

Total No. of Questions : 5]

SEAT No. :

P498

[4917]-101

[Total No. of Pages : 4

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 the right indicate full marks.

Q1) Attempt Any Eight of the following:

[16]

- a) Let  $A = \{0, 1, 2, 3\}$  and  $R$  be a relation given by  
 $R = \{(0, 0), (1, 1), (2, 2), (3, 3), (1, 2), (2, 1), (3, 2), (2, 3), (1, 3), (3, 1)\}$   
Is  $R$  symmetric and transitive? Justify.
- b) Let  $a$ ,  $b$  and  $c$  be integers. If  $a|b$  and  $a|c$  then show that  $a|b+c$ .
- c) State division algorithm for two polynomials in  $\mathbb{R}[x]$ .
- d) Find eigenvector of  $A = \begin{bmatrix} 3 & -1 \\ 1 & 1 \end{bmatrix}$  corresponding to eigenvalue 2.
- e) Define Euler's  $\phi$  function and hence find  $\phi(12)$ .
- f) Shift the origin to the point  $(-1, 2)$  and transform the equation  
$$x^2 - y^2 + 2x + 4y = 0.$$
- g) Find the equation of the plane passing through the point  $(2, 3, 5)$  and perpendicular to the line whose d.r.s. are  $3, -2, 6$ .
- h) Find  $K$ , so that the lines  $\frac{x-1}{-3} = \frac{y-1}{2k} = \frac{z-3}{2}$  and  $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$  are perpendicular to each other.

P.T.O.

- i) Define cone and generator of a cone.
- j) Find the equation of the sphere whose centre is at  $(-1, 2, 1)$  and radius 3.

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

- a) Using principle of mathematical induction prove that  $3|n^3 + 2n$ , where  $n$  is a positive integer.
- b) If  $p$  is a prime and  $a_1, a_2, a_3, \dots, a_n$  are integers such that  $p | a_1 a_2 a_3 \dots a_n$  then show that  $p|a_i$  for some  $i, 1 \leq i \leq n$ .
- c) Solve  $x^3 - 12x^2 + 39x - 28 = 0$ , the roots being in A.P.
- d) By using Euclidean algorithm, find g.c.d. of 2378 and 1769. Also express the g.c.d. as the linear combination of the given numbers.
- e) Verify Cayley Hamilton theorem for the matrix  $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$ .
- f) Let  $a, b, c, d$  be integers and  $m > 0$  be an integer. If  $a \equiv b \pmod{m}$  and  $c \equiv d \pmod{m}$  then prove that  $ac \equiv bd \pmod{m}$ .

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

- a) Prove that for any two non-zero integers  $a$  and  $b$  have a unique positive g.c.d.  $d = (a, b)$  and can be expressed in the form  $d = (a, b) = ma + nb$ , for some integers  $m, n$ .
- b) i) Show that any two equivalence classes are either disjoint or identical.
- ii) Prepare multiplication table for  $Z_6$ . Also find multiplicative inverse of element in  $Z_6$  if exist.

- c) i) If  $p(x), q(x), r(x)$  are polynomials in  $\mathbb{R}[x]$  with  $p(x) \neq 0$ . If  $p(x) | q(x)$  and  $p(x) | r(x)$  then show that  $p(x) | m(x)q(x) + n(x)r(x)$ , where  $m(x), n(x)$  are polynomials in  $\mathbb{R}[x]$ .
- ii) Solve the following system of linear equations by using Gauss elimination method.

$$x - 4y + 5z = -1$$

$$2x - y + 3z = 1$$

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

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

- a) Shift the origin to a suitable point so that  $x^2 + 4x - 8y + 12 = 0$  will be in the form  $x^2 = 4by$ . State the value of  $b$ .
- b) With usual notation prove that  $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$ .
- c) Find the angle between line  $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$ , where  $l, m, n$  are d.c.s. of a line and the plane  $ax + by + cz + d = 0$ .
- d) Find the length of the intercept made by the line  $\frac{x-7}{2} = \frac{y-6}{1} = \frac{z+5}{-1}$  with the sphere  $x^2 + y^2 + z^2 - 2x + 3y - 5z - 31 = 0$ .
- e) Find the equation of a cylinder whose generators are parallel to the line  $6x - 3y = 2z$  and whose guiding curve is an ellipse  $x^2 + 2y^2 = 1, z = 3$ .
- f) Find the equations of the planes bisecting the angles between the planes  $x + 2y + 2z = 9$  and  $4x - 3y + 12z + 13 = 0$ . Also specify the one which bisects the acute angle.

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

- a) Reduce the equation  $5x^2 + 6xy + 5y^2 - 4x + 4y - 4 = 0$  to the standard form and name the conic.

- b) i) Prove that every section of a right circular cone by a plane perpendicular to its axis is a circle.
- ii) Find the equations of the line of shortest distance between the skew lines  $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-4}{4}$  and  $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$ .
- c) i) Derive the condition under which the plane  $lx + my + nz = p$  is tangent plane to the standard sphere  $x^2 + y^2 + z^2 = a^2$ . Also find the point of contact.
- ii) Find equation of the sphere passing through the circle  $x^2 + y^2 + z^2 = 9, 2x + 3y + 4z - 5 = 0$  and the point  $(1, 2, 3)$ .



Total No. of Questions : 5]

SEAT No. :

**P499**

**[4917]-102**

[Total No. of Pages : 3

**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 side indicate full marks.*

**Q1)** Attempt any EIGHT of the following:

**[16]**

a) Solve the inequality :  $|3x + 4| < |x + 2|$ .

b) Evaluate:  $\lim_{x \rightarrow 4} \frac{4 - \sqrt{x+12}}{x-4}$ .

c) Find the real numbers  $x$  for which of the following function is continuous.

$$f(x) = \frac{x^2 + x + 1}{x^2 + 3x - 10}$$

d) Find the derivative of the function  $f(x) = \sqrt{x + \sqrt{x}}$  with respect to  $x$ .

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

f) Evaluate:  $\int_0^{\pi/2} \sin^8 x \, dx$ .

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

h) Solve the differential equation  $(1 + y^2)dx - x^2 dy = 0$ .

i) Find the orthogonal trajectories of the family of curves  $y^2 = mx$  where  $m$  is a parameter.

j) Solve:  $y = px + \tan^{-1} \left( \frac{p}{\sqrt{1+p^2}} \right)$ ,

where  $p = \frac{dy}{dx}$ .

**P.T.O.**

**Q2)** Attempt any FOUR of the following:

[16]

- a) Prove that for any  $x, y \in \mathbb{R}$ ,  $|x + y| \leq |x| + |y|$ .
- b) Evaluate :  $\lim_{x \rightarrow 0} (1 + x)^{1/x}$ .
- c) Find the value of K for which the following function  $f(x)$  is continuous.

$$f(x) = \begin{cases} x^2 - 2, & x < 1 \\ Kx - 4, & x \geq 1 \end{cases}$$

- d) Prove that :  $|\sin x - \sin y| \leq |x - y|, \forall x, y \in \mathbb{R}$ .
- e) State and prove Cauchy's mean value theorem.
- f) Expand  $\sin x$  in ascending powers of  $\left(x - \frac{\pi}{2}\right)$ .

**Q3)** Attempt any TWO of the following:

[16]

- a) i) If  $f(x) = (x-3)\log x$  then show that the equation  $x \log x = 3 - x$  is satisfied by  $c \in (1, 3)$ .
- ii) If  $y = \frac{x+1}{x^2-4}$  then find  $y_n$ .
- b) i) If  $y = \sin^{-1}x$  then show that  $(1-x^2)y_{n+2} - 2(n+1)xy_{n+1} - n^2y_n = 0$ .

ii) Discuss the continuity of the function  $f(x) = \begin{cases} \frac{x-6}{x-3}, & x < 0 \\ 2, & x = 0 \\ +\sqrt{x^2+4}, & x > 0 \end{cases}$

- c) Let  $f$  be continuous function on closed and bounded interval  $[a, b]$ , such that  $f(a) < 0 < f(b)$ . Prove that there is at least one  $c$  in  $(a, b)$  such that  $f(c) = 0$ .

**Q4)** Attempt any FOUR of the following:

**[16]**

- a) Evaluate :  $\int \frac{x^2}{(x-1)(x+1)(x-3)} dx$ .
- b) If the differential equation  $M(x, y)dx + N(x, y)dy = 0$  where M and N are homogeneous functions of same degree is not exact, then prove that  $\frac{1}{Mx + Ny}$  is an integrating factor, provided  $Mx + Ny \neq 0$ .
- c) Solve:  $y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$ .
- d) Show that  $y^2 = 4a(x+a)$  is self orthogonal.
- e) Solve:  $\frac{dy}{dx} = \frac{x+y+1}{x+y-1}$ .
- f) Explain the method of solving differential equation  $f(x, y, p) = 0$  which is solvable for x.

**Q5)** Attempt any two of the following:

**[16]**

- a) If  $I_n = \int \cos^n x dx, n \geq 2$  then prove that  $I_n = \frac{\sin x \cos^{n-1} x}{n} + \frac{(n-1)}{n} I_{n-2}$ .
- Hence evaluate  $\int_0^{\pi/2} \cos^6 x dx$ .
- b) State and prove necessary and sufficient condition for the differential equation  $Mdx + Ndy = 0$  to be exact.
- c) i) Solve the differential equation  $(x^2 + y^2 + x)dx + xy dy = 0$ .
- ii) Solve:  $x^2 p^2 + xyp - 6y^2 = 0$  where  $\frac{dy}{dx} = p$ .



Total No. of Questions : 5]

SEAT No. :

**P500**

**[4917]-103**

[Total No. of Pages : 3

**F. Y. B. Sc.**

**PHYSICS - I**

**Mechanics, Heat and Thermodynamics  
(2013 Pattern) (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) *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 first law of motion.
- b) Define kinetic energy of a body. Give its S.I. unit.
- c) Define the term steady flow.
- d) A uniform metal wire has length of 4 m and a diameter of 4mm. When it is stretched by 0.5 mm, its diameter decrease by 0.15  $\mu\text{m}$ . Find the Poisson's ratio for the metal of the wire.
- e) What is equation of state? Give equation of state for perfect gas.
- f) State and explain zeroth law of thermodynamics.
- g) State the advantages of mercury thermometer.
- h) A reversible heat engine working between 273°K and 373°K absorbs 800J of heat from the source. Calculate workdone.

***P.T.O.***



**Q2)** Attempt any four of the following:

**[16]**

- a) Explain in brief basic forces of nature.
- b) Explain the term workdone. Calculate the workdone by a varying force.
- c) Discuss various applications of surface tension.
- d) A body of mass 60 gram is thrown vertically upwards with a speed of 10m/s. Find the workdone by the force of gravity during the time the body goes vertically up.
- e) Show that the workdone of a body during the longitudinal strain is  $\frac{1}{2} \times$   
Longitudinal stress  $\times$  Longitudinal strain.
- f) Water flowing in a horizontal pipe has a speed 40cm/s at one end point and 30cm/s at another point. Determine the pressure drop between two points. [Given  $\rho_{\text{water}} = 1\text{gm/cm}^3$ ].

**Q3)** Attempt any four of the following:

**[16]**

- a) Describe Amagat's experiment.
- b) Derive an expression for workdone during an isothermal process.
- c) Derive the second Tds equation.
- d) A two litre of hydrogen at 127°C and  $10^6$  dyne  $\text{cm}^{-2}$  pressure expands isothermally, when pressure reduces to  $5 \times 10^5$  dyne  $\text{cm}^{-2}$ . Find the volume of the gas after expansion.
- e) Calculate the change in entropy when 2mole of an idel gas is allowed to expand from a volume of 1 litre to a volume of 10 litres at 27°C.
- f) On a certain day the temperature is 12°C. What will be the temperature in Fahrenheit and Reaumur scale?

**Q4)** Attempt any two of the following:

**[16]**

- a) What is critical velocity of liquid? Obtain an expression for Reynold's number. Give its physical significance.
- b)
  - i) A rectangular metal bar is supported at its two ends on knife edges and a load is applied at the middle point. Obtain the Young's modulus of the bar.
  - ii) A man pulls a suitcase of mass 10.4 kg with a force of 25 N inclined to the horizontal at an angle of 30°. As a result the suitcase accelerates horizontally. What is the magnitude of acceleration?
- c)
  - i) Poisson's ratio cannot be greater than 0.5. Explain.
  - ii) Calculate the workdone in blowing a soap bubble of 1.3cm radius if the surface tension of soap solution is 0.030 N/m.

