f) Examine the consistency of the system and if consistent solve it.

$$2x + 6y = -11$$
$$6x + 20y - 6z = -3$$
$$6y - 18z = -1$$

Q3) Attempt Any Two of the following: **[16]**

a) i) Find the g.c.d. of 3645 and 2357. Also find integers x and y such that $219 = 3645x + 2357y$.

ii) Let $a, b, c, d \in \mathbb{Z}$. If $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$ then prove that $ac \equiv bd \pmod{m}$.

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b) i) Solve: $27x^3 + 42x^2 - 28x - 8 = 0$, whose roots are in G.P.

   ii) If $f(x) \in R[x]$ is a non constant polynomial with root $a + ib$, then prove that $a - ib$ is also a root of $f(x)$, where $b \neq 0$.

c) Verify Cayley-Hamiltonian theorem for the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$

   and hence find A^{-1}.

Q4) Attempt Any Four of the following: **[16]**

a) By rotating the axes, origin being unchanged, the expression $ux + vy$ becomes $u'x' + v'y'$, show that $u^2 + v^2 = u'^2 + v'^2$.

b) Prove that every equation of first degree in x, y, z represents a plane.

c) Find the perpendicular distance of a point P(6, 6, −1) from the line $\dfrac{x-2}{1} = \dfrac{y-1}{2} = \dfrac{z+3}{-1}$. Also find the co-ordinates of its foot.

d) Find the co-ordinates of the centre and radius of the circle

   $x^2 + y^2 + z^2 - 2x - 4y + 2z - 30 = 0,\ 2x - y + 2z - 7 = 0$.

e) Find the condition that the plane $lx + my + nz = p$ is tangent plane to the sphere $x^2 + y^2 + z^2 = a^2$. Also find the point of contact.

f) Find the equation of right circular cylinder of radius 2 having an axis of the line $\dfrac{x-1}{2} = \dfrac{y-2}{1} = \dfrac{z-3}{2}$.

Q5) Attempt Any Two of the following: [16]

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

b)   i)   Show that the lines $\dfrac{x+3}{2} = \dfrac{y+5}{3} = \dfrac{z-7}{-3}$ and

$\dfrac{x+1}{4} = \dfrac{y+1}{5} = \dfrac{z+1}{-1}$ are coplaner and find the equation of the plane containing them.

ii) If the homogeneous second degree equation

$ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy = 0$ represents two planes, then prove that $abc + 2fgh - af^2 - bg^2 - ch^2 = 0$.

c)   i)   Find the equation of the sphere described on the line joining the points $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$ as end points of diameter.

ii) Find the equation of right circular cone with vertex at (2, 1, −1),

axis the line $\dfrac{x-2}{-1} = \dfrac{y-1}{1} = \dfrac{z+1}{3}$ and semivertical angle 30°.

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F.Y. B.Sc.

MATHEMATICS

MT - 102 : Calculus and Differential Equations

(2013 Pattern) (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.*

Q1) Attempt Any Eight of the following: [16]

a) Find greatest lower bound and least upper bound of the set

$$\left\{-\frac{1}{3}, \frac{7}{4}, -\frac{1}{5}, \frac{11}{6}, -\frac{1}{7} \ldots \ldots \right\}.$$

b) Solve the inequality $4 - 7x < 3x - 16$.

c) Use $\lim\limits_{x \to 0} \dfrac{\sin x}{x} = 1$ to evaluate $\lim\limits_{x \to 0} \dfrac{\sin 5x - \sin 3x}{x}$

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

e) If $y = \tan^{-1} x$ then prove that $(1 + x^2) y_2 + 2xy_1 = 0$.

f) Evaluate $\int_0^{\frac{\pi}{2}} \cos^5 x \, dx$.

g) Define non-homogeneous differential equation of first degree and first order.

h) Define self orthogonal family of curves.

P.T.O.

i) Solve: $\dfrac{dy}{dx} + \sqrt{\dfrac{4-y^2}{25-x^2}} = 0$.

j) Solve $(p-2)(p+3) = 0$, where $p = \dfrac{dy}{dx}$.

Q2) Attempt Any Four of the following: [16]

a) Prove that $|x+y| \le |x| + |y|, \forall\ x, y \in \mathbf{R}$.

b) Show that if $\lim\limits_{x \to a} f(x)$ exists then it is unique.

c) State and prove Rolle's theorem.

d) Evaluate $\lim\limits_{x \to 0} \dfrac{x\cos x - \log(1+x)}{x^2}$.

e) If $y = (x^2 - 1)^n$ then prove that $(x^2 - 1)y_{n+2} + 2xy_{n+1} - n(n+1)y_n = 0$.

f) Discuss the continuity of the function $f(x)$ at $x = 4$ where

$$f(x) = \dfrac{x^2}{4} - 4, \quad \text{if } 0 < x < 4$$
$$= 0 \qquad , \quad \text{if } x = 4$$
$$= 4 - \dfrac{64}{x^2}, \quad \text{if } x > 4.$$

Q3) Attempt Any Two of the following: [16]

a) Let f be a continuous function on a closed and bounded interval $[a, b]$ such that $f(a)$ and $f(b)$ are of opposite signs. Then prove that there is at least one c in (a, b) such that $f(c) = 0$.

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b) i) If $y = e^{ax} \cos x \sin x$ then prove that

$$y_n = \frac{1}{2} e^{ax} (a^2 + 4)^{n/2} \sin\left[2x + n\tan^{-1}\left(\frac{2}{a}\right)\right].$$

ii) Use Taylor's theorem to express the polynomial $2x^3 + 7x^2 + x - 6$ in powers of $(x - 2)$.

c) i) Prove the Maclaurin's series expansion $e^{\sin x} = 1 + x + \frac{x^2}{2} - \frac{x^4}{8} + \cdots$.

ii) Evaluate $\lim\limits_{x \to 0}(\operatorname{cosec} x)^{\frac{1}{\log x}}$

Q4) Attempt Any Four of the following: **[16]**

a) Evaluate $\int \dfrac{x^2 + 1}{(x^2 - 1)\,(x^2 - 4)}dx$.

b) Solve: $\dfrac{dy}{dx} = \tan^2(x + y)$.

c) Solve: $x^3 dx - (x + y^3)dy = 0$.

d) Explain the method of solving differential equation $\dfrac{dy}{dx} + p(x)y = q(x)y^n$.

e) Find the orthogonal trajectories of the family of curves $x^2 + y^2 = 2ax$.

f) Define Clairaut's equation and explain the method of solving it.

