050 (E)

(JULY, 2006)
(New Course)

Time : 3 Hours] ***[Maximum Marks : 100***

Instructions :

1. Answer **all** questions.
2. Write your answers according to the instructions given below with the questions.
3. Begin each section on a new page.

Section - A

Given below are **1** to **15** multiple choice questions. Each carry **one** mark. Write the serial number (*a* or *b* or *c* or *d*) in your answer book of the alternative which you feel is the correct answer of the question. **15**

1. $d\left(\left(|7|, -8\right), \left(|-7|, -3\right)\right) = ?$

a) -5 b) 11

c) 5 d) -11

2. The Cartesian equation of the line passing through the points $(5, 6)$ and $(-3, 6)$ is .....

a) $y-6=0$ b) $y+6=0$

c) $x-5=0$ d) $x+3=0$

3. The equation of the circle touching the *Y*-axis and having its centre at $(3, -4)$ is .....

a) $x^2+y^2+6x+8y+16=0$ b) $x^2+y^2-6x+8y+9=0$

c) $x^2+y^2-6x-8y+9=0$ d) $x^2+y^2-6x+8y+16=0$

4. The end points of the Latus-rectum for parabola $x^2=-6y$ are

a) $\left(\pm 3, -\frac{3}{2}\right)$ b) $\left(-\frac{3}{2}, 3\right)$

c) $\left(-\frac{3}{2}, -3\right)$ d) $\left(\pm 3, \frac{3}{2}\right)$

5. Measure of the angle between asymptotes of $4x^2 - y^2 = 9$ is .....

a) $Tan^{-1}\left(-\frac{4}{3}\right)$ b) $\pi - Tan^{-1}\left(\frac{4}{3}\right)$

c) $\frac{\pi}{3}$ d) $Tan^{-1}\left(\frac{4}{3}\right)$

6. Which is a unit vector ?

a) $(Cos\,\alpha,\ 2Sin\,\alpha)$ b) $(Sin\,\alpha,\ Cos\,\alpha)$

c) $(1, -1)$ d) $(2Cos\,\alpha,\ Sin\,\alpha)$

7. $\bar{x} = (1, -1)$ and $\bar{y} = (1, 0)$ then $Comp_{\bar{x}}\,\bar{y}$

a) 1 b) 0

c) $\frac{1}{\sqrt{2}}$ d) $\bar{y}$

8. Measure of the angle between $x + 2y + z = 1$ and $\bar{r} = (0, 0, 0) + K(2, 1, -1),\ K \in R$ is .....

a) $\frac{\pi}{6}$ b) $\frac{\pi}{3}$

c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

9. The plane $\bar{r} \cdot (2, -2, 1) = -12$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$, then the point of contact is .....

a) $(1, -4, 2)$ b) $(-1, 4, -2)$

c) $(-1, 4, 2)$ d) none of these

10. $\underset{x \to 1/4}{Lim} \frac{e^{4x} - e}{x - 1/4} = ?$

a) 4 b) $e/4$

c) $-4e$ d) $Log_e 4$

11. The derivative of $Sin^{-1}x$ with respect to $Cos^{-1}x$ is .....

a) 1 b) -1

c) 0 d) None of these

12. Radius of a circular metal plate when heated, increase by 2%. If its radius is 10 c.m., then the increase in its area is .....

a) 4π (c.m.)^2 b) 4π c.m.

c) 20π (c.m.)^2 d) 2π (c.m.)^2

13. $\int_{-1}^{0} |x| \cdot dx$ = ?

a) $-\frac{1}{2}$ b) $\frac{1}{2}$

c) 1 d) None of these

14. The degree and order of the $\frac{d^2y}{dx^2} = \left(1+\left(\frac{dy}{dx}\right)^2\right)^{3/2}$ are .....

a) 6 and 1 b) 3 and 2

c) 2 and 2 d) 1 and 1

15. A body projected in vertical direction attains maximum height 50m. Its velocity at 25 m height is .....

a) $7\sqrt{10}$ m/s b) $7\sqrt{10}$ m/s^2

c) $-7\sqrt{10}$ m/s d) 490 m.

Section - B

Answer the following **16** to **30** questions. Each question carry **one** mark. **15**

16. In which ratio does the X- axis divide the line-segment joining A (3, 5) and B (2, 6) ?

17. Obtain the equation of the circle which has a diagonal of rectangle formed by $x = 2$, $x = -2$, $y = 3$ and $y = 1$.

OR

Obtain the equation of a circle with radius $\frac{5}{2}$, if it passes through $(-1, 1)$ and $(-1, -4)$.

18. There is a point on the parabola $y^2 = 2x$, whose x-co-ordinate is two times the y-co-ordinate. If this point is not the vertex of the parabola, find the point.

19. Find the parametric equation of director circle of $\frac{x^2}{16} + \frac{y^2}{9} = 1$

20. Find a unit vector orthogonal to both $(2, 2, 1)$ and $(3, 2, 2)$.

21. Find the projection of $(1, 1, 1)$ on $(2, 2, 1)$.

22. Find the perpendicular distance of the point $P(4, -5, 3)$ from the line $\frac{x-5}{3} = \frac{y+2}{-4} = \frac{z-6}{5}$.