**Q5)** Attempt any two of the following:

**[16]**

- a) Explain Otto cycle with an indicator diagram and obtain an expression for the efficiency of the Otto engine.
- b)
  - i) State and explain the principle of air conditioning.
  - ii) Show that for a gas obeying Van der Waal's equation

$$\frac{RT_c}{P_c V_c} = \frac{8}{3} = 2.67.$$

- c)
  - i) Explain construction and working of liquid filled thermometer.
  - ii) Calculate the change in the melting point of ice at 273°K, when pressure is increased by 1 atmosphere. The latent heat of fusion is 80 kcal/kg. The specific volume of ice at 273°K is  $1.09 \times 10^{-3} \text{ m}^3/\text{kg}$  and that of water at the same temperature is  $1.00 \times 10^{-3} \text{ m}^3/\text{kg}$ .



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :3

**P501**

**[4917]-104**

**F.Y.B.Sc.**

**PHYSICS**

**Physics Principles and Applications and Electromagnetics  
(2013 Pattern) (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) Use of logtables and calculators is allowed.*
- 4) Neat diagram must be drawn wherever necessary.*

**Q1)** Attempt ALL of the following:

**[16]**

- a) State Biot Savart's law.
- b) Define terms - electric dipole and dipole moment.
- c) Give relation between  $\vec{B}$ ,  $\vec{M}$  &  $\vec{H}$  .
- d) Explain Polar and Non-Polar molecules.
- e) What do you meant by stimulated emission?
- f) What do you mean by photon?
- g) Give the equation of wavelength in Paschen series of hydrogen atom.
- h) Calculate the electric field intensity due to a point charge  $2 \times 10^{-10}$  C at a distance of 1 m away from it [Given -  $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 / \text{N-m}^2$  ]

**Q2)** Attempt any FOUR of the following:

**[16]**

- a) Explain Laser action using three level energy system.
- b) Explain the working of solar cell with schematic diagram.

**P.T.O.**

- c) What is meant by covalent bonding? Give properties of covalent crystals.
- d) The input power of solar cell is 1.25W and it has  $I_{sc} = 300 \text{ mA}$ ,  $V_{oc} = 0.5\text{V}$  and  $FF = 0.6$ . Calculate the efficiency of solar cell.
- e) A microwave radiation has a frequency of 12GHz. What would be the energy of the photon corresponding to this radiation?  
[Given -  $h = 6.626 \times 10^{-34} \text{ Js}$ ]
- f) Find the wave number of second line of the Paschen series  
[Given -  $R = 1.097 \times 10^7 \text{ m}^{-1}$ ]

**Q3)** Attempt any FOUR of the following:

**[16]**

- a) Obtain an expression for torque on a dipole placed in a uniform electric field.
- b) Distinguish between paramagnetic and ferromagnetic materials.
- c) State and prove Gauss's Law in dielectrics.
- 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 -  $\mu_0 = 4\pi \times 10^{-7} \text{ Wb/A-m}$ ]
- e) Calculate the force between two balls each having a charge of  $16\mu\text{C}$  and are 10 cm apart. (Given -  $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N-m}^2$ ]
- f) The electric field intensity at a point at a distance of 1m from the centre of a charged sphere of radius 30 cm is  $10^4 \text{ N/C}$ . Find surface charge density on the surface of sphere. The sphere is placed in air.  
[Given -  $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N-m}^2$ ]

**Q4)** Attempt any TWO of the following:

**[16]**

- a) What is X-ray radiography? State its applications.
- b)
  - i) Give physical properties of ionic compounds.
  - ii) The series limit wavelength for Balmer series of hydrogen spectrum is  $3645 \text{ \AA}$ . Calculate the value of Rydberg constant.
- c)
  - i) Explain Rutherford's atomic model and give its limitations.
  - ii) The lowest vibrational states of the NaCl molecule are  $0.063 \text{ eV}$  apart. Find approximate force constant of this molecule.

[Given - Mass of Na =  $3.82 \times 10^{-26} \text{ kg}$

Mass of Cl =  $5.81 \times 10^{-26} \text{ kg}$ ]

**Q5)** Attempt any TWO of the following:

**[16]**

- a) Obtain an expression for electric field intensity on the axis of charged disc.
- b)
  - i) Define electric polarization vector. Obtain an expression for polarization vector in homogeneous isotropic dielectric.
  - ii) An aluminium wire of diameter  $0.3 \text{ cm}$  carries a current of  $15 \text{ amp}$ . Find the magnetic field on the surface of the wire.  
[Give -  $\mu_0 = 4\pi \times 10^{-7} \text{ Wb/A-m}$ ]
- c)
  - i) Obtain an expression for  $\vec{B}$  on the axis of a current carrying circular loop.
  - ii) A bar magnet made of iron has magnetic moment  $3.0 \text{ A-m}^2$  and mass  $3 \times 10^{-3} \text{ kg}$ . If the density of iron is  $6 \times 10^{-3} \text{ kg/m}^3$ , find the intensity of magnetization.

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Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 4

**P502**

**[4917]-105**

**F. Y. B. Sc.**

**CHEMISTRY**

**Physical and Inorganic Chemistry**

**(2013 Pattern) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) All questions are compulsory.*
- 2) Draw Neat diagrams wherever necessary.*
- 3) Figures to right indicate full marks.*
- 4) Use of logtable and calculator is allowed.*

**Q1)** Answer the following Questions:

**[16]**

- a) Give the rule of differentiation for product of two functions.
- b) Explain thermotropic liquid crystal.
- c) Define :
  - i) dispersed phase
  - ii) dispersion medium
- d) Explain Heisenberg's uncertainty principle.
- e) Identify the following processes as spontaneous and nonspontaneous process.
  - i) Uphill flow of water
  - ii) Diffusion of gases.
- f) Define: i) Primary standard ii) Oxidation number.
- g) Explain in brief formation of co-valent bond with suitable example.
- h) How many moles are present in 49 grams of  $H_2SO_4$ ?

**P.T.O.**

**Q2)** Attempt any four of the following:

**[16]**

- a) Describe the nature of liquid according to kinetic molecular model.
- b) Explain physical or Vander Waal's adsorption.
- c) Write the equation of the line passing through a point
  - i)  $(-4, 0)$  and having slope - 3. &
  - ii)  $(-2, 0)$  & slope -  $\frac{1}{3}$ .
- d) Explain de-Broglies hypothesis and derive the expression for wavelength in terms of kinetic energy of particle.
- e) Explain the importance of Carnot's cycle in terms of
  - i) determination of efficiency.
  - ii) thermodynamic scale of temperature.
- f) Give assumptions and limitations of Bohr's theory.

**Q3)** Answer any four of the following:

**[16]**

- a)
  - i) If  $Y = \frac{1-x^2}{1+x^2}$ , find  $dy/dx$ .
  - ii) Solve the integral  $\int (2x)^{3/2} \cdot dx$

- b) Describe the influence of frequency and intensity of incident radiation on the current in photoelectric effect.
- c) What are gels? How are they classified? Give any two differences between gel and emulsion?
- d) Give different statements of second law of thermodynamics.
- e) Define viscosity of a liquid. Give its unit. Discuss the method to measure viscosity of liquid.
- f) Derive an equation for the radius of  $n^{\text{th}}$  orbit on the basis of Bohr's theory.

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

- a) What is hybridization? Explain the formation of  $\text{CH}_4$  molecule.
- b) What is primary and secondary standard? Explain with examples.
- c) Balance the following equation by oxidation number method.  
$$\text{FeSO}_4 + \text{H}_2\text{SO}_4 + \text{Cl}_2 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + \text{HCl}$$
- d) What are the assumptions of VSEPR theory?
- e) State the assumptions of Pauling - Slater theory.
- f) Explain the formation of  $\text{F}_2$  molecule on the basis of atomic orbital overlap.

**Q5)** Solve any Four of the following: **[16]**

- a) Molecular weight of compound is 119.88. What will be the volume displaced by 0.146 g of the compound at  $22^\circ\text{C}$  and pressure 755 mm of Hg?

(Aq. tension at  $22^\circ\text{C}$  = 20 mm)



- b) 10 ml of the solution of NaOH containing 2 grams of the alkali per liter is exactly neutralized by 15 ml solution a solution of  $\text{H}_2\text{SO}_4$  and 30 ml HCl solution separately. Calculate strengths of acids in grams per liter.
- c) Viscosity measurement of water and other liquid was carried out by Ostwald's viscometer. Water took 40seconds to travel between the two marks A and B. The other liquid with density  $1400 \text{ g dm}^{-3}$  at the same temperature took 60 seconds. If density of water at the same temperature is  $995 \text{ g dm}^{-3}$ . Calculate the viscosity of other liquid.

(Given : Viscosity of water = 0.01002 poise).

- d) The pressure and temperature of one mole of an ideal gas are changed simultaneously from 293 K and  $1.01325 \times 10^5 \text{ Nm}^{-2}$  to 363 K and  $4.06625 \times 10^5 \text{ Nm}^{-2}$ . Calculate the change in entropy.

(Given :  $R = 8.314 \text{ J (mole-k)}^{-1}$ ;  $C_p = \frac{5}{2} R$ )

- e) Calculate the velocity of an electron having energy 827 eV and mass  $9.1 \times 10^{-31} \text{ kg}$ . (Given:  $1\text{eV} = 1.6 \times 10^{-19} \text{ J}$ )
- f) A heat engine operates between  $10^\circ\text{C}$  and  $110^\circ\text{C}$ . It absorbs 35.46 Kcal of heat from the source. Calculate the maximum work done by the engine. (Given :  $1\text{cal} = 4.184\text{J}$ ).



Total No. of Questions : 5]

SEAT No. :

**P503**

[4917]-106

[Total No. of Pages : 5

F.Y. B.Sc.

**CHEMISTRY**

**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 following terms.
  - i) Chirality
  - ii) Specific rotation
- b) What is bond angle? Explain with suitable examples.
- c) Draw zig - zag structures for the following compounds
  - i) Butanal
  - ii) Glycine
- d) Carbontetrachloride is nonpolar molecule.Explain.
- e) M.P and B.P. of amines are lower than those of alcohol of comparable molecular weight.Explain.
- f) Alkali metals show +1 oxidation state. Explain.
- g) Write the names and electronic configuration of group III A elements.
- h) What are metalloids?

**P.T.O.**

**Q2)** Attempt any four of the following:

**[16]**

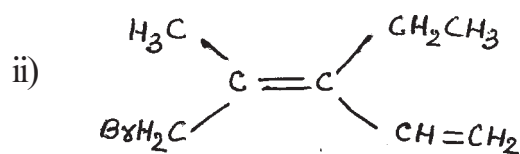
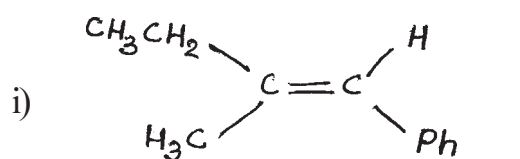
- a) What is inductive effect? Explain why chloroacetic acid is stronger acid than acetic acid.
- b) What are carboxylic acids? What is the action of following reagents on acetic acid?
  - i)  $\text{C}_2\text{H}_5\text{OH}/\text{H}^+$
  - ii)  $\text{NH}_3/\Delta$
- c) What is conformational isomerism? Discuss conformational isomerism in propane with energy profile diagram.
- d) What are alcohols? Give classification of alcohols. How will you prepare ethyl alcohol from acetaldehyde?
- e) What are aromatic compounds? Discuss Huckel's Rule of aromaticity with examples.
- f) What are alkanes? How will you prepare propane from.
  - i) 2-bromo propane
  - ii) propene

**Q3)** Attempt any four of the following:

**[16]**

- a) What are amines? How are they classified? How will you prepare ethyl amine from acetonitrile.
- b) What are alkyl halides? How will you prepare ethyl bromide from-
  - i) ethanol
  - ii) ethylene

c) Assign E and Z configuration of the following compounds.



d) What are alkenes? How will you prepare ethylene from

i) ethanol

ii) ethyl bromide

e) How will you prepare acetone from 2-propanol?

what is the action of following reagents on acetone?

i) methyl magnesium bromide

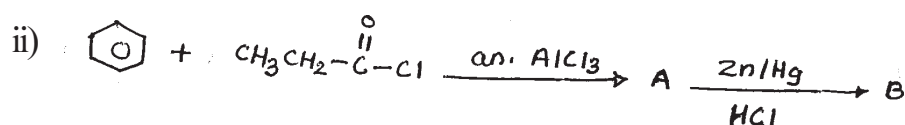
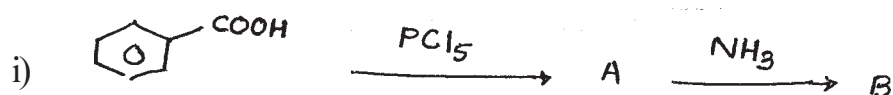
ii) NaOH/I<sub>2</sub>

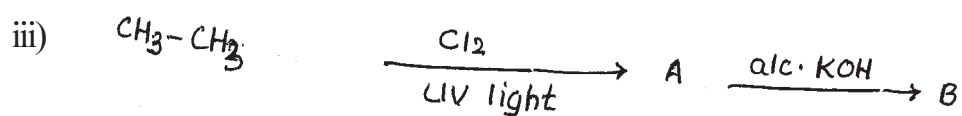
f) What is hybridisation? Discuss formation of acetylene molecule using the concept of hybridisation.