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Q5) Attempt Any Two of the following: [16]

a) If $I_n = \int (a^2 + x^2)^{\frac{n}{2}}\, dx$ then prove that $I_n = \dfrac{x}{n+1}(a^2 + x^2)^{\frac{n}{2}} + \dfrac{na^2}{n+1} I_{n-2}$

Hence evaluate $\int (a^2 + x^2)^{\frac{3}{2}} dx$.

b) State and prove necessary and sufficient condition for differential equation M dx + N dy = 0 to be exact.

c) i) Solve: $(x^2 y^2 + 5xy + 2)\, y\, dx + (x^2 y^2 + 4xy + 2)\, x\, dy = 0$.

ii) Solve: $y = -px + p^2 x^4$.

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F.Y. B.Sc.
CHEMISTRY-II
Organic and Inorganic Chemistry
(2013 Pattern) (Paper-II) (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: **[16]**

     a)   Explain the term tautomerism with suitable example.

     b)   Draw zigzag structure for the following compounds

         i)   Isopropyl alcohol   ii)   Hexanal

     c)   Explain the following terms.

         i)   Enantiomers   ii)   Configuration

     d)   Acetic acid is weaker acid than chloroacetic acid. Explain.

     e)   Benzaldehyde doesnot undergo Aldol condensation. Explain.

     f)   Alkali metals are more reactive than alkaline earth metals. Explain.

     g)   Define:

         i)   Ionization energy   ii)   Electronegativity

     h)   Why group VI A elements are named as chalcogens?

Q2) Attempt Any Four of the following: **[16]**

     a)   Discuss conformational isomerism in propane with energy profile diagram.

     b)   What is inductive effect? Give different types of inductive effect. Why dimethylamine is stronger base than methylamine?
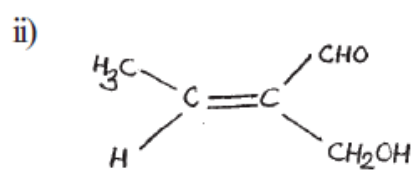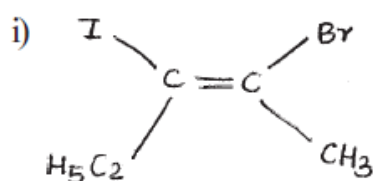
P.T.O.

c) What are alkenes? Give major and minor products when propene reacts with

   i) HBr

   ii) $H_2O / H^{\oplus}$.

d) What are alcohols? Give classification of alcohols. How will you prepare ethyl alcohol by using Grignard's reagent.

e) What are carboxylic acids? How will you prepare acetic acid from -

   i) Acetonitrile

   ii) Dry ice

f) What are phends? What is the action of following reagents on phenol?

   i) dil HNO_3

   ii) Br_2 / water

Q3) Attempt Any Four of the following: [16]

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

   i) Propene

   ii) 2-bromopropane

b) What are amines? How will you prepare aniline from

   i) benzene

   ii) benzamide

c) What are alkyl halides? What is the action of CH_3MgBr on the following compounds?

   i) acetaldehyde

   ii) acetone

d) Assign E or Z configuration of the following compounds

i)

ii)

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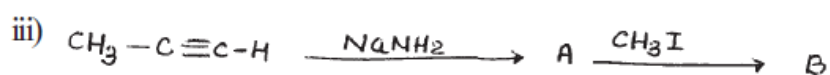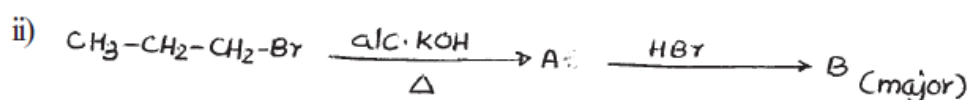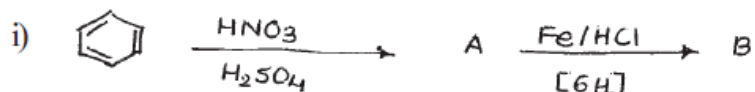
e) What are aldehydes? Explain perkin reaction with suitable example.

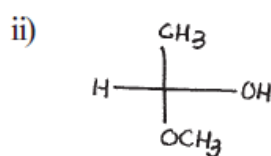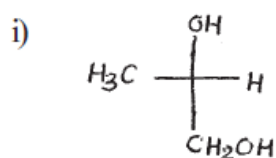f) What is hyperconjugation? Write different hyperconjugative structures for toluene.

Q4) Attempt Any Four of the following: [16]

a) Identify the products Ⓐ and Ⓑ and rewrite the reactions cany two.

i) $\underset{\underset{H_2SO_4}{\overset{HNO_3}{\longrightarrow}}}{\bigcirc}$ A $\xrightarrow[[6H]]{Fe/HCl}$ B

ii) $CH_3-CH_2-CH_2-Br \xrightarrow[\triangle]{alc.KOH}$ A $\xrightarrow{HBr}$ B (major)

iii) $CH_3-C\equiv C-H \xrightarrow{NaNH_2}$ A $\xrightarrow{CH_3I}$ B

b) Assign R or S configuration of the following compounds

i)
$$H_3C \underset{CH_2OH}{\overset{OH}{\underset{|}{\overset{|}{-}}}} H$$

ii)
$$H \underset{OCH_3}{\overset{CH_3}{\underset{|}{\overset{|}{-}}}} OH$$

c) Write short notes on -

i) Saytzeff's rule

ii) Huckel rule of aromaticity

d) What is hybridisation? Discuss formation of acetylene molecule using the concept of hybridisation.

e) Explain anomalous behaviour of Boron in group III A elements.

f) Explain the diagonal relationship between beryllium and aluminium.

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Q5) Attempt Any Four of the following: [16]

a) Explain the periodicity in properties of alkaline earth metals with respect to atomic size and ionization energy.

b) Give the names of group IA elements and write electronic configuration for group IA elements.

c) Describe the separation of alkali metals using crown ethers.

d) Write note on silicates.

e) Draw the structures of Al_2Br_6, IF_7, H_2SO_4 and ClF_3.

f) Explain the periodicity in properties of Group V A elements with respect to Ionization energy and Electronegativity.

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F.Y. B.Sc.

CHEMISTRY-II

Organic and Inorganic Chemistry

(2013 Pattern) (Paper-II) (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: [16]

  a) Explain the term tautomerism with suitable example.

  b) Draw zigzag structure for the following compounds

    i) Isopropyl alcohol   ii) Hexanal

  c) Explain the following terms.

    i) Enantiomers   ii) Configuration

  d) Acetic acid is weaker acid than chloroacetic acid. Explain.

  e) Benzaldehyde doesnot undergo Aldol condensation. Explain.

  f) Alkali metals are more reactive than alkaline earth metals. Explain.

  g) Define:

    i) Ionization energy   ii) Electronegativity

  h) Why group VI A elements are named as chalcogens?

Q2) Attempt Any Four of the following: [16]

  a) Discuss conformational isomerism in propane with energy profile diagram.

  b) What is inductive effect? Give different types of inductive effect. Why dimethylamine is stronger base than methylamine?
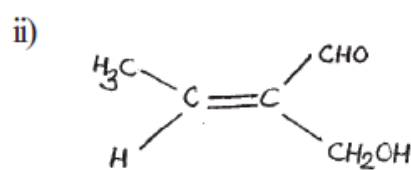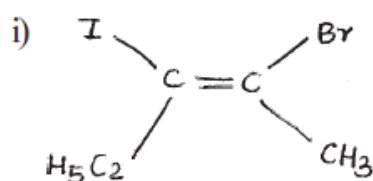
P.T.O.

c) What are alkenes? Give major and minor products when propene reacts with

   i)   HBr

   ii) $H_2O / H^{\oplus}$.

d) What are alcohols? Give classification of alcohols. How will you prepare ethyl alcohol by using Grignard's reagent.

e) What are carboxylic acids? How will you prepare acetic acid from -

   i)   Acetonitrile

   ii)   Dry ice

f) What are phends? What is the action of following reagents on phenol?

   i)   dil HNO_3

   ii) Br_2 / water

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

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

   i)   Propene

   ii)   2-bromopropane

b) What are amines? How will you prepare aniline from

   i)   benzene

   ii)   benzamide

c) What are alkyl halides? What is the action of CH_3MgBr on the following compounds?

   i)   acetaldehyde

   ii)   acetone
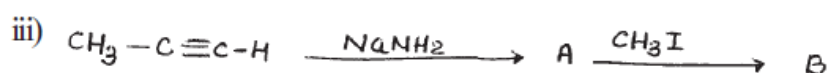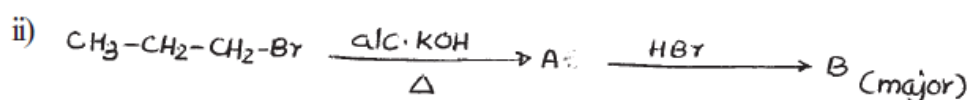
d) Assign E or Z configuration of the following compounds

e) What are aldehydes? Explain perkin reaction with suitable example.

f) What is hyperconjugation? Write different hyperconjugative structures for toluene.

Q4) Attempt Any Four of the following: [16]

a) Identify the products (A) and (B) and rewrite the reactions cany two.

i) $\text{Benzene} \xrightarrow[\text{H}_2\text{SO}_4]{\text{HNO}_3} \text{A} \xrightarrow[\text{[6H]}]{\text{Fe/HCl}} \text{B}$

ii) $CH_3-CH_2-CH_2-Br \xrightarrow[\Delta]{alc.KOH} A \xrightarrow{HBr} B \ (major)$

iii) $CH_3-C\equiv C-H \xrightarrow{NaNH_2} A \xrightarrow{CH_3I} B$

b) Assign R or S configuration of the following compounds

i)
```
        OH
        |
 H3C ---+--- H
        |
      CH2OH
```

ii)
```
       CH3
        |
  H ----+---- OH
        |
       OCH3
```

c) Write short notes on -

i) Saytzeff's rule

ii) Huckel rule of aromaticity

d) What is hybridisation? Discuss formation of acetylene molecule using the concept of hybridisation.

e) Explain anomalous behaviour of Boron in group III A elements.

f) Explain the diagonal relationship between beryllium and aluminium.

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Q5) Attempt Any Four of the following: [16]

    a)   Explain the periodicity in properties of alkaline earth metals with respect to atomic size and ionization energy.

    b)   Give the names of group IA elements and write electronic configuration for group IA elements.

    c)   Describe the separation of alkali metals using crown ethers.

    d)   Write note on silicates.

    e)   Draw the structures of Al_2Br_6, IF_7, H_2SO_4 and ClF_3.

    f)   Explain the periodicity in properties of Group V A elements with respect to Ionization energy and Electronegativity.

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[5017]-123

F.Y.B.Sc.
ELECTRONIC SCIENCE
EL 101 : Principles of Analog Electronics
(2013 Pattern) (New Syllabus) (Paper-I)

Time : 3 Hours] *[Max. Marks : 80*
Instructions to candidates:
1) *All questions are compulsory.*
2) *Neat and labelled diagram must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of calculator and log table is allowed.*

Q1) Answer the following questions in brief. **[16]**
- a) State Thevenin's Theorm.
- b) Draw circuit symbols of
  - i) UJT
  - ii) JFET
- c) Define
  - i) CMRR
  - ii) Slew rate of OPAMP
- d) What is reactance ? Define capacitive and inductive reactance.
- e) State the essential biasing condition in order to operate transistor in active region.
- f) Give the colour code for
  - i) $47k\Omega$, 10% tolerance
  - ii) $100k\Omega$, 5% tolerance.
- g) Draw I-V characteristics of zener diode.
- h) A two stage amplifier has $AV_1 = 200$ and $AV_2 = 50$. Find the total gain in dB.

Q2) Attempt any four of the following: **[16]**
- a) i) What is transformer ? Draw its circuit symbol. Define efficiency of transformer.
  - ii) What is switch ? State at least two types of switches.
- b) With a neat diagram explain RC low pass filter circuit. Explain cut off frequency relation.
- c) Draw block diagram of regulated power supply. Explain function of each block in brief.

P.T.O.

d) Define clipper. Explain any one type of clipper circuit in brief.

e) Explain transistor as a switch.

f) Draw circuit diagram of OPAMP as inverting configuration. Derive the expression for its output voltage.

Q3) Attempt any four of the following [16]

a) i) What is fuse? Explain its use in electronic equipments.

ii) Differentiate between primary and secondary cells.

b) Explain concept of phase difference - Draw waveforms to show phase differences of

i) 0^0

ii) 90^0

iii) 180^0

c) Explain working of half wave rectifier. Draw input output waveforms.

d) Give classification of amplifiers on the basis of its operating point. Explain it using d.c.load line.

e) Draw equivalent circuit of UJT. Explain its working and define intrinsic stand off ratio.

f) Explain schmitt trigger circuit using opamp. Derive relation for UTP and LTP.