**Q4)** Attempt any four of the following :

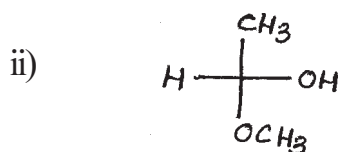
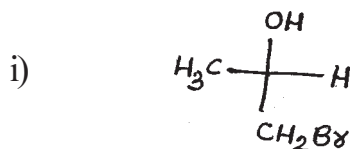
**[16]**

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





b) Assign R or S configuration of the following compounds.



c) What is mesomeric effect? Explain why cyclohexylamine is stronger than aniline.

d) write short notes on:

i) ozonolysis

ii) tautomerism

e) Draw the structures of 12-crown-4 and 15-crown-5

Explain their use in separation of alkali metals.

f) Write note on allotropes of carbon

**Q5)** Attempt any four of the followong:

**[16]**

- a) Explain anomalous behaviour of oxygen in group VI A elements.
- b) Explain bonding and shape of  $\text{ClF}_3$  molecule.
- c) Name the elements of nitrogen family, write their electronic configuration and discuss the trends in the atomic size and electronegativity.
- d) Explain periodicity in properties of alkali metals with respect to ionization energy and oxidation states.
- e) Give different applications of alkaline earth metals and their compounds.
- f) Explain the diagonal relationship between beryllium and aluminium.



Total No. of Questions : 5]

SEAT No :

**P504**

[Total No. of Pages : 2

[4917] - 107

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) Define Algae.
- b) Name any two types of Lichen.
- c) Give any two examples of Bryophytes.
- d) Give any two characters of Angiosperms.
- e) Define Anatomy.
- f) What is Inflorescence?
- g) Define Flower.
- h) Name any two elements of phloem.

**Q2)** Attempt any four of the following:

**[16]**

- a) Write the process of conida formation in cystopus (Albugo).
- b) Describe Foliose lichen.
- c) Explain the structure and Functions of hydathode of Nephrolepis.
- d) Describe types of root with examples.
- e) Describe any two types of Racemose inflorescence.
- f) Define Morphology and give it's scope.

**P.T.O.**

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

- a) Mode of nutrition in Albugo ( cystopus).
- b) Characters of pteridophytes.
- c) Causes of evolutionary success of Angiosperms.
- d) Corm.
- e) Agents of seed dispersal.
- f) Tuber.

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

- a) Describe cell structure in spirogira.
- b) Describe the structure of sporophyte of Riccia.
- c) Describe the types of aestivation.
- d) Explain structure and functions of sclerenchyma and collenchyma.

**Q5)** a) Describe external structure of cycas sporophyte. Add a note on internal structure of cycas leaf let.

- b) Describe internal structure of monocot stem and leaf.

**[16]**





Total No. of Questions : 5]

SEAT No. :

**P505**

**[4917]-108**

[Total No. of Pages : 2

**F.Y. B.Sc.**

**BOTANY**

**BO - 112 : Industrial Botany-I & II**  
**(New Syllabus 2013 Pattern) (Theory) (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 right indicate full marks.*

**Q1)** Attempt the following:

**[16]**

- a) Enlist any two important floricultural crops.
- b) What is gum?
- c) What is plant tissue culture?
- d) Give any two plant resources of fodder.
- e) Define biofertilizer.
- f) What is biofuel?
- g) Define canning.
- h) Give names of any two fungi used in industry.

**Q2)** Attempt Any Four of the following:

**[16]**

- a) Give the advantages of green house technology.
- b) Explain the technique of inoculation.
- c) Write the uses of mushroom.
- d) Give the advantages of biofuel.
- e) Explain the importance of biopesticides.
- f) Give the need of biofertilizers.

**P.T.O.**

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

**[16]**

- a) Organic farming.
- b) Hardening.
- c) Spawn production.
- d) Integrated Pest Management (IPM).
- e) Blue Green Algal biofertilizers.
- f) Need of biofuels.

**Q4)** Answer Any Two of the following:

**[16]**

- a) Give an account of cultivation practices in Gerbera.
- b) Explain in brief seed processing and production in cotton.
- c) Describe in detail products & applications of Trichoderma.
- d) What is fruit processing? Describe the process of jam preparation.

**Q5)** What is plant propagation? Describe in detail the methods of natural vegetative propagation. **[16]**

OR

Give the botanical source, active principles and medicinal uses of Adhatoda and add a note on nutraceuticals.



Total No. of Questions : 5]

SEAT No. :

**P506**

**[4917]-109**

[Total No. of Pages : 2

**F.Y. B.Sc.**

**ZOOLOGY**

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

**(2013 Pattern) (Theory) (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) Conjugation.
- b) Monera.
- c) Flagella.
- d) Typhlosole.
- e) Tympanum.
- f) Hemichordata.
- g) Nuptial pads.
- h) Tunicata.

**Q2)** Write short notes on (Any Four):

**[16]**

- a) State the structure and function of Trichocyst.
- b) Explain the general characters of Kingdom Animalia.
- c) Describe the five kingdom classification system.
- d) Write the salient features of Cephalochordata.
- e) Axolotal larva.
- f) Describe the functions of blood of frog.

**P.T.O.**

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

- a) With a suitable diagram describe the structure of contractile vacuoles in paramecium.
- b) State the general characters of class Hydrozoa.
- c) Describe the structure of septal nephridia in earthworm.
- d) Explain amphidromous migration in fishes.
- e) Discuss parental care in Anura with any two examples.
- f) Sketch and label the internal structure of heart of frog.

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

- a) State the distinguishing characters of phylum porifera. Give names of classes with examples each.
- b) External characters of Earthworm.
- c) With suitable diagram describe structure and functions of eye of frog.
- d) Give the general characters of bony fishes with suitable example.

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

OR

Describe the male reproductive system of Frog.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P507**

**[4917]-110**

**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 side indicate full marks.*

**Q1)** Define / Explain the following:

**[16]**

- a) Eukaryotic cell.
- b) Cytoplasm.
- c) Glyoxysomes.
- d) Nucleolus.
- e) Lethal genes.
- f) Kappa particles.
- g) Down's syndrome.
- h) Autosomes.

**Q2)** Write short notes on (Any Four):

**[16]**

- a) Leptotene and Zygotene.
- b) Scope of cell biology.
- c) Fluid Mosaic model of plasma membrane.
- d) Inhibitory factor (13:3 ratio).
- e) Law of segregation.
- f) Negative eugenics.

**P.T.O.**

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

- a) Draw a neat labelled diagram of Prokaryotic cell.
- b) Write a note on vital stain with any two examples.
- c) Write note on nuclear pore complex.
- d) What is colourblindness? Explain the genetic basis of colourblindness.
- e) What is genetic engineering? Give its applications.
- f) Write note on Turner's syndrome.

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

- a) Describe in brief process of mitosis.
- b) Describe in detail various functions of plasma membrane.
- c) What is Gynandromorphism? Explain its types with suitable examples.
- d) What is multiple alleles? Explain with suitable example.

**Q5) Describe the structure and functions of endoplasmic reticulum and golgi complex. [16]**

OR

Describe the generalized structure of the chromosome. Add a note on different types of chromosomes on the basis of position of centromere.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P508**

[4917]-111

F. Y. B. Sc.

**GEOLOGY**

**Mineralogy and Petrology  
(2013 Pattern) (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)** Answer the following questions:

**[16]**

- a) Define a rock.
- b) Mention the branches of Mineralogy.
- c) What is Structural Geology?
- d) Define twinkling.
- e) Explain Schistose structure.
- f) Define specific gravity of minerals.
- g) Draw diagram to show Graded Bedding Structure.
- h) Define plane of symmetry of a crystal.

**Q2)** Answer the following questions (Any FOUR):

**[16]**

- a) Define Hardness of Mineral. Explain the Moh's scale of hardness.
- b) Give an account of minerals used in Ceramic industry.
- c) Explain Isotropism and Anisotropism with suitable examples.
- d) Explain Covalent bonding in minerals with suitable examples.
- e) Describe Phyllosilicate structure with examples.
- f) Explain the sublimation and crystallization from melt processes of mineral formation.

**P.T.O.**

**Q3) Answer the following questions (ANY FOUR): [16]**

- a) Describe symmetrical and asymmetrical folds.
- b) Give the classification of Igneous rocks based on colour index and Silica percentage.
- c) Explain the Rock Cycle.
- d) Explain the different kinds of Metamerphism.
- e) Describe Dyke and Lopolith.
- f) Explain the clastic and non clastic texture of Sedimentary rocks.

**Q4) Answer the following questions (ANY TWO): [16]**

- a) Explain Isomorphism and Polymerphism with suitable examples.
- b) Define a unconformity. Explain angular unconformity and nonconformity.
- c) Explain the various parts of a petrological microscope.
- d) Define metamerphism. Describe the various agents of metamerphism.

**Q5) Give the elements of symmetry, crystallographic axes, the various forms present with indices in Orthorhombic System (Baryte Type): [16]**

OR

- a) Explain the following structures: [8]
  - i) Vesicular structure
  - ii) Ripple Marks
- b) What are Faults? Describe the terms associated with faults. [8]





Total No. of Questions : 5]

SEAT No :

**P509**

[Total No. of Pages : 2

[4917] - 112

F.Y. B.Sc.

**GEOLOGY**

**Physical Geology and Palaeontology  
(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.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

**Q1)** Answer the following questions:

**[16]**

- a) Define Geology.
- b) What are Belemnites?
- c) Mention all the major tectonic plates of the world.
- d) Define Brachial Skeleton.
- e) What are stacks?
- f) Define a disaster.
- g) Give the systematic position of Gastropod shell.
- h) Evolution of life through Mesozoic era.

**Q2)** Answer the following questions (Any Four)

**[16]**

- a) Describe the frost action and insolation processes of mechanical weathering.
- b) Explain the Big Bang Theory for the origin of the Universe.
- c) Define an Earthquake. Explain the terms associated with earthquakes.
- d) Define a mountain and describe Residual mountains.
- e) Explain the Pratt's Hypothesis of Isostasy.
- f) Describe Potholes and Mesa and Butte.

**P.T.O.**

**Q3)** Answer the following questions (Any Four) **[16]**

- a) Describe the suture lines in ammonoids.
- b) Define Palaeontology. Describe its branches.
- c) Describe the hard part morphology of the interior of lamellibranch shell.
- d) Explain with the help of neat diagram apical disc in regular echinoids.
- e) Describe any four forms shown by Gastropod shell.
- f) Describe the uses of fossils.

**Q4)** Answer the following questions (Any Two) **[16]**

- a) Describe the various products of volcanic activity.
- b) Explain
  - i) Petrification
  - ii) Cast and Moulds
- c) Describe the geological evidences of continental drift theory.
- d) Describe the hard part morphology of a trilobite.

**Q5)** Describe the erosional landforms formed by the action of Glaciers. **[16]**

OR

- a) Define a fossil. Explain the conditions necessary for fossilization. **[8]**
- b) Describe the different types of septa in corals. **[8]**



Total No. of Questions : 5]

SEAT No. :

**P510**

[4917]-113

[Total No. of Pages : 4

F. Y. B. Sc.

**STATISTICS/STATISTICAL TECHNIQUES**

**Descriptive Statistics**

**(2013 Pattern) (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) *Use of Statistical table and calculator is allowed.*
- 4) *Symbols have their usual meanings.*

**Q1)** Attempt each of the following:

A) a) Define “discrete variable” with one real life example. [1]

b) State any two requisites of good measure of dispersion [1]

c) Suggest an appropriate sampling method giving reason for the following situation. [1]

A sample of 1000 units is to be selected to find daily total requirement of electricity consumption out of 3000 houses, 500 offices and 600 shops.

d) Define “Positively correlated variables” with one illustration. [1]

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

a) Mean deviation is minimum if the deviations are taken from:

i) Mean

ii) Median

iii) Mode

iv) The first quartile

b) If  $\text{Var}(2X + 3) = 36$ , then  $\text{Var}(X)$  is equal to:

i) 36

ii) 18

iii) 33

iv) 9

**P.T.O.**

- c) If  $N = 100$ ,  $(A) = (B) = 20$ ,  $(AB) = 5$ , then attributes A and B are:
- Positively associated
  - Positively correlated
  - negatively associated
  - negatively correlated
- d) If regression coefficient Y on X is equal to 2, we can conclude that variables X and Y are
- perfectly positively correlated
  - perfectly negatively correlated
  - positively correlated
  - negatively correlated
- C) a) If  $\text{Min} = 10$ ,  $Q_1 = 25$ ,  $Q_2 = 38$ ,  $Q_3 = 60$ ,  $\text{Max} = 90$ , comment on skewness, give justification. [2]
- b) State Yule's coefficient of association, comment if its value is zero. [2]
- c) Find variance of data having the values  $-4, -2, 0, 2, 4$ . [2]
- d) Using the method of dot operator in case of three variables, express  $(\alpha\beta C)$  in terms of positive class frequencies. [2]

**Q2)** Attempt any Four of the following:

**[4 each]**

- a) Compute Fisher's price index number for the following data:

Commodity	2011		2012	
	Price	Quantity	Price	Quantity
A	10	8	15	6
B	15	15	12	20
C	12	10	18	8

- b) Compute first four central moments if

$$\mu'_1 = 25, \mu'_2 = 725, \gamma_1 = 20, \gamma_2 = 500$$

- c) Find number of pairs (n) for the following data:

$$r = -0.7, \Sigma x_i = 20, \Sigma x_i^2 = 90, \Sigma y_i = 20, \Sigma y_i^2 = 90, \Sigma x_i y_i = 73.$$

- d) Average salary of an employee in certain company is Rs. 9,000/-. Find ratio of male and female employees, if their average salary is Rs. 12,000/- and Rs. 7,500/- respectively.
- e) What is correlation? Using scatter diagram explain various types of correlation.
- f) Define  $r^{\text{th}}$  order central moment. Express 4<sup>th</sup> order central moment in terms of raw moments.