Q4) Attempt any four of the following. [16]

a) i) Explain fiber cable.

ii) What is connector? Give its two applications.

.

b) Distinguish between common base and common emitter configuration of trasistor.

c) Describe operating principle of photodiode.

d) Describe emitter characteristics of UJT. Show different regions on characteristics.

e) Explain block diagram of opamp.

f) Using Maximum power transfer theorm,determine the values of R_L and power delivered of the following circuit.
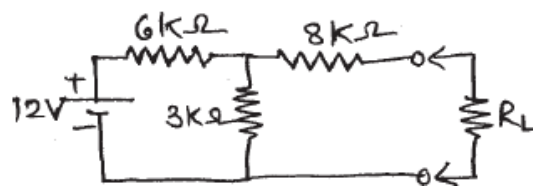
Q5) Attempt any four of the following.   **[16]**

   a)   i)   Two capacitors of values 10 µF and 20 µF are connected in series. What is its effective capacitance? Also estimate the capacitance value when connected in parallel.

       ii)   A transformer is marked as 230V AC, 50 Hz, 0-9 V, 500 mA. Explain the meaning of each of them.

   b)   State and prove superposition theorm.

   c)   i)   Draw circuit symbols of

          1)   MOSFET.

          2)   BJT.

       ii)   Explain potential divider biasing method for transistor.

   d)   Explain FET as Voltage Variable Resistor (VVR)

   e)   Explain how RC circuit works as integrator.

   f)   Find output voltage (V_o) of following circuit.
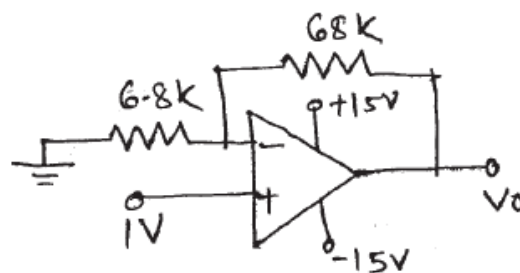
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F.Y.B.Sc.

ELECTRONIC SCIENCE

EL-102 : Principles of Digital electronics

(Paper II) (New -2013 Pattern)

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) *Figures to the right indicate full marks.*
4) *Use of calculator is allowed.*

Q1) Answer the following questions in brief.   **[16]**

    a)   What is an ASCII code ?

    b)   What is k-map ? Where it is used ?

    c)   What is multiplexer ? Write it's application.

    d)   Define half adder. Write it's truth table.

    e)   Convert following numbers into 1's Complement 101101 ,100010.

    f)   What is flip flop ? Write different types of flipflops.

    g)   List important characteristics of logic families.

    h)   State the advantages of Schottky TTL over standard TTL.

Q2) Answer <u>any four</u> of the following: **[16]**

    a)   Draw the circuit of 3-input DTL NAND gate. Explain it's action.

    b)   Differentiate synchronous and asynchronous counters.

    c)   Construct 8:1 multiplexer using two 4:1 multiplexers and give it's function table.

    d)   Perform subtraction using 1's complement method.

       i) $(20)_{10} - (14)_{10}$

       i) $(45)_{10} - (22)_{10}$

    e)   Draw the logic circuit and obtain the truth table for the following expression.

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

    f)   With suitable example explain Gray code system.

P.T.O.

Q3) Attempt any four of the following. [16]

   a)   Describe BCD to seven segment display decoder/driver.

   b)   Draw the circuit of 3-bit asynchronous up counter. Write it's truth table.

   c)   Compare CMOS and TTL logic families.

   d)   Explain NOR gate circuit with transistor.

   e)   State and verify Demorgan theorem.

$$\overline{(A \cdot B)} = \overline{A} + \overline{B}$$

   f)   Perform subtraction using 2's Complement method.

      i) $(56)_{10} - (34)_{10}$

      ii) $(69)_{10} - (41)_{10}$

Q4) Answer any four of the following. [16]

   a)   Draw the logic symbol of full adder and write it's truth table.

   b)   Simplify the following logic expression using k-map.

$$Y = \overline{A} B \overline{C} D + A B \overline{C} D + A B C D + A \overline{B} C \overline{D}$$

   c)   Explain application of EXOR Gate as parity checker.

   d)   Explain D-Flipflop with proper diagram and truth table.

   e)   Explain Decimal to BCD encoder with the help of logic diagram.

   f)   Explain decade counter with proper logic circuit and truth table.

Q5) Attempt any four of the following. [16]

   a)   What is logic gate ? List different logic gates.

   b)   What is ring counter ? Write it's applications.

   c)   Design basic AND gate using only NOR gates.

   d)   What is the difference between decoder and de-multiplexer.?

   e)   Explain how EXOR gate can work as two bit Comparator.

   f)   Explain 1:2 Demultiplexer using suitable circuit.

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F.Y.B.Sc.

MICROBIOLOGY

Introduction to Microbiology

(2013Pattern) (Paper - I)

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 rigth indicate full marks.*

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

   a)   What are buffers? Give two examples.

   b)   Name any two diseases caused by Bacteria.

   c)   Define - Nucleotides.

   d)   Name any two endospore producing bacteria.

   e)   Give any two ways in which Normal flora is useful to the host.

   f)   Match the following-

      i)   Beadle & Tatum   a)   Plant viruses

      ii)   Edwadrd Jenner   b)   Genes and mutation

                            c)   Vaccination

   g)   Fill in the Blanks-

      The organs of motility in <u>Paramoecium</u> are _____ and in Entamoeba are _____.

   h)   State True or False-

      i)   Glycogen bodies are stores of carbohydrates.

      ii)   Gram negative cell wall contains high percentage of peptidoglycan as compared to Gram positive cell wall.

P.T.O.

Q2) Write short notes on Any four:- [16]

   a) Developments in chemotherapy.

   b) River's postulates.

   c) Metachromatic granules.

   d) Types of spores in Fungi.

   e) Immunoglobulins.

   f) Functions of cell membrane.

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

   a) Enlist any four diseases caused by Rickettsia. Name their vectors.

   b) Give a brief account of food and dairy microbiology.

   c) Give applications and advantages of Bio control agents.

   d) Discuss in brief the ICTV classification of viruses.

   e) Write short note on Medical Microbiology.

   f) State and describe germ theory of fermentation.

Q4) Answer any two of the following: [16]

   a) Give the general characters of Bacteria. Add a note on Archae bacteria.

   b) Explain with neat labelled diagram Swan neck flask experiment by Pasteur to disprove spontaneous Generation Theory.

   c) What is RNA? Give its types, and explain their function and structure.

   d) Name the different types of bonds in Biomolecules. Explain co- valent bonds in detail.

Q5) Attempt Any One of the following. [16]

   a) Describe structure and function of flagella in bacteria.

   b) What are carbohydrates? Give its classification and describe their functions with suitable examples.

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F.Y.B.Sc.

MICROBIOLOGY

Basic Techniques in Microbiology

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

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 rigth indicate full marks.*

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

   a)   Name two examples of acidic stains.

   b)   What is gaseous sterilization? Give one example.

   c)   Match the following.

      i)   Peptone   - 'C'   Source

      ii)   Glucose   - 'C' &/'N' Source

                                      - Growth factors source.

   d)   Define - Lyophilization.

   e)   Define - Generation time.

   f)   State true or false.

      i)   Direct microscopic count is used to enumerate viable bacteria

      ii)   Diauxic growth curve shows one log phase

   g)   What are acidophiles? Give any one example of acidophilic bacteria.

   h)   Define - oligodynamic action of heavy metals.

Q2) Write short notes on any four.   **[16]**

P.T.O.

a) Direct microscopic count method.

b) Cultivation of photosynthetic bacteria.

c) Role of accentuators in staining.

d) Phenol coefficient.

e) Use of agar - in microbiological media.

f) Magnification in compound microscopy.

Q3) Attempt any four of the following. [16]

a) What is differential medium? Explain with suitable example.

b) With neat labelled diagram explain growth phases of bacterial culture.

c) What is culture collection centre? Give it's role.

d) Explain the mechanism of Gram's staining.

e) Describe filtration as a method of sterilization.

f) What are chromatic aberrations?

Q4) Answer any two. [16]

a) With suitable diagram explain the principle of dark field microscope.

b) Describe plate count methods for enumeration of bacteria.

c) What is disinfection? Explain the mode of action of any two disinfectants.

d) Explain the effect of pH and temperature on the growth of bacteria.

Q5) Attempt any one of the following. [16]

a) What is sterilization? Explain the use of heat for sterilization.

b) Explain nutritional requirements of micro - organisms. Give nutritional classification of bacteria with suitable examples.

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F.Y.B.Sc.

GEOGRAPHY - I

Gg 110 : Geomorphology

(New Course) (2013 Pattern) (Paper - I)

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

Instructions to the candidates:

1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Use of map stencils is allowed.*

Q1) Answer the following in twenty words (Any Eight). [16]

   a) What is astnehosphere?

   b) List the branches of physical Geography.

   c) What is Isostasy?

   d) What are 'P' Waves?

   e) What is a major Plate?

   f) How are igneous rocks formed?

   g) What is weathering?

   h) What are 'V' shaped valleys?

   i) What are moraines?

   j) What is a Pedestal rock?

Q2) Explain the following in 150 words (Any four): [16]

   a) Division of geological time scale into eras.

   b) Temperature variations in the layers of the interior of the earth.

P.T.O.

c)   Evidences in support of the continental drift theory.

d)   Biological weathering.

e)   Types of mass movements.

f)   Cross profile of a river.

Q3) Answer the following in 150 words (Any four):   [16]

a)   Composition of the interior of the earth.

b)   What is horst and graben structure? Explain with diagram.

c)   Discuss the types of volcanic erruptions in brief.

d)   Discuss components of a sea wave.

e)   What is a barkhan? Explain it with a neat labelled diagram.

f)   How is a sea arch formed? Explain it with a diagram.

Q4) Answer the following in 300 words: (Any two)   [16]

a)   Define Geomorphology and discuss the importance of its study.

b)   What are crustal movement? Discuss any three types of folds.

c)   What is chemical weathering? Discuss any two types in detail.

d)   Explain the processes of sea-wave erosion.

Q5) Answer the following in 500 words: (Any one)   [16]

What is the plate tectonics theory? Discuss its evolution and the different types of plates and plate margins.

OR

What are the three basic river mechanisms? Explain erosion and discuss any four erosional features.

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F.Y.B.Sc.

GEOGRAPHY - II

Gg - 120 : Climatology and Oceanography

(2013Pattern) (Paper - II)

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 wherever necessary.*
4) *Use of map stencil is allowed.*

Q1) Answer the following in twenty words (Any Eight).   **[16]**

a) What is Insolation?

b) What is Lapse rate?

c) What is condensation?

d) What do you mean by El Nino?

e) What do you mean by pressure gradient?

f) Define Oceanography.

g) What is continental shell?

h) What do you mean by Tides?

i) What is wave length?

j) Define submarine relief.

Q2) Explain the following in 150 words (Any four):   **[16]**

a) Nature of climatology.

b) Temperature inversion.

P.T.O.

c) Humidity.

d) Salinity of partially Landlocked seas.

e) Dead sea.

f) Causes of tides.

Q3) Answer the following in 150 words (Any four): [16]

a) Importance of climatology.

b) Albedo of the Earth.

c) South west monsoon winds.

d) Submerged coast.

e) Relief structure of pacific ocean.

f) Dalmation coast.

Q4) Answer the following in 300 words (Any two). [16]

a) Explain the structure of atmosphere.

b) Describe low clouds in details.

c) Explain the causes of ocean currents.

d) Explain the factors affecting distribution of salinity.

Q5) With a neat diagram explain the distribution of pressure belts over the earth's surface. [16]

OR

Explain nature and scope of Oceanography.

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F.Y. B.Sc.

PHYSICS-I

Mechanics, Heat and Thermodynamics

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

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

   a)   State and explain Newton's second law of motion.

   b)   Define potential energy of a body. Give its SI unit.

   c)   State Pascal's law.

   d)   Calculate the Poisson's ratio for metal, if Young's modulus of metal is 8×10^{10} N/m^2 and modulus of rigidity is 3×10^{10} N/m^2.

   e)   Define critical temperature and critical pressure of the gas.

   f)   State first law of thermodynamics. Give it's physical significance.

   g)   Give the principle of resistance thermometer.

   h)   Calculate the efficiency of the Carnot's engine working between 100°C and 0°C.

Q2) Attempt Any Four of the following: **[16]**

   a)   What is pseudo force? Illustrate with examples.

   b)   Explain the term work done. Calculate the work done by a constant force.