**Q3)** Attempt any four of the following:

**[4 each]**

- a) With usual notation prove that

$$\mu'_3 = 3\mu'_2\mu'_1 - 2\mu_1^3, \text{ for symmetric distribution.}$$

- b) Given the following information:

$$N = 100, (AB) = 25, (A\bar{B}) = 15, (\bar{A}B) = 25$$

Comment on the association between two attributes A and B.

- c) Size of two groups are in ratio 3:4, their means are 20 and 40 respectively whereas their variance are 10 and 5. Compute combined standard deviation.
- d) Define SRSWR and SRSWOR. Give one real life example of each.
- e) For two observations  $a$  and  $b$ , arithmetic mean and geometric mean are 6.5 and 6 respectively. Find  $a, b$ ; also find harmonic mean.
- f) Define dispersion. Explain relative measure of dispersion and state its utility.

**Q4)** Attempt any two of the following:

- a) i) Compute rank correlation coefficient for the following data: [6]

Marks by judge I	81	72	60	33	29	11	56	42
Marks by judge II	75	56	42	15	30	20	60	80

- ii) Define the following terms: [2]
- 1) Nominal scale.
  - 2) Population.
- b) Derive the formula for median using graphical method for a continuous frequency distribution. [8]
- c) i) Show that Yule's coefficient of association lies between  $-1$  and  $+1$ . [4]
- ii) If  $Q_{AB} = 0$ , prove that  $(AB)N = (A)(B)$ . [4]
- d) Explain the procedure of fitting second degree curve  $Y = a + bX + cX^2$  for bivariate data. [8]

**Q5)** Attempt any one of the following:

- a) i) Show that  $\beta_2 \geq 1$ . [4]
- ii) Define "Skewness". Explain the types of skewness using Box-plot. [4]
- iii) Show that  $-1 \leq \rho(X, Y) \leq 1$  [8]
- b) i) Mean and variance for certain data of 100 observations are 10 and 45 respectively. At the time of rechecking it is found that observation 40 was misread as 14. Calculate correct arithmetic mean and variance. [6]
- ii) For a set of 100 observations [6]
- $$\sum x_i = 25, \sum y_i = 68, \sum x_i^2 = 167, \sum y_i^2 = 162, \sum x_i y_i = 130$$
- 1) Compute correlation coefficient.
  - 2) Find regression line of Y on X.
  - 3) Estimate Y for X = 0
- iii) Define "Kurtosis". Explain different types of Kurtosis. [4]



Total No. of Questions : 5]

SEAT No. :

**P511**

[4917]-114

[Total No. of Pages : 4

F. Y. B. Sc.

**STATISTICS / STATISTICAL TECHNIQUES**  
**Discrete Probability and Probability Distributions**  
**(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.*
- 3) *Use of Statistical tables and calculator is allowed.*
- 4) *Symbols have their usual meanings.*

**Q1) A)** Attempt each of the following:

- a) Give one real life situation where geometric distribution can be applied. **[1]**
- b) Write the sample space of a random experiment of tossing 3 coins. **[1]**
- c) State moment generating function (m.g.f.) of a binomial distribution with parameters  $n$  and  $p$ . **[1]**
- d) If A and B are independent events with  $P(A)=0.6$  and  $P(B)=0.5$ , find  $P(A \cap B)$ . **[1]**

**B)** Choose correct alternative for the following:

**[1 each]**

- a) If  $P(A \cap B)=0$ , then the two events A and B are
  - i) Exhaustive events
  - ii) Dependent events
  - iii) Mutually exclusive events
  - iv) Independent events
- b) If X and Y are independent random variables with m.g.f.  $M_X(t)$  and  $M_Y(t)$  respectively then,  $M_{X+Y}(t)$  is :
  - i)  $M_X(t) + M_Y(t)$
  - ii)  $M_X(t) - M_Y(t)$
  - iii)  $M_X(t) / M_Y(t)$
  - iv)  $M_X(t) * M_Y(t)$

**P.T.O.**

- c) If  $X \sim P(m)$  then variance of  $X$  is
- i)  $2m$
  - ii)  $m$
  - iii)  $4m$
  - iv)  $0$
- d) If  $X$  and  $Y$  are two random variables with means  $E(X)=2$  and  $E(Y)=3$ , then  $E(2X-3Y)$  is :
- i)  $-5$
  - ii)  $-1$
  - iii)  $13$
  - iv)  $5$

C) a) If Karl Pearson's coefficient of correlation between  $X$  and  $Y$  ( $\rho(x, y)$ ) is  $0.6$ , then find  $\rho\left(\frac{x+2}{-5}, \frac{y-3}{2}\right)$ . [2]

b) Let  $X \sim B\left(n=10, p=\frac{1}{3}\right)$  then state the mode of  $X$ . [2]

c) For a probability distribution of  $X$ , obtain cumulative distribution function (c.d.f.) of  $X$ . [2]

$x$	$-1$	$0$	$1$
$p(x)$	$1/2$	$1/4$	$1/4$

d) State Baye's theorem. [2]

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

- a) Explain the following terms with one illustration each.
- i) Mutually exclusive events.
  - ii) Sure event.
- b) Let  $X$  and  $Y$  are two independent discrete r.v's. show that  $E(XY)=E(X) \cdot E(Y)$
- c) If  $A$  and  $B$  are mutually exclusive and non empty events defined on sample space  $\Omega$ , show that  $P(A|A \cup B) = \frac{P(A)}{P(A)+P(B)}$ .
- d) For a Poisson distribution with  $P(X=2)=P(X=3)$ , compute  $P(X \geq 1)$ .



e) If  $P(A)=0.4$ ,  $P(B)=0.6$  and  $P(A \cup B)=0.8$ , find

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

f) Define the following terms:

i) Pairwise independence of three events.

ii) Partition of the sample space.

**Q3) Attempt any four of the following:**

**[4 each]**

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

b) Define a discrete uniform distribution with parameter ' $n$ '. Find its mean and variance.

c) Let  $X \sim B(n,p)$ . State the c.g.f. of  $X$ , hence find mean of  $X$ .

d) The probability mass function (p.m.f.) of a r.v.  $X$  is given by,

$$P(X=x) = K {}^5C_x \quad ; x=0,1,2,3,4,5.$$

$$, K>0$$

$$= 0 \quad ; \text{otherwise.}$$

Find the value of  $K$ .

e) A committee of 4 persons has to be formed out of 5 graduate and 4 non graduate persons. Find the probability that the committee consists of at most 2 non graduate persons.

f) State and prove multiplication theorem of probability for two events  $A$  and  $B$  defined on sample space  $\Omega$ .

**Q4) Attempt any two of the following:**

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

X \ Y	0	1	2	3
-1	0.05	0.05	0.075	0.075
0	0.10	0.25	0.075	0.075
1	0.10	0.05	0.05	0.05

- Find
- i)  $E(Y|X = 0)$  and [4]
  - ii)  $V(Y|X = 0)$ . [4]
- b) i) Obtain variance of a linear combination of two variables X and Y;  
 $V(aX + bY)$ . [6]
- ii) What do you mean by a deterministic model? State one example of it. [2]
- c) State and prove binomial approximation to hypergeometric distribution. [8]
- d) For a certain probability distribution if mean = 5, Variance = 2, coefficient of skewness = +1 and coefficient of kurtosis = +1, find first four raw moments of the distribution. [8]

**Q5)** Attempt any one of the following:

- a) i) The joint p.m.f. of (X,Y) is given by,
- $$P(x,y) = c(x^2+y^2) \quad ; c>0, x = -1,1,$$
- $$y = -2,2.$$
- $$= 0 \quad ; \text{otherwise.}$$
- Obtain
- I)  $c$
  - II) Marginal p.m.f.'s of X and Y
  - III) Are X and Y independent? Justify. [8]
- ii) Let X and Y be two independent Poisson random variables with mean 3 and 2 respectively. Find: [8]
- I)  $P(X=4|X+Y=5)$
  - II)  $E(X|X+Y=5)$
- b) i) If the probability that a certain test yields a positive reaction is equal to 0.4. What is the probability that less than 5 negative reactions occur before the first positive one? [5]
- ii) State the p.m.f. of hypergeometric distribution. Find mean and variance of the distribution. [8]
- iii) What is the probability that a non-leap year should have fifty three Sundays? [3]



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

**P512**

**[4917]-115**

**F.Y.B.Sc.**

**GEOGRAPHY**

**Gg-110: Geomorphology - I**

**(2013 Pattern) (New Course) (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 mantle?
- b) What is Geological time scale?
- c) What is Ring of fire?
- d) What are 'S' Waves?
- e) What is a minor plate?
- f) How are sedimentary rocks formed?
- g) How is weathering different than erosion?
- h) What is a delta?
- i) What is an arete?
- j) What are ventifacts?

**Q2)** Explain the following in 150 words (Any four)

**[16]**

- a) Divisions of the Mesozoic era.
- b) Density variation in the interior of the earth.
- c) Criticisms of the Wegner's continental drift theory.
- d) Physical weathering.
- e) Meaning of mass movement and major types.
- f) Longitudinal profile of a river.

**P.T.O.**

**Q3)** Answer the following in 150 words (Any four)

**[16]**

- a) What is Isostatic equilibrium? Discuss in brief.
- b) What is block mountain? How is it formed.
- c) Discuss the different types of volcanic cones.
- d) Difference between rocks and minerals.
- e) List and explain different types of dunes in brief.
- f) What is a Lagoon? How is it formed?

**Q4)** Answer the following in 300 words (Any Two):

**[16]**

- a) Explain the nature and scope of Geomorphology.
- b) What is folding? Explain the different types of folds.
- c) Explain the process of biological weathering. What is the impact of human induced weathering?
- d) Discuss the major depositional landforms formed by sea waves.

**Q5)** Answer the following in 500 words (Any One):

**[16]**

Explain the continental drift theory with supporting evidences.

OR

Explain river deposition and discuss any four depositional features with diagrams.

**x x x**

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P513**

**[4917]-116**

**F.Y. B.Sc.**

**GEOGRAPHY-II**

**Gg - 120 : Climatology and Oceanography  
(2013 Pattern) (New Course) (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 stencils is allowed.*

**Q1)** Answer the following in twenty words (Any Eight):

**[16]**

- a) Define climate.
- b) What is Ozonosphere?
- c) Define Earth's Albedo.
- d) Give types of planetary winds.
- e) What do you mean by high clouds?
- f) Define oceanography.
- g) Give the examples submerged coast.
- h) Define salinity.
- i) Define Wavelength.
- j) What do you mean by Tsunami?

***P.T.O.***

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

- a) Formation of pressure belts.
- b) Lapse rate.
- c) Mountain and valley winds.
- d) Emerged coast.
- e) Effects of ocean currents.
- f) Salinity of dead sea.

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

- a) Mechanism of monsoon winds.
- b) Causes of Global warming.
- c) Scope of climatology.
- d) Relief of Indian ocean.
- e) Ria coast.
- f) Types of tides.

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

- a) Importance of climatology.
- b) Vertical distribution of temperature.
- c) Causes of salinity.
- d) Explain in detail types of ocean currents.

**Q5) Define precipitation, explain the forms of precipitation.** **[16]**

OR

Explain with a neat diagram general idea of ocean relief.



Total No. of Questions : 5]

SEAT No. :

**P514**

[4917] - 117

[Total No. of Pages : 3

F.Y.B.Sc.