P.T.O.

c) Describe in detail Jaeger's method to determine surface tension of a liquid.

d) A body of mass 8 kg at rest is subjected to a force of 32 N. What is the kinetic energy acquired by the body at the end of 5 sec.

e) Show that the work done of a body during volume strain is $\frac{1}{2} \times$ volume stress × change in volume.

f) A metal cube of side 6 cm and relative density 8 gm/cm³ is suspended by a string so as to be completely immersed in a liquid of density 1.2×10^3 kg/m³. Find the tension in the string.

Q3) Attempt Any Four of the following: [16]

a) Describe Andrew's experiment on carbondioxide.

b) Prove that slope of adiabatic curve through a point in P-V diagram is r times the slope of the isothermal curve through the same point.

c) Derive first Tds equation.

d) A 1.5 litre of hydrogen at 137°C and 10^6 dynes cm⁻² pressure expands isothermally, until it's volume is doubled. Find the pressure of the gas.

e) Calculate the change in entropy when 20 gm of ice at 0°C is converted into water at the same temperature. (Given: latent heat of fusion = 80 cal/ gm).

f) The resistance of platinum wire is 6 ohm at 0°C and 7.2 ohm at 100°C. Calculate the temperature coefficient of resistance.

Q4) Attempt Any Two of the following: [16]

a) State and prove Bernoulli's theorem.

b) i) What is torsional oscillations? Derive an expression for the modulus of rigidity (η)

   ii) What force is required to accelerate 1200 kg car from 5 m/s to 25 m/s in time of 5 sec?

[5017]-103   2

c) i) Show that the value of Poisson's ratio lies between-1 and 0.5.

ii) Calculate the surface tension of the liquid which rises 50 cm in a circular tube, 0.04 mm in diameter. Relative density of the liquid is 0.8. (Given - the angle of contact = 20°).

Q5) Attempt Any Two of the following: [16]

a) Explain diesel cycle with an indicator diagram. Obtain an expression for the efficiency of the diesel engine.

b) i) State the principle of a refrigerator and explain the coefficient of performance of the refrigerator.

ii) The Van-der-Waal's constant for a gas are $a = 1.328 \times 10^2$ dynes cm^3/mole and $b = 32$ cm^3/mole upto what maximum temperature will the Joule-Thomson expansion produce cooling? ($R = 8.31$ J/mole-K).

c) i) Explain construction and working of gas filled thermometer.

ii) Find the increase in boiling point of water at 100°C when pressure is increased by one atmosphere, where 1 gm of water vapour occupies volume 1598 cm^3. (Latent heat of fusion = 540 cal/gm).

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F.Y. B.Sc.

PHYSICS-II

Physics Principles and Applications and Electromagnetics

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

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

Instructions to the candidates:

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

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

a) Define wave length. Calculate wave length of the wave with frequency of 4 GHz.

b) Give the equation of wave length in Paschen Series of hydrogen atom.

c) Define ionic bond. Give example.

d) What do you meant by stimulated emission?

e) Give the relation between $\vec{B}$, $\vec{M}$ and .

f) State Ampere's Circuital law.

g) Define terms - Electric dipole and dipole moment.

h) Calculate the electric field intensity due to a point charge 2×10^{-10} C at a distance of 1 m away from it

[Given - $\epsilon_0 = 8.85 \times 10^{-12}$ C^2/N–m^2]

Q2) Attempt Any Four of the following: **[16]**

a) Explain Laser action using four level energy system.

b) Explain in short X-ray radiography.

P.T.O.

c) What is meant by metallic bonding? Explain the properties of metallic crystal.

d) The vibration frequency for a diatomic molecule HF is 1.24×10^{14} Hz. The mass of hydrogen atom and fluorine atom are 1.67×10^{-27} kg and 3.15×10^{-26} kg respectively. Find force constant K. For interatomic force.

e) A microwave radiation has a frequency of 12 GHz. What would be the energy of the photon corresponding to this radiation?

[Given - h = 6.626×10^{-34} Js]

f) Find the wave number of second line of the Paschen Series.

[Given - R = 1.097×10^{7} m^{-1}]

Q3) Attempt Any Four of the following: [16]

a) Obtain an expression for torque on a dipole placed in an uniform electric field.

b) Using Biot - Savart's, obtain expression for magnetic field produced in long straight conductor.

c) What is hysteresis? Using hysteresis curve explain the terms retentivity and coercivity.

d) A solenoid of 300 turns/m is carrying a current of 4 Amp. If the core is made of iron, which has a relative permeability of 5000, determine the magnetic intensity H, magnetization M and magnetic induction B inside the core [Given - $\mu_\sigma = 4\pi \times 10^{-7}$ Wb/A-m]

e) Calculate the force between two balls each having a charge of 16 μC and are 10cm apart.

[Given - $\in_0 = 8.85 \times 10^{-12}$ C^2/N–m^2]

f) Two point charges in a dielectric medium having K = 5.2 interact with a force of 8.6×10^{-3} N. What would be the force if the charges were in free space?

Q4) Attempt Any Two of the following: [16]

   a)   State principle and applications of following

      i)   Microwave Oven

      ii)   RADAR

      iii) Pyroelectric thermometer

      iv) Solar cell

   b)   i)   Give the physical properties of covalent compounds.

      ii)   The series limit wavelength for Balmer series of hydrogen spectrum

          is 3645   . Calculate the value of Rydberg constant.

   c)   i)   What are the advantages of Bohr's model?

      ii)   The lowest vibrational states of the NaCl molecule are 0.063 eV apart. Find approximate force constant of this molecule.

          [Given - Mass of Na = 3.82×10^{-26} kg Mass of Cl = 5.81×10^{-26} kg].

Q5) Attempt Any Two of the following: $\overset{\circ}{A}$ [16]

   a)   Obtain an expression for electric field intensity on the axis of charged disc.

   b)   i)   Explain polar and non-polar molecule. What will be the effect of electric field on them?

      ii)   An aluminium wire of diameter 0.3 cm carries a current of 15 Amp. Find the magnetic field on the surface of the wire.

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

   c)   i)   Derive an expression for the magnetic field at a point inside the winding of torid.

      ii)   A bar magnet made of iron has magnetic moment 3.0 A-m² and mass 3×10^{-3} kg. If the density of iron is 6×10^{-3} kg/m³, find the intensity of magnetization.