**MICROBIOLOGY**

**Introduction To Microbiology  
(2013 Pattern) (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 right indicate full marks.*

**Q1)** Attempt the following:

**[16]**

- a) What is an acid? Give two examples.
- b) Name any two diseases caused by protozoa.
- c) Define - Atom.
- d) Name any two motile bacteria.
- e) Give any two functions of cell wall.
- f) Match the following:
  - i) Anaerobic life
  - ii) Animalcules
  - iii) Structure of DNA
  - a) Watson & Crick
  - b) Louis Pasteur
- g) Fill in the blanks:
  - i) Two amino acids are linked by \_\_\_\_\_ bond in a protein molecule.
  - ii) \_\_\_\_\_ is known as the father of surgical antiseptics.

**P.T.O.**

- h) State true or false:
  - i) Rickettsia are obligate intracellular parasites.
  - ii) Plasmids are double stranded RNA Molecules.

**Q2)** Write short notes on Any Four:

**[16]**

- a) Discovery of Microscope.
- b) Distribution & Significance of Normal Flora.
- c) Functions of Capsule.
- d) Starch and glycogen.
- e) Spontaneous generation theory.
- f) PHB granules.

**Q3)** Attempt any four of the following:

**[16]**

- a) Write a brief account on Agricultural Microbiology.
- b) Give the significance of probiotic cultures.
- c) Explain applications of Biotechnology.
- d) Give the general characters of Fungi
- e) State Koch's postulates.
- f) Give structure and function of endospore in bacteria.



**Q4)** Answer Any Two of the following:

**[16]**

- a) Give the general characters of Algae. Add a note on their economic importance.
- b) Explain Tyndall's experiment with a neat labelled diagram.
- c) What are Ribosomes? Describe their structure and function.
- d) Give structure and function of Haemoglobin and Immunoglobulin.

**Q5)** Attempt any one of the following:

**[16]**

- a) Enlist the contributions of Louis Pasteur in the development of Microbiology?
- b) What are Nucleic Acids? Give structure and function of different types of Nucleic acids.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

**P515**

**[4917]-118**

**F.Y.B.Sc.**

**MICROBIOLOGY**

**Basic Techniques in Microbiology  
(2013 Pattern) (New Course) (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 right indicate full marks.*

**Q1)** Answer the following.

**[16]**

- a) Define: Numerical Aperture.
- b) Name any two decolorizers used in staining.
- c) Fill in the blanks.
  - i) \_\_\_\_\_ is used as biological indicator of sterilization.
  - ii) Membrane filter with \_\_\_\_\_ pore size is used for sterilization by filtration.
- d) Name any two culture collection centres.
- e) Define – Growth rate.
- f) What is an Oligodynamic action.
- g) Define diauxic growth curve.
- h) Name two methods of counting of total viable count of bacteria.

**Q2)** Write short notes on any four.

**[16]**

- a) Use of autoclave for sterilization.
- b) Spherical aberrations.
- c) Fixatives.

**P.T.O.**

- d) Role of peptone in media.
- e) Chemoautotrophs.
- f) Exponential phase.

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

- a) what is synchronous culture? Explain any one method of obtaining synchronous culture.
- b) What are extremophiles? Give suitable examples.
- c) Explain principle and significance of negative staining.
- d) Diagrammatically represent principle of dark field microscopy.
- e) Write characteristics of an 'Ideal disinfectant'.
- f) Comment on use of oil immersion objective.

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

- a) What are differential media? Explain any one in detail.
- b) Explain mechanism and significance of acid fast staining.
- c) Describe different methods of maintenance of bacterial culture.
- d) What is phenol coefficient? Explain any one method to determine it.

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

- a) Enlist different methods of enumeration of bacteria. Explain any two methods.
- b) Explain the principle, construction and working of bright field compound microscopy.

**x      x      x**

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P516**

**[4917]-119**

**F. Y. B. Sc.**

**EXPERIMENTAL PSYCHOLOGY**

**General Psychology**

**(2013 Pattern) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

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

**Q1)** Answer in 20 words [8 out of 10]

**[16]**

- a) What is Psychology?
- b) State the full form of GABA.
- c) What is attention?
- d) Define Motivation.
- e) What is conflict?
- f) Define Emotion.
- g) Define Memory.
- h) What is Personality?
- i) Define Creative Thinking.
- j) State the full form of WAIS.

**Q2)** Answer in 50 words [4 out of 6]:

**[16]**

- a) State the method of observation.
- b) State the function of Thyroid.
- c) Explain the sources of frustration.
- d) Explain love as a basic emotion.
- e) State the Canon Bard's theory of emotion.
- f) Explain Allport approach of personality.

**P.T.O.**

**Q3)** Answer in 150 words: [4 out of 6] : **[16]**

- a) Explain the educational Psychology.
- b) Write short note on span of Attention.
- c) Explain the definition and nature of sensation.
- d) State the importance of EQ.
- e) Explain the TAT.
- f) What is decision making?

**Q4)** Answer in 300 words [2 out of 4]: **[16]**

- a) Explain the Fields of Psychology.
- b) Explain the structure and function of neuron.
- c) Explain the misconceptions of Personality.
- d) Explain the types of mentally challenged.

**Q5)** Answer in 500 words [1 out of 2]: **[16]**

- a) Define Motivation. Explain the types of Biological motive.
- b) What is learning? Explain the types of learning.



Total No. of Questions : 5]

SEAT No :

**P517**

[Total No. of Pages : 2

**[4917] - 120**  
**F.Y. B.Sc.**  
**PSYCHOLOGY**  
**Experimental Psychology**  
**(2013 Pattern) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

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

**Q1)** Answer in 20 words (8 out of 10):

**[16]**

- a) Define experimental Psychology.
- b) Differentiate Experimental and control group.
- c) Define threshold.
- d) What is Learning?
- e) What is image?
- f) Define thinking.
- g) What is fore-period?
- h) Define Psychological Test.
- i) State the formula of IQ.
- j) State the full form of WAIS.

**Q2)** Answer in 50 words (4 out of 6):

**[16]**

- a) State the application of educational Psychology.
- b) State the precaution of method of average, error.
- c) Describe the method of Trial and Error.
- d) State the Experiment on Operant conditioning.
- e) State the factors influencing of learning.
- f) Describe Mechanical Aptitude Test.

**P.T.O.**

**Q3)** Answer in 150 words (4 out of 6): **[16]**

- a) State the Fechner Law.
- b) State the approaches of problem solving.
- c) State the types of concept formation.
- d) Write short note on individual test.
- e) State the definition and nature of aptitude.
- f) Explain in brief Sentence Completion Test. (SCT)

**Q4)** Answer in 300 words (2 out of 4): **[16]**

- a) Describe the Goals of Experimental Psychology.
- b) Explain the basic concepts of Psychophysics.
- c) Explain the characteristics of classical conditioning.
- d) Explain the uses of Psychological test.

**Q5)** Answer in 500 words (1 out of 2): **[16]**

- a) What is variable? Explain the various types of variable.
- b) Define Reaction time. Describe the determinants of Reaction time.



Total No. of Questions : 5]

SEAT No. :

**P518**

[4917] - 123

[Total No. of Pages : 4

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 the candidates:*

- 1) *All Questions are compulsory.*
- 2) *Neat labelled diagrams 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) Give the color code format for
  - i)  $470\Omega$  with 20% tolerance.
  - ii)  $470\Omega$  with 5% tolerance.
- b) What is ideal voltage source? Compare it with practical voltage source.
- c) Define the parameters frequency, period, phase rms value for ac signal.
- d) What is zener diode? Draw it's characteristics. Also draw its circuit symbol.
- e) Give the circuit symbol for PNP transistor and n-channel FET.
- f) Sketch the output characteristics of a transistor showing different regions.
- g) What is intrinsic standoff ratio for UJT? Give its typical value.
- h) What is operational Amplifier?

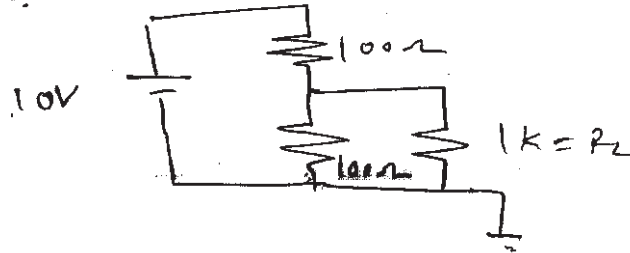
**P.T.O.**



Q2) Attempt any four of the following:

[16]

- a) i) Draw the circuit symbols for Non-polar, polar, variable and Trimmer capacitors.
- ii) What is effective value of two capacitors if they are connected in series and in parallel?
- b) State Thevenin's theorem, use it for the following circuit.

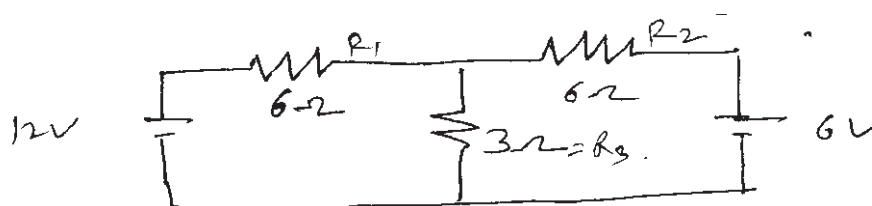


- c) What is Rectifier? Draw the circuit diagram for full wave rectifier using bridge. Also explain its working.
- d) Explain the concept of amplification. Draw its circuit diagram using transistor. Explain the role of all components in it.
- e) Draw the diagram showing construction of JFET. Explain its working.
- f) Write at least 4 parameters of op-amp. Give their ideal and practical values.

Q3) Attempt any four of the following:

[16]

- a) i) What is inductance? If two inductors of value 10mH each are connected in parallel, then what is effective inductance?
- ii) What is transformer? State its types.
- b) What is superposition theorem? Using it calculate current through 3Ω resistance in following circuit.

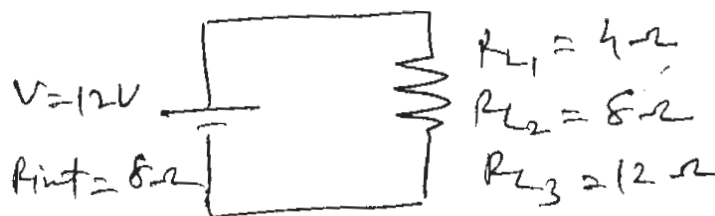


- c) Draw the block diagram of p/s (power supply). Explain the function of each block in it.
- d) Explain the working of transistor as switch.
- e) Draw the circuit symbols for n-channel and p-channel MOSFETs. Explain the working of any one of them.
- f) Draw the circuit diagram for operational amplifier as voltage follower. Derive its o/p expression.

**Q4)** Attempt any four of the following:

**[16]**

- a)
  - i) What is switch? Give at least 2 types of switches.
  - ii) Explain the role of fuse in circuit. How cartridge fuse works?
- b) What is maximum power transfer theorem. Verify it for the circuit.

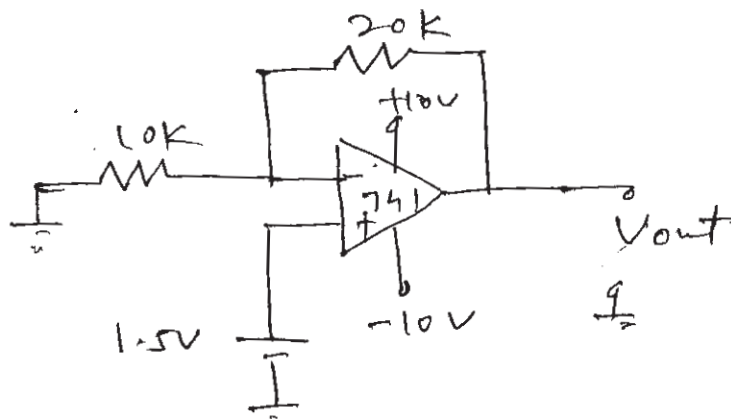


- c) What is photodiode? Explain its working principle. Give its one application.
- d) Draw the CC configuration of transistor where is it used? Why is it called EF (Emitter follower)?
- e) What is VVR? How to obtain it?
- f) What is virtual ground? Using it derive the expression for the inverter using op-amp.

Q5) Attempt any four of the following:

[16]

- a)
  - i) What is relay? Explain its working principle.
  - ii) What is BNC and FRC connector?
- b) What is series resonance? Derive the expression for its resonant frequency.
- c)
  - i) What is phase difference?
  - ii) What is barrier potential for p-n junction diode.
- d) What is frequency response? Draw it for RC coupled amplifier. How to find BW?
- e)
  - i) Compare BJT with JFET.
  - ii) For a transistor  $\alpha = 0.9$ . Find  $\beta$ .
- f) Find the o/p voltage for the following circuit.



Total No. of Questions :5]

SEAT No. :

**P519**

**[4917]-124**

[Total No. of Pages :3

**F.Y.B.Sc.**

**ELECTRONIC SCIENCE**

**EL-102: Principles of Digital Electronics**

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

*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 calculator and logtable is allowed.*
- 4) *Figures to the right indicate full marks.*

**Q1)** Answer the following questions in brief:

**[16]**

- a) What is sequential circuit? Give its examples.
- b) Distinguish between binary and BCD codes.
- c) What is digital comparator?
- d) Draw logic circuit of 1:2 demultiplexer. Write its truth table.
- e) Draw logic symbols and truth tables of OR gate and NAND gate.
- f) Convert following numbers into 2's complement:
  - i) 101101,
  - ii) 111101
- g) What is Fan out of logic families?
- h) State advantages of MOS family over bipolar family.

**Q2)** Answer any FOUR of the following:

**[16]**

- a) Explain AND gate circuit using diode logic.
- b) Convert given nonstandard SOP expression into standard SOP expression:  $AB + A\bar{C} + BC$
- c) Perform subtraction using 2's complement:
  - i)  $(45)_{10} - (29)_{10}$ ,
  - ii)  $(78)_{10} - (49)_{10}$

**P.T.O.**

- d) Construct 4:1 multiplexer using two 2:1 multiplexers and give its function table.
- e) Explain working of J-K flip flop constructed with only NAND gates.
- f) Explain 2 input TTL NAND gate with proper circuit.

**Q3)** Answer any FOUR of the following:

**[16]**

- a) Explain EXOR gate as parity generator.
- b) Simplify the following logic expression using K-map:

$$Y = \bar{A}\bar{B}\bar{C}D + A\bar{B}\bar{C}D + ABC\bar{D} + A\bar{B}C\bar{D}$$

- c) Perform subtraction using 1's complement method.
  - i)  $(69)_{10} - (32)_{10}$ ,                      ii)  $(27)_{10} - (15)_{10}$
- d) Describe BCD to seven segment decoder.
- e) Draw the circuit of 3 bit Asynchronous UP counter. Write its truth table.
- f) Write short note on tristate logic.

**Q4)** Answer any FOUR of the following:

**[16]**

- a) Explain gray code system with suitable example.
- b) Use only NAND gates to design OR gate.
- c) Draw logic symbol of Half adder. Write its truth table.
- d) What is seven segment display? Explain types of seven segment displays? Write its application.
- e) Explain MOD 6 counter with proper logic circuit and truth table.
- f) Explain different types of shift registers.

**Q5)** Answer any FOUR of the following:

**[16]**

- a) Perform the following:
  - i)  $(23.85)_{10} = (\dots)_2$
  - ii)  $(E8DC)_{16} = (\dots)_8$
- b) Draw logic symbols and truth tables of basic logic gates - OR and NAND.
- c) Explain 4-bit parallel adder with proper circuit.
- d) What is difference between decoder and demultiplexer?
- e) Explain 1:4 demultiplexer with suitable circuit.
- f) Explain T-Flip Flop with proper logic diagram.

**x x x**

Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

**P520**

**[4917]-125**

**F. Y. B. Sc. (Annual)**

**DEFENCE AND STRATEGIC STUDIES**

**DS - 1 : Evolution of Strategic Thought**

**(New Course) (2013 Pattern) (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.*

**Q1)** Answer in 20 words each: [Any Ten]

**[20]**

- a) Define "Air Power".
- b) What do you mean by "Strategy"?
- c) Define "Tactics".
- d) What do you understand by "Guerrilla"?
- e) Write any two causes of war.
- f) Who was Mao-Tse-Tung?
- g) What do you know about Sun-tzu?
- h) What do you mean by Industrial Revolution?
- i) State the title of literature which was wrote by Kautilya.
- j) Define "Sea Power".
- k) Write the name of the author of "On War".
- l) Define "Modern War".
- m) What do you mean by Civil War?

***P.T.O.***

**Q2) Answer in 50 words [Any Two]: [10]**

- a) Write a few lines on “Total War”.
- b) Explain the concept of “Heartland”.
- c) Explain the causes of rise of Professional Army.
- d) Write few lines on “J.F.C. Fuller”.

**Q3) Answer in 150 words [Any Two]: [20]**

- a) Discuss the Prof. Mackinders theory of Heartland.
- b) Write an essay on Thoughts of Karl Von Clausewitz.
- c) What was the impact of American civil war?
- d) Evaluate the geopolitical thoughts of Haushofer.

**Q4) Answer in 300 words [Any Two]: [30]**

- a) Write an essay on “Various Causes of War”.
- b) Evaluate the views of Cheguevara on “Guerilla Warfare”.
- c) Analyse the strategic thoughts of Kautilya.
- d) Explain the elements of sea power as per A.T. Mahan.





Total No. of Questions : 4]

SEAT No :

**P521**

[Total No. of Pages : 2

**[4917] - 126**  
**F.Y. B.Sc. Annual**  
**DEFENCE AND STRATEGIC STUDIES**  
**DS - 2: India's National Security**  
**(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)** Answer in 20 words each (any ten).

**[20]**

- a) Introduce "Two Nations Theory."
- b) Define Terrorism.
- c) What was the outcome of Chinese Aggression in 1962?
- d) Briefly introduce 1965 WAR.
- e) What is D-DAY?
- f) What do you mean by Hostility?
- g) What is National Security?
- h) Introduce Military.
- i) What is meant by Insurgency?
- j) How will you differentiate military and non-military threat?
- k) Define Comprehensive Security.
- l) Relate threats and its abetments.
- m) What is aim of food security?

**P.T.O.**

**Q2)** Answer in 50 words each (any two) **[10]**

- a) Write the role of DRDO.
- b) Write about the Military Operations on HYDERABAD.
- c) How External elements abet to LIC? Justify
- d) Explain about the geostrategic importance of Indian Ocean.

**Q3)** Answer in 150 words (any two) **[20]**

- a) What are the constraints and compulsion in a democracy in controlling LIC?
- b) What are the problems and prospects of peace in Indo-Pakistan relations?
- c) Explain about the role of naval power in 1971.
- d) Explain about India's land border.

**Q4)** Answer in 300 words (any two) **[30]**

- a) Explain about the Theory of Nuclear deterrence.
- b) Explain the role of IAF in 1971 War.
- c) Explain about India's defence policy.
- d) Explain the role of Scientific and Technological capacity to substantiate the national defence.



Total No. of Questions : 4]

SEAT No. :

**P522**

[4917]-127

[Total No. of Pages : 2

**F. Y. B. Sc.**

**DEFENCE AND STRATEGIC STUDIES**

**Ds - 3 : International Security  
(New) (2013 Pattern) (Paper - III)**

*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):

**[10 × 2 = 20]**

- a) State the meaning of Arms Control.
- b) What do you mean by Collective Security?
- c) Write the meaning of Neutrality.
- d) State the meaning of National power.
- e) Write the meaning of National vital values.
- f) What do you mean by nationalism?
- g) What do you mean by International security?
- h) State the meaning of Terrorism.
- i) What do you mean by Conflict studies?
- j) State the meaning of pacific settlement.
- k) What do you mean by Strategy?
- l) State the meaning of globalization.
- m) What do you mean by model of International Security?

***P.T.O.***

**Q2) Answer in 50 Words (Any Two):**

**[2 × 5 = 10]**

- a) Explain impact of regionalism.
- b) Discuss India's external security environment.
- c) Explain basic features of Neutrality.
- d) Discuss nature and scope of conflict management.

**Q3) Answer in 150 Words (Any Two):**

**[2 × 10 = 20]**

- a) Explain Techniques of Balance of Power (BOP).
- b) Discuss problems of Disarmament.
- c) Assesses contribution of Non-alignments movement in world security.
- d) Discuss social and economic achievements of U.N.O.

**Q4) Answer in 300 Words (Any Two):**

**[2 × 15 = 30]**

- a) Discuss UN system of Pacific settlement of Disputes.
- b) Explain importance of peace and conflict studies.
- c) Discuss India's internal security environment.
- d) Write a note on Conflict management and resolution.



Total No. of Questions : 5]

SEAT No. :

**P523**

[4917]-128

[Total No. of Pages : 2

F. Y. B. Sc.

**ENVIRONMENTAL SCIENCE**

**EVS - 101 : Fundamentals of Environmental Chemistry &  
Fundamentals of Environmental Biology  
(New Course) (Paper - I) (2013 Pattern) (Theory)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

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

**Q1)** Answer the followings in not more than 5 lines:

**[16]**

- a) Define: Heavy Metal.
- b) What are Adulterants?
- c) Give any two physical properties of water.
- d) What is molarity?
- e) What is Domain?
- f) Define : Evolution.
- g) Explain the concept of 'Sub-Species'.
- h) What is Habitat loss?

**Q2)** Answer any four of the following:

**[16]**

- a) Explain the 'Oxygen Cycle' in detail.
- b) State the physical and Chemical properties of Water.
- c) What is the scope of Environmental Chemistry.
- d) Explain Geological factors for distribution of life on earth.
- e) Give the ecological adaptations of plants.
- f) Explain the components of systematics.

**P.T.O.**

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

- a) Sulphur Cycle.
- b) Titrimetric Methods.
- c) Food Additives.
- d) Continental Drift.
- e) Classification of Microbes.
- f) Speciation.

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

- a) Explain Mass Extinction in detail.
- b) Explain biogeographic profile of India.
- c) What is pesticide? Explain its impact on environment.
- d) Explain interactive reactions between any two segments of environment.

**Q5)** Answer any one of the following: **[16]**

- a) What is Adulteration? State its impact on environment and Human health.
- b) What is Bioresource? Explain its significance, Extraction method and threats to Bioresource.



Total No. of Questions :5]

SEAT No. :

**P524**

**[4917]-129**

[Total No. of Pages :2

**F.Y.B.Sc.**

**ENVIRONMENTAL SCIENCE**

**EVS-102: Fundamentals of Environmental Geosciences &  
Fundamentals of Environmental Pollution  
(2013 Pattern) (New Course) (Theory) (Paper - II)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

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

**Q1)** Answer the following in not more than 5 lines: **[16]**

- a) Define: Igneous rocks and give one example.
- b) What is weathering?
- c) Name any two types of Lapse rate.
- d) Write any two renewable energy sources.
- e) Write the full form of OSHA.
- f) What is Eutrophication?
- g) Define : Biofertilisers.
- h) State the difference between point & Non- point source of pollution.

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

- a) Describe any four physical properties of soil.
- b) Define Evaporation and explain the factors affecting its rate.
- c) Describe the vertical structure of earths atmosphere.
- d) Discuss the effects of air pollution on Biological and non-Biological system.
- e) What control measures can be taken against soil pollution.
- f) Write the sources of Radioactive pollution and add a note on chernobyl disaster.

**P.T.O.**

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

- a) Sedimentary Rocks.
- b) Management of natural calamities.
- c) Internal structure of earth with diagram.
- d) Ozone depletion.
- e) Organic farming.
- f) A case study of solid waste pollution.

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

- a) Discuss the significance of solar energy.
- b) Describe the factors affecting winds.
- c) Explain different types of pollutants with examples.
- d) Describe the sources of water pollution with suitable case study.

**Q5)** Answer any one of the following: **[16]**

- a) Explain any four micro and four micronutrients with respect to functions and deficiency syndromes.
- b) Describe the sources effects and control measures of noise pollution.





Total No. of Questions : 4]

SEAT No. :

**P525**

[Total No. of Pages : 4

[4917] - 130

**F.Y. B.Sc.**

**FOUNDATION COURSE (A. Component)**

**(2013 Pattern) (Restructuring)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates :*

- 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) Fraternity
- ii) Population Explosion
- iii) Government
- iv) Self - Employment

**Q2)** Write the following short notes in 100 words each. (Any four) **[20]**

- i) Religious Values
- ii) Prarthana Samaj
- iii) Food Problem
- iv) State and Nation
- v) Types of Liberty
- vi) Privatization

**P.T.O.**

**Q3)** Write answer of the following questions in 200 to 250 words each. (Any three) [30]

- i) Write the effect of science and technology on Agriculture.
- ii) State the supporting component of National Integration.
- iii) State the information about Feminism movement in India.
- iv) Write the causes of Gender disparity.
- v) Write the characteristics of Indian society.

**Q4)** Write the answer any one of following question in 500 words. [20]

- i) What is Democracy? Write the merits and demerits of Indian Democracy?
- ii) Give an account on scientific method.