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F.Y.B.Sc. (Vocational)
COMPUTER HARDWARE & NETWORK ADMINISTRATION
Essentials of Computers
(Paper - I) (2013 Pattern) (78710)

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 flash memory ?

b) What is BIOS ?

c) Why Hard disc drive is a fixed disc kind of a drive ?

d) What is USB ?

e) What is instruction prefetch ?

f) Write full forms of : UPC, EBCDIC, ALU, MODEM.

g) What is MOUSE?

h) Define Microprocessor.

Q2) Attempt any FOUR: **[16]**

a) What is SIMM/DIMM ? Explain their need.

b) Distinguish between Dot Matrix / Inkjet printer.

c) Write in short about computer generations.

d) Write a short note on: MICR Scanner.

e) Give details of the components connected to motherboard.

f) Write short note on RAM.

P.T.O.

Q3) Attempt any FOUR : [16]

  a)   Write a short note on LASER printer.

  b)   What is packing of microprocessor ? How the cooling is achieved ?

  c)   What is Clock ? How it is obtained in computer ?

  d)   What is formatting ? What are different utility tools in computer ?

  e)   Explain bus structure in computer.

  f)   Explain CD - ROM.

Q4) Attempt any TWO: [16]

  a)   Write a note on Memory for computer giving details of Auxillary and Main Memory.

  b)   i)   How sound is generated for the computer to be produced from mike ?

    ii)   Comment on characteristics of computer.

  c)   Explain offline and online UPS.

Q5) Attempt any TWO: [16]

  a)   Write a note on Displays. What is VDU ?

  b)   i)   Write a short note on DMA.

    ii)   What is digitizer ?

  c)   Write notes on

    i)   Cables & connectors

    ii)   Front & rare panel of CPU

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F.Y.B.Sc. (Vocational)

COMPUTER HARDWARE & NETWORK ADMINISTRATION

Computer Organisation (Hardware & Software Aspects)

(2013 Pattern) (Paper-II) (78720)

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

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

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

    a) Define LAN.

    b) What is HDMI?

    c) Define Assembler.

    d) What is simulator?

    e) Explain firmware with example.

    f) List different segment registers of 8086.

    g) What is debugger?

    h) Explain flag register of 8086.

Q2) Attempt any FOUR :   **[16]**

    a) Explain any two logical instructions of 8086.

    b) Write notes on ANDROID Operating System.

    c) Write notes on Wi-Fi System.

    d) Define Math coprocessor.

    e) Explain main functions of Operating System.

    f) What is multimedia?

P.T.O.

Q3) Attempt any FOUR: [16]

    a) Explain application software with examples.

    b) Define algorithm with example.

    c) What is Tri state buffer.

    d) Define System Software.

    e) Write notes on microprocessor.

    f) Draw and explain different symbols used in flow chart.

Q4) Answer any TWO : [16]

    a) Explain logical system architecture of computer with block diagram.

    b) Explain different network topologies in detail.

    c) Define

        i) POST.

        ii) Emulator.

Q5) Attempt any TWO [16]

    a) Explain Network Operating System and its main functions.

    b) Explain data transfer and arithmetical instructions of 8086.

    c) Define

        i) Internet.

        ii) Control panel of window.

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Total No. of Questions : 5]

P675

[5017]-113

F.Y.B.Sc.
STATISTICS / STATISTICAL TECHNIQUES
Descriptive Statistics
(Paper - I) (2013 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)   Use of statistical tables and calculator is allowed.
  4)   Symbols have their usual meanings.

Q1) Attempt each of the following:

 a)   i)   Define SRSWOR.   [1]

      ii)   Define the term open end class.   [1]

      iii) State any two demerits of median.   [1]

      iv)   Define the term primary data.   [1]

 b)   Choose the correct alternative for the following: [1 each]

      i)   Variance of X is the

            A)   First raw moment.   B)   Second raw moment.

            C)   Second central moment.   D)   First central moment.

      ii)   If X is constant then corr (X, Y) is:

            A)   1   B)   −1

            C)   0   D)   Indeterminate

      iii) Yule's coefficient of association lies between

            A)   [0, 1]   B)   [−1, 1]

            C) $(0, \infty)$ D) $(-\infty, \infty)$

      iv)   If mode of the frequency distribution is 35, mean is 31, then the coefficient of skewness is

            A)   Greater than zero.   B)   Less than zero.

            C)   Equal to zero.   D)   Cannot be determined.

P.T.O.

c) i) Find geometric mean from the following set of observations:

2, 24, 38, 46, 12   [2]

ii) Find third central moment if   [2]

$\mu_1'=10, \ \mu_2'=40, \ \mu_3'=80$

iii) Explain the term population with an illustration.   [2]

iv) Explain the term continuous variable with an illustration.   [2]

Q2) Attempt any Four of the following: [4 each]

a) Show that covariance is invariant to the change of origin.

b) Show that, S.D. $\geq$ M.D. about mean.

c) You are given the following information about two variables X and Y.

$n = 10, \ \Sigma x^2 = 385, \ \Sigma y^2 = 192, \ \bar{x}=5.5, \ \bar{y}=4, \ \Sigma(x-\bar{x})(y-\bar{y})=-35$

Find regression line of Y on X.

d) Calculate Fisher's price index number using following data:

Item	Base year		Current year	
	Price	Quantity	Price	Quantity
A	18	2	24	1.5
B	12	30	15	15
C	20	15	30	15
D	10	30	19	25

e) Spearman's rank correlation coefficient between the marks in English and marks in statistics for a group of students is 0.5. If the sum of squares of differences between ranks is 42, find the number of students in the group. Assume no rank is repeated.

f) State any two merits and two demerits of standard deviation.

[5017]-113   2

Q3) Attempt any Four of the following: [4 each]
  a) Explain the procedure of drawing Stratified random sample.
  b) Calculate harmonic mean from the following data:
     8, 4, 9, 7, 10, 11, 5, 6.
  c) Define raw moments and central moments of a frequency distribution and express fourth central moment in terms of raw moments.
  d) Two groups of sizes 40 and 50 have same mean and standard deviation 20 and 10 respectively. Find variance of the combined group.
  e) Is the following information consistent?
     (A) = 30, (B) = 40, (AB) = 35, N = 100.
  f) Calculate coefficient of correlation from the following information:
     $n = 5$, $\Sigma x = 25$, $\Sigma x^2 = 150$, $\Sigma y = 25$, $\Sigma y^2 = 150$, $\Sigma xy = 140$.