Total No. of Questions : 4]

P525

[4917] - 130  
F.Y. B.Sc.  
FOUNDATION COURSE (A. Component)  
(2013 पॅटर्न) (Restructuring)  
(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 शब्दात स्पष्ट करा.(फक्त दोन) [10]
- i) बंधुत्व
  - ii) लोकसंख्या विस्फोट
  - iii) सरकार / शासनसंस्था
  - iv) स्वयंरोजगार
- प्रश्न 2) पुढील टीपा 100 शब्दात लिहा.(फक्त चार) [20]
- i) धार्मीक मूल्ये
  - ii) प्रार्थना समाज
  - iii) अन्न समस्या
  - iv) राष्ट्र व राज्य
  - v) स्वातंत्र्याचे प्रकार
  - vi) खाजगीकरण

प्रश्न 3) पुढील प्रश्नांची 200 ते 250 शब्दात उत्तरे लिहा. (फक्त तीन)

[30]

- i) विज्ञान तंत्रज्ञानाचा शेतीवरील परिणाम लिहा.
- ii) राष्ट्रीय एकात्मतेस पोषक ठरणारे घटक स्पष्ट करा.
- iii) भारतातील स्त्रीवादी चळवळीवर वृतांत लिहा.
- iv) लैंगिक विषमतेची कारणे स्पष्ट करा.
- v) भारतीय समाजाची वैशिष्ट्ये लिहा.

प्रश्न 4) पुढीलपैकी एका प्रश्नाचे उत्तर 500 शब्दात लिहा.

[20]

- i) लोकशाही म्हणजे काय? भारतीय लोकशाहीचे गुणदोष सांगा.
- ii) वैज्ञानिक पद्धतीवर सविस्तर वृतांत लिहा.



Total No. of Questions : 10]

SEAT No. :

[Total No. of Pages : 3

**P526**

**[4917]-131**

**F. Y. B. Sc. (Vocational)  
INDUSTRIAL CHEMISTRY  
Surface Chemistry and Catalysis  
(New) (2013 Pattern) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagrams wherever necessary.*

**SECTION - I**

**Q1)** Define and explain the following: **[8]**

- a) Adsorption.
- b) Homogeneous catalysis.
- c) Promoters.
- d) Lyophobic solutions.

**Q2)** Answer any two of the following: **[8]**

- a) What is electrophoresis? How it is useful in separation of colloids?
- b) Describe the kinetic properties of solutions.
- c) Discuss the mechanism of enzyme catalysis.

**Q3)** Write short notes on any two of the following: **[8]**

- a) Peptization.
- b) Factors affecting catalysis.
- c) Active centers.

**P.T.O.**

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

- a) Explain the mechanism of acid catalysed hydrolysis of an ester.
- b) What are gels? How are they different from sols? Explain the properties of gels.

**Q5)** Answer any two of the following: [8]

- a) Describe autocatalysis.
- b) Discuss Langamur theory of adsorption.
- c) Explain the method of dialysis for purification of colloidal solutions.

### SECTION - II

**Q6)** Define and explain the following terms: [8]

- a) Empirical formula.
- b) Yield.
- c) Limiting reactant.
- d) Vapour pressure.

**Q7)** Answer any two of the following: [8]

- a) Prove that  $C_p - C_v = R$ .
- b) What is the effect of temperature on heat of reaction?
- c) What do you understand by Flash distillation?

**Q8)** Write short notes on any two of the following: [8]

- a) Recycling operations.
- b) Energy balance in closed systems.
- c) Work and heat.

**Q9)** Answer any one of the following: [8]

- a) State and explain phase rule by taking water-ethanol system.
- b) State and explain Raoult's Law and Henry's Law.

**Q10)** Solve any two of the following: [8]

- a) 9.8 gms of sulphuric acid is dissolved in water to prepare one litre of solution. Determine the normality and molarity of the solution.
- b) A stream of carbon dioxide flowing at a rate of 100 gmole/Min is heated from 25°C to 110°C. Calculate the heat that must be transferred using  $C_p^\circ$  data.

$$C_p^\circ = a + bT + cT^2 \text{ cal/gmole } ^\circ\text{K.}$$

Gas	9	$b \times 10^3$	$c \times 10^6$
CO <sub>2</sub>	6.339	10.14	-3.415

- c) 10,000 kg/hr of solution containing 20% methanol is continuously fed to a distillation column. Product is found to contain 98% methanol and waste solution from column carries 1% methanol. All percentages are by weight. Calculate the mass flow rates of distillate and bottom product and percent loss of methanol.



Total No. of Questions : 6]

SEAT No. :

**P2658**

[Total No. of Pages : 2

**[4917]-132**

**F.Y. B.Sc. (Vocational Biotechnology)**

**101 : BIOCHEMISTRY AND MICROBIOLOGY**

**(2013 Pattern) (Theory) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Use separate answer book for section I & II.*
- 3) *Figures to the right indicate full marks.*

**SECTION - I**  
**(Biochemistry)**

**Q1)** Answer the following questions in short: **[8]**

- a) Define carbohydrates.
- b) Explain the term “inhibitors of enzymes”.
- c) What is a nucleotide? Give example.
- d) What are lipoproteins? Give example.

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

- a) Explain the effect of temperature on enzyme activity.
- b) Differentiate between DNA and RNA.
- c) Describe TCA cycle in brief.
- d) Enlist the functions of lipids.
- e) Give classification of proteins on the basis of functions.

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

- a) Give classification of carbohydrates with examples.
- b) What is glycolysis? Give features and energetics of glycolysis.
- c) What are enzymes? Give classification of enzymes with examples.

**P.T.O.**



**SECTION - II**  
**(Microbiology)**

**Q4)** Answer the following questions in short: **[8]**

- a) Define antagonism. Give example of antagonism.
- b) Name any two capsule forming microorganisms.
- c) What is MPN?
- d) Mention any two dyes used in EMB agar.

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

- a) Gram staining is considered as differential staining. Explain.
- b) Describe the crowded plate technique in brief.
- c) Write a note on endospore staining.
- d) Mention various physical agents used for control of microbes.
- e) Explain the concept of differential media.

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

- a) What is symbiotic association? Explain it with suitable example.
- b) Explain the concept of selective media with suitable example.
- c) Give the structure of peptidoglycon. Compare the cell wall structure of gram positive and Gram negative bacteria.



Total No. of Questions : 5]

SEAT No. :

**P1622**

[Total No. of Pages : 2

**[4917] - 133**

**F.Y. B.Sc.**

**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION**

**Basic Photography and Appreciation of Media**

**(2013 Pattern) (Paper - I) (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 and labeled diagrams wherever necessary.*

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

- a) Why is the white balance setting important in digital photography?
- b) What is the function of the mirror used in a DSLR camera?
- c) Mention advantages of 'point and shoot' camera.
- d) What would you prefer between the 'live view' and the view finder? Why?
- e) Explain the function of the shutter in a DSLR camera.
- f) Explain the difference between refraction and diffraction of light.
- g) Draw a diagram and explain the difference between the specular and the diffused reflection of light.
- h) Draw a diagram and explain the concept of dispersion of light.

**Q2)** Answer ANY FOUR of the following. **[16]**

- a) Draw a suitable diagram and explain how is a pin-hole image formed? Discuss its merits and demerits.
- b) What is shutter speed? How is it important for a photographer?
- c) Draw a diagram and explain what is a diverging beam and a converging beam of light.
- d) Give suitable examples and differentiate between 'news' and 'photo news'.
- e) Mention four different technical qualities of a photographic image.

**P.T.O.**

**Q3)** Answer ANY FOUR of the following. **[16]**

- a) Compare the leaf shutter and focal plane shutter.
- b) Draw a diagram and explain the ‘barrel distortions’ and the ‘pincushion distortion’. How are these distortions reduced?
- c) What do you mean by f number? Write down the f number scale. What is a full stop, half stop and intermediate stop?
- d) Draw a diagram and explain the spherical aberration. Discuss how it can be reduced.
- e) Give suitable examples and differentiate between a ‘public place’ and a ‘private place’ as understood by a photographer.

**Q4)** Answer the following. **[16]**

- a) Discuss the comparison between a photograph and a painting.

OR

Discuss the role of a photographic image in the print media.

- b) Discuss the ethical issues a photographer should consider.

OR

Discuss the role of photographer in society.

**Q5)** Answer ANY ONE of the following. **[16]**

- a) What is Pictorial Composition? What are the different elements of composition? Discuss the importance of these elements with the help of suitable sketches.
- b) Draw a neat and labeled diagram and describe the construction and working of a DSLR camera.



Total No. of Questions : 5]

SEAT No. :

**P527**

**[4917]-134**

[Total No. of Pages : 2

**F. Y. B. Sc. (Vocational)**  
**ELECTRONIC EQUIPMENT MAINTENANCE (EEM)**  
**Maintenance Concepts, Instruments and Appliances**  
**(Paper - I) (New Course) (2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

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

**Q1)** Attempt all of the following:

**[16]**

- a) What is reliability of an instrument?
- b) What are the precautions when handling a voltmeter?
- c) What is mean by MTR?
- d) What is the function of “level knob” on front panel of CRO?
- e) What is resolution & sensitivity of instrument?
- f) What are the waveforms generated by function generator?
- g) What is typical current consumption in digital clock in different parts?
- h) What is a function of thermostat in electric iron?

**Q2)** Attempt any four of the following:

**[16]**

- a) How does reliability defined in series systems?
- b) What is pmmc movement? What are different parts of it?
- c) Explain the concept of autoranging in instrument.
- d) What are different errors that can occur in measurement?
- e) Write a short note on AF signal generator.

**P.T.O.**

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

- a) Write a short note on series type ohmmeter.
- b) Explain the working of Digital Storage Oscilloscope.
- c) Explain the working of switch mode power supply.
- d) How emergency light works? Explain it with suitable diagram.
- e) What are applications of pulse generator?

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

- a) Explain the working of pulse generator.
- b) Explain the working of digital clock with the help of block diagram.
- c)
  - i) Explain the working of DTMF Dialing of telephone instrument.
  - ii) What is the difference between linear & switch mode power supply.

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

- a) Write a short note on Microwave Oven.
- b) What is circuit breaker? What are different types of it? Explain in brief.
- c) Explain the working of Automatic electric iron.



Total No. of Questions : 5]

SEAT No. :

**P528**

[4917]-135

[Total No. of Pages : 2

**F. Y. B. Sc. (Vocational)**

**INDUSTRIAL MICROBIOLOGY**

**Micro-Organism and Systems for Fermentation Processes**

**(Paper - I) (2013 Pattern) (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) *All questions carry equal marks.*
- 4) *Draw neat labelled diagrams whatever necessary.*
- 5) *Scientific calculators is allowed.*

**Q1)** Answer each sub-question in one or two lines. Fill in the blanks; State whether the statement is true or false: **[16]**

- a) Yield.
- b) Fermentation.
- c) Quality Control.
- d) True or False:  
Streptomyces are important Fungi employed in fermentation industry to produce antibiotic streptomycin.
- e) True or False:  
Ashbya gossypii is natural overproducer of Ribo-flavin or Vitamin B<sub>12</sub>.
- f) List phases of clinical trial.
- g) What is BSL?
- h) Normality.

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

- a) Explain brief about downstream process.
- b) Discuss the process of modelling.
- c) Draw the flow chart of production process in typical industrial microbiology establishment.

**P.T.O.**

- d) Discuss the advantages and limitation of bioprocesses.
- e) What are culture collection? What is their role in industrial microbiology.
- f) Explain manufacturing and environmental safety in fermentation industry.

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

- a) Patents.
- b) GRAS microorganisms.
- c) Need of models in fermentation study.
- d) Multidisciplinary nature of industrial microbiology.
- e) Types of error in measurement.
- f) Proteobacteria.

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

- a) Explain ideal characteristics of strains used in fermentation.
- b) Describe equation and graphs of log- lag plot.
- c) Explain the WHO's classification of micro-organisms on the basis of hazards.
- d) Following are the measurement carried out on concentration of antibiotics produced by strain XC-01. Calculate and represent mean, standard deviation and variance.

Antibiotic produced mg/L: 37.3, 33.31, 59.8, 29.41, 41.45, 47.8, 36.28, 55.78, 51.95 & 42.31.

**Q5)** Answer any one of the following: **[16]**

- a) Describe the various methods of presentation of data.
- b) Give complete account of development of pharmaceutical product.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**P529**

**[4917]-136**

**F. Y. B. Sc. (Vocational)**

**COMPUTER HARDWARE AND NETWORK ADMINISTRATION**

**Essentials of Computer**

**(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 indicates full marks.*
- 3) *Draw neat diagrams wherever necessary.*

**Q1)** Attempt the following:

**[16]**

- a) Define flash memory.
- b) Explain nested interrupts.
- c) What is BIOS?
- d) Write the full forms of CAD, BCD, SIMM & MICR.
- e) Write short notes on HDD.
- f) Write short notes on History of Computers.
- g) Define Web Camera.
- h) Explain the working of MOUSE.

**Q2)** Attempt any four:

**[16]**

- a) Define DMA.
- b) Explain the working of LASER printer.
- c) Define plotter.
- d) Write short notes on Bus structure of computer.
- e) Explain Motherboard.
- f) Define device controller.

**P.T.O.**



**Q3)** Attempt any four:

**[16]**

- a) Explain Instruction prefetch.
- b) Write notes on notebook and tablet.
- c) Explain front and rear panel of computer.
- d) Write notes on bluetooth.
- e) Explain working of scanner.
- f) Write notes on DOT matrix printer.

**Q4)** Attempt any two:

**[16]**

- a) Write short notes on off-line and on-line UPS.
- b) Explain the different types of computer memory.
- c) Explain computer system architecture with functional block diagram.

**Q5)** Attempt any two:

**[16]**

- a) Explain control unit of computer.
- b) Explain different types of software.
- c) Write short notes on:
  - i) Memory mapping.
  - ii) Digitizer.



Total No. of Questions : 5]

SEAT No. :

**P530**

[4917]-137

[Total No. of Pages : 2

**F. Y. B. Sc. (Vocational)  
SEED TECHNOLOGY**

**Morphology, Plant Breeding and Testing for Cultivar Genuineness  
(2013 Pattern) (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 labeled diagrams wherever necessary.*

**Q1)** Answer in two lines (Any eight):

**[8 × 2 = 16]**

- a) Define a flower.
- b) Give an example of capsule type of fruit.
- c) What is artificial vegetative propagation?
- d) What do you mean by selection activity in plant breeding?
- e) Define plant introduction.
- f) What is a seed?
- g) Enlist the types of mutation.
- h) Define grow out test.
- i) What is anther culture?

**Q2)** Attempt any four of the following:

**[4 × 4 = 16]**

- a) Describe wheat flower in detail.
- b) Explain any one method of natural vegetative propagation in detail.
- c) Give the contrivances in self pollination.
- d) Define plant breeding. Write the scope and objectives of plant breeding.
- e) Comment on the achievements of mutation breeding.

**P.T.O.**

**Q3)** Write notes on any four of the following:

**[4 × 4 = 16]**

- a) Development of microspore.
- b) Development of female gametophyte.
- c) Types of endosperm.
- d) Plant introduction.
- e) Phenol colour test.

**Q4)** Attempt any two of the following:

**[2 × 8 = 16]**

- a) What is fertilization? Discuss process of fertilization in angiosperms.
- b) Describe berry and pepo type of fruits with suitable examples and diagrams.
- c) Define hybridization. Write the procedure of hybridization.

**Q5)** Write the diagnostic characters, floral formula and floral diagram of families Malvaceae and Liliaceae. **[16]**

OR

Define clonal selection. Write procedure, advantages, disadvantages and achievements of clonal selection.



Total No. of Questions :10]

SEAT No. :

[Total No. of Pages :3

**P531**

[4917] - 138

**F.Y.B.Sc. (Vocational)**  
**INDUSTRIAL CHEMISTRY - II**  
**Material and Energy Balance**  
**(Paper - II) (2013 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 in allowed.*
- 6) All questions are compulsory.*

**SECTION - I**

**Q1)** Answer the following:

**[8]**

- a) What is coal - tar?
- b) Define calorific value?
- c) Give advantages of bio - gas.
- d) Define Cracking.

**Q2)** Attempt any two of the following:

**[8]**

- a) Write a short - note on coke - oven gas.
- b) Give a brief account of analysis of coal by any one method.
- c) Give classification of gaseous fuels.

***P.T.O.***

- Q3)** Attempt any two of the following: [8]
- Write a short note on rocket fuel.
  - Describe in brief process of manufacture of coal gas.
  - Give a brief account of fractional distillation of coal oil.
- Q4)** Answer any one of the following: [8]
- Discuss the theories of origin and sources of petroleum.
  - Give advantages and disadvantages of the following:
    - Liquid fuels.
    - Producer gas.
- Q5)** Answer any one of the following: [8]
- Describe in detail various methods of analysis of fuel - gases.
  - Give classification of coal according to rank. Discuss destructive distillation of wood.
- SECTION - II**
- Q6)** Answer the following: [8]
- Give allotropic forms of iron.
  - Define slag and flux.
  - Give uses of clay minerals.
  - Give uses of aluminium oxide.
- Q7)** Attempt any two of the following: [8]
- Comment on smelting process employed in blast furnace.
  - Write a short note on commercial forms of Aluminium.
  - Explain manufacturing process of magnesium by electrolysis of fused magnesium chloride.

**Q8)** Attempt any two of the following: [8]

- a) Give a brief account of roasting of Copper.
- b) Write a note on carbon nanobuds and carbon nanotubes.
- c) Give application of alumina in fillers.

**Q9)** Answer any one of the following: [8]

- a) What are allotropes? Give a detailed account of allotropes of carbon.
- b) Write a note on origin of clay minerals and explain their types.

**Q10)** Answer any one of the following: [8]

- a) How is Aluminium produced from bauxite? Give physical properties of Aluminium and comment on its occurrence.
- b) Give the process of manufacture of cast iron or pig iron. Also enlist properties and uses of cast iron.



Total No. of Questions : 5]

SEAT No. :

P1623

[Total No. of Pages : 2

[4917] - 140

F.Y. B.Sc.

**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION**  
**Introduction to Mass Communication & Media Scene in India**  
**(2013 Pattern) (Paper - II) (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 and labeled diagrams and give suitable examples wherever necessary.*

**Q1) Attempt any two of the following :** **[16]**

- a) Draw a block diagram and explain the Shanon and Weaver model of communication. Enlist the advantages and disadvantages of this model.
- b) What is communication? Explain the terms used in the definition and give suitable examples to illustrate.
- c) Write about the different ways in which communication impacts an audience.

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

- a) You are asked to interview a newly elected Member of the Parliament. What questions would you ask him for a youth magazine?
- b) What are the different stages of intra-personal communication?
- c) Feedback is essential in communication. Explain.
- d) Explain the role of newspapers in the freedom struggle movement of India.
- e) What is the difference between group communication and mass communication?

**P.T.O.**

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

- a) Explain what are 5W and 1H questions in the context of news?
- b) Print is the most trustworthy medium. Debate.
- c) Explain the hierarchy of the editorial department in a newspaper.
- d) What are the different stages in inter-personal communication?
- e) Explain how the many-to-one communication happens.

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

- a) What is the difference between verbal and non-verbal communication? Explain the limitations of verbal communication.
- b) What are the primary parameters of communication? Explain the significance of each of the parameters.
- c) What is the meaning of news value? What are the different types of news value? Give suitable examples for each of these types.

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

- a) Explain the importance of photographs in newspapers. What are the different restrictions put on the freedom of expression?
- b) Write short notes on (i) Aristotle's model (ii) Bharatshastra
- c) Savita (30) was found murdered in the Kothrud flat when she was alone - the jewellery in the house is missing-son Abhishek (7 years) is missing - Savita's husband Waman (34 years) has filed a complaint Write a news with heading and lead. (You can imagine the details)





Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

**P532**

**[4917] - 141**

**F.Y.B.Sc. (Vocational)**

**ELECTRONIC EQUIPMENT AND MAINTENANCE**

**Electronic Components, Circuit and Equipment Assembly**

**(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) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Attempt the following questions:

**[16]**

- a) Explain the use of fuse in electronic systems.
- b) Explain the information we get from data sheets.
- c) Name different PCBs used in Electronic industry.
- d) Explain use of CAD tool for PCB design.
- e) Name different displays used in Electronics.
- f) Name different Tools used in Electronics.
- g) Which standard circuit symbols are used in Electronics.
- h) Explain cold solder Joint.

**Q2)** Attempt any four of the following:

**[16]**

- a) Explain different faults that occur in Resistances.
- b) Explain causes of failures.
- c) Explain use of ELCB also draw a neat diagram.
- d) Explain the importance of circuit diagram.
- e) With the help of a neat diagram explain Bread Board.

***P.T.O.***

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

- a) Enlist tools required for desoldering.
- b) Name different types of cables used in Electronics and also its applications.
- c) Explain different wire harnessing techniques.
- d) With the help of a neat diagram explain wiring of tubelight.
- e) Name use of capacitors in Electronic industry.

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

- a) Explain advantages of ultrasonic soldering.
- b) Explain SMD packages and its assembling techniques.
- c) Explain Electric shock, what precautions should be taken to avoid Electric shock.

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

- a) What are different types of Earthing. Explain plate Earthing.
- b) What precautions should be taken during soldering and desoldering.
- c) With the help of a neat diagram explain front and rear panel.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

**P533**

[4917] - 142

**F.Y.B.Sc. (Vocational)**

**INDUSTRIAL MICROBIOLOGY (Paper - II)**

**Industrial Processes and Products**

**(Theory) (Paper - I) (2013 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**Q1)** Answer any eight of the following:

**[16]**

- a) Concept of novelty for a patent application.
- b) Enlist the organisms that can be used as probiotics.
- c) Write the approximate elemental composition of microbial cell.
- d) Give two examples of bacteria classified as GRAS.
- e) Justify the requirement of water for fermentations.
- f) What is a precursor in raw material?
- g) Justify, Genetic stability is an important criteria of an industrial strain.
- h) Give two examples of ergot alkaloid producing microorganisms.
- i) Which organisms are used for industrial production of ethanol?
- j) Enlist the culture collections established in India?

***P.T.O.***

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

- a) Write in brief about mushroom as microbial biomass.
- b) Enlist the factors that affect the final choice of raw material in any industry.
- c) Justify, micro-organisms play an important role in energy generation.
- d) Discuss the concept and importance of due diligence. Describe the applications of biotechnology companies in agriculture sector. Define the 'Competitive advantage' and enlist its different forms.

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

- a) Strain improvement.
- b) Working capital cost.
- c) Applications of biotechnology companies in 'Food sector'
- d) Biodegradation of xenobiotics.
- e) Market need.
- f) Bioinsecticides.

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

- a) Enlist the basic components of the biotech companies and discuss the hierarchical structure of management.
- b) Discuss in brief the ideal characteristics of an industrial strain.
- c) Discuss the significance of micro-organisms in environmental biotechnology.

**Q5) Answer any one of the following: [16]**

- a) With the help of suitable example discuss different forms of competitive advantage.
- b) Discuss the process of strain improvement through metabolic engineering.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

**P534**

**[4917] - 143**

**F.Y.B.Sc. (Vocational)**

**COMPUTER HARDWARE AND 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) Figures to the right indicate full marks.*
- 3) Draw neat diagram wherever necessary.*

**Q1)** Attempt the following:

**[16]**

- a) What is POST?
- b) Define USB.
- c) Define Software package.
- d) What is HDMI?
- e) Define Hardware.
- f) Write notes on i-series microprocessor.
- g) Define Assembler.
- h) What is compiler?

**Q2)** Attempt any four:

**[16]**

- a) Explain any two data transfer instructions of 8086.
- b) Explain Math Co-processor.
- c) Explain control panel of window.
- d) Write notes on Tristate buffer.
- e) Define RS - 232.
- f) Write short notes on bluetooth devices.

***P.T.O.***

**Q3) Attempt any four:** **[16]**

- a) Explain Wi - Fi System.
- b) Explain different network topologies.
- c) Explain any two Arithmatical instructions of 8086.
- d) Write notes on operating system.
- e) Define Multimedia.
- f) Explain ANDROID operating system.

**Q4) Attempt any two:** **[16]**

- a) Explain flow chart with example.
- b) Explain architecture of 8086.
- c) Write notes on network operating system.

**Q5) Attempt any two:** **[16]**

- a) What is algorithm? Explain with example.
- b) Explain the types of software with example.
- c) Define:
  - i) firmware
  - ii) flag register of 8086.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

**P535**

**[4917] - 144**

**F.Y.B.Sc. (Vocational)**

**SEED TECHNOLOGY**

**Seed Physiology and Seed Production**

**(New) (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.*
- 3) Draw neat labelled diagrams wherever necessary.*

**Q1)** Attempt the following:

**[16]**

- a) Define epigeal seed germination.
- b) Enlist different factors affecting seed dormancy.
- c) Comment on long term storage seeds.
- d) What is seed ageing?
- e) Define genetic purity of seeds.
- f) What are off types?
- g) Comment on isolation distance.
- h) What are certified seeds?

***P.T.O.***

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

- a) Comment on seedling abnormalities and its causes.
- b) Explain seed viability concept.
- c) Give advantages of artificial seed production.
- d) Explain, seed as a basic input in agriculture.
- e) Comment on state seed corporation and its objectives.
- f) Comment on cultural practices and isolation distance in seed production.

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

- a) Roughing
- b) Sources of irrigation
- c) Seed deterioration
- d) Storage condition
- e) Composition of seed storage constituents.
- f) Care during harvesting and threshing.

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

- a) Define seed dormancy. Explain various methods to break seed dormancy.
- b) Give detail account of artificial seed production.
- c) Explain different methods of sowing.
- d) Comment on quality of irrigation water and losses due to excessive irrigation.

**Q5)** Explain various factors affecting seed vigour. Add a note on importance of seed vigour. [16]

OR

Give causal organism, symptoms, disease cycle and control measures for wheat rust. [16]