Q4) Attempt any two of the following: [8 each]
  a) i) Test whether the attributes A and B are independent, given that (AB) = 256, (αB) = 768, $(A\beta)$ = 48, $(\alpha\beta)$ = 144.
     ii) What is meant by association of two attributes? How is it measured?
  b) i) Show that Bowley's coefficient of skewness lies between −1 and +1.
     ii) The mean and variance of a distribution are 30 and 64 respectively and its Pearson's coefficient of skewness is 0.25, find mode and median.
  c) i) What is correlation? Using scatter diagram explain various types of correlation.
     ii) The first four moments of a distribution about the value 5 are 2, 20, 40 and 200 respectively. Find third central moment and comment upon the type of skewness.
  d) Explain the terms:
     i) Order of a class.
     ii) Attribute.
     iii) Dichotomy.
     iv) Ultimate class frequency.
     v) Positive attribute and positive class.
     vi) Negative attribute and negative class.

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Q5) Attempt any one of the following:

a) i) Let (X_i, Y_i) $i = 1, 2, ...n$ are n observations on bivariate random variable (X, Y). Derive the equation of line of regression of Y on X. [8]

ii) Define an index number and state its two uses. [4]

iii) Write a short note on Kurtosis. [4]

b) i) Karl Pearson's coefficient of correlation between X and Y obtained from 10 pairs of observations is 0.5. Means of X and Y are 12 and 15 respectively. Standard deviations of X and Y are 3 and 4 respectively. While checking it was noticed that one of the observation was wrongly entered as 16 instead of 26 for X series and as 9 instead of 18 for Y series. Calculate the correct coefficient of correlation. [8]

ii) Show that $\beta_2 \geq 1$. [4]

iii) Show that $V(X + Y) = V(X - Y)$ if X and Y are uncorrelated. [4]

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F.Y.B.Sc.

STATISTICS / STATISTICAL TECHNIQUES

Discrete Probability and Probability Distributions
(Paper - II) (2013 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) *Use of statistical tables and calculator is allowed.*
4) *Symbols have their usual meanings.*

Q1) Attempt each of the following:

    a)   i)   Give one real life situation where Poisson distribution can be applied.   **[1]**

          ii)   A discrete random variable (r.v.) X has mean = 5 and variance = 9. Find second raw moment of X.   **[1]**

          iii)   If $X \sim p(m)$ then state mean of X.   **[1]**

          iv)   Define a degenerate distribution.   **[1]**

    b)   Choose correct alternative for the following: **[1 each]**

          i)   Let P(A) = 0.6 and P(B) = 0.5. If A and B are independent events then $P(A \cap B)$ is :

              A)   0.6   B)   0.5

              C)   0.30   D)   0.1

          ii)   If $X \sim B\left(n, p = \dfrac{1}{3}\right)$ and mean of X is 5 then the value of *n* is:

              A)   15   B)   5

              C)   5/3   D)   10/3

          iii)   If $P(A \cup B) = 1$, then two events A and B are:

              A)   mutually exclusive   B)   exhaustive

              C)   dependent   D)   independent

P.T.O.

iv) If X and Y are independent r.vs. with c.g.f. $K_X(t)$ and $K_Y(t)$ respectively, then $K_{X+Y}(t)$ is:

A) $K_X(t) * K_Y(t)$ B) $K_X(t)/K_Y(t)$

C) $K_X(t) - K_Y(t)$ D) $K_X(t) + K_Y(t)$

c) i) State the addition theorem of probability for two events A and B. [2]

ii) If Karl Pearson's coefficient of correlation between X and Y $(\rho(x,y))$ is -0.6, then find $\rho(-x,-y)$ [2]

iii) Explain with an illustration, what is meant by a Bernoulli trial. [2]

iv) Define conditional probability of an event. [2]

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

a) Let X and Y are two discrete r.v's. Show that $E(X + Y) = E(X) + E(Y)$.

b) Let A and B are two events defined on a sample space Ω. If A and B are independent then show that A' and B' are also independent.

c) Define the following terms:

i) Event,

ii) Complement of an event,

iii) Sure event and

iv) Impossible event.

d) A personnel officer knows that 25% of the applicants for a certain position are suitable for the job. What is the probability that the 4th person interviewed will be the first one who is suitable?

e) If $P(A) = P(B) = \dfrac{1}{2}$ and $P(A \cup B) = \dfrac{2}{3}$ find

i) P(exactly one of A and B occurs)

ii) P(none of A and B occurs).

f) Give classical definition of probability. State the axioms of probability.

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

    a)   Find the m.g.f. of r.v. X having a geometric distribution with p.m.f.,

$$P(X = x) = p\, q^x \quad ; \quad x = 0, 1, 2, \ldots, 0 < p < 1, q = 1-p$$
$$= 0 \quad ; \quad \text{otherwise.}$$

    b)   Let $X \sim B(n, p)$. Find mean of X.

    c)   If X and Y are two independent discrete r.v's with $\sigma_x = 9$ and Var (X –
3Y) = 99, find σ_y.

    d)   The joint p.m.f. of (X, Y) is,

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

    Find

        i)   the value of K and

        ii)   marginal p.m.f. of X.

    e)   A die is rolled twice. If sum of upper most faces is more than 4 find the
probability that both the outcomes are different.

    f)   What is the probability that non-leap year should have fifty three sundays?

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

    a)   Obtain the mode of Poisson distribution with parameter *m*.

    b)   State and prove binomial approximation to hypergeometric distribution.

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

X \ Y	0	1
0	$\frac{1}{4}$	$\frac{1}{4}$
1	$\frac{1}{8}$	$\frac{3}{8}$

    Find correlation coefficient between X and Y.

    d)   For a certain probability distribution if $\mu_1'=5, \mu_2=2, v_1=1$ and $v_2=1$,
Find first four raw moments.

Q5) Attempt <u>any one</u> of the following:

a) i) State the p.m.f. of Poisson distribution with parameter *m*. Obtain c.g.f. of it and hence find variance of the distribution. **[8]**

   ii) The joint p.m.f. of (X, Y) is given by,

   $P(x, y) = k(2x + 3y)$; $k > 0$; $x = 0, 1, 2$;

   $y = 1, 2, 3$.

   $= 0$; otherwise.

   Find

   I) k

   II) $V(X | Y = 3)$.   **[2+6]**

b) i) I) State and prove Baye's theorem.   **[6]**

   II) Define mutually exclusive events.   **[2]**

   ii) The p.m.f. of X is given by,

   $P(x) = kx$; $x = 1, 2, 3, 4, 5$

   $= 0$; otherwise

   Find

   I) k

   II) $P(X < 3 | X \text{ is odd})$

   III) median of X.

   [2 + 4 + 2]

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