23. Find $\frac{d}{dx}\left(Sin^3 x^0\right)$

OR

Find $\frac{d}{dx}\left(e^{-2006 Log_e x}\right)$

24. Evaluate $\int \frac{ex}{\sqrt{2x^2+3}} \cdot dx$

25. Find the area of the region bounded by the curve $y = Cos\, x$ X- axis and the the lines $x = 0$, $x = \pi$.

26. Evaluate $\int Tan^2 x \cdot Sec^2 x \cdot dx$.

OR

Evaluate $\int \frac{1}{9+4x^2} \cdot dx$.

27. Evaluate $\int_1^{4013} \left(Cosec^{-1} x + Sec^{-1} x\right) \cdot dx, |x| \geq 1$

28. Obtain the differential equation representing all line of family $y = mx + c$ (where m and c are arbitrary constants).

29. If the distance of a particle executing rectilinear motion is x from fixed point at time t, where $x = 2t^3 - 9t^2 + 12t + 8$, then when will the volocity become 0.

30. Two balls are thrown vertically upwards with velocities 19.6 m/s and 9.8 m/s. Find the height of the second ball, when the first ball attains maximum height.

Section - C

Answer the following **31** to **40** questions. Each carrying **two** marks as directed in the question. **20**

31. Prove by using slopes that $A\ (12, 8)$, $B\ (-2, 6)$, $C\ (6, 0)$ are the vertices of a right triangle.

OR

Find the equation of the perpendicular bisector of $\overline{AB}$ where A is $(-3, 2)$ and B is $(7, 6)$.

32. For the parabola $x^2 = 12y$, find the area of the triangle whose vertices are the vertex of the parabola and two-end points its latus-rectum.

33. If the end-points of a chord of the ellipse $b^2x^2 + a^2y^2 - a^2b^2 = 0$ have eccentric angle with measure α and β, then prove that the equation of the line containing the chord is

$$\frac{x}{a}Cos\left(\frac{\alpha+\beta}{2}\right) + \frac{y}{b}Sin\left(\frac{\alpha+\beta}{2}\right) = Cos\left(\frac{\alpha-\beta}{2}\right).$$

34. If the eccentricities of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \pm 1$ are e_1 and e_2 respectively, then prove that $e_1^2 + e_2^2 = e_1^2 \cdot e_2^2$.

OR

If the chord of hyperbola joining $P(\alpha)$and $Q(\beta)$ on the hyperbola subtends a right angle at the centre $C(0, 0)$, then prove that $a^2 + b^2 Sin\alpha \cdot Sin\beta = 0$.

35. Prove that : $[\bar{x}+\bar{y} \quad \bar{y}+\bar{z} \quad \bar{z}+\bar{x}] = 2[\bar{x} \ \bar{y} \ \bar{z}]$

36. If $\bar{x}$, $\bar{y}$, $\bar{z}$ are coplanar vectors, then prove that $\bar{x}+\bar{y}$, $\bar{y}+\bar{z}$, $\bar{z}+\bar{x}$ are coplanar.

OR

If $(\bar{x}+\bar{y})\cdot(\bar{x}-\bar{y})=63$ and $|\bar{x}|=8|\bar{y}|$ then, find $|\bar{x}|$.

37. Get the radius of the circle that is the intersection of the sphere $x^2+y^2+z^2=49$ and the plane $2x+3y-z=5\sqrt{14}$.

38. If $x=a(1-Cos\theta)$, $y=a(\theta-Sin\theta)$, $\theta \in (0, \pi)$, $a \neq 0$, then find $\frac{d^2y}{dx^2}$.

39. Verify Rolle's theorem for $f(x)=Sin\,x+Cos\,x-1$, $x \in \left[0, \frac{\pi}{2}\right]$ If it is applicable, find C.

OR

In which interval the function $f(x)=5x^3-15x^2-120x+3$ is increasing and in which it is decreasing ?

40. Evaluate $\int \frac{Sin\,x}{1+Sin\,x} \cdot dx$.

Section - D

Answer the following **41** to **50** questions. Each carrying **three** marks as directed in the question. **30**

41. A is $\left(2\sqrt{2},\ 0\right)$ and B is $\left(-2\sqrt{2},\ 0\right)$. If $|AP-PB|=4$, then find the equation of locus of P.

OR

Origin is circumcentre of traingle with vertices $A(x_1,\ x_1\,Tan\theta_1)$, $B(x_2,\ x_2\,Tan\theta_2)$, $C(x_3,\ x_3\,Tan\theta_3)$ $\left(0<\theta_i<\pi/2, x_i>0,\ i=1,2,3\right)$

If the centroid of ΔABC is $(x,\ y)$ prove that

$$\frac{y}{x}=\frac{Sin\,\theta_1+Sin\,\theta_2+Sin\,\theta_3}{Cos\,\theta_1+Cos\,\theta_2+Cos\,\theta_3}.$$

42. If the equation $3x^2+(3-p)xy+qy^2-2px=8pq$ represents a circle, find p and q. Also determine the centre and radius of the circle.

43. Forces measuring 5, 3 and 1 unit act in the direction : (6, 2, 3), (3, –2, 6), (2, –3, –6) respectively. As a result, the particle moves from (2, –1, –3) to (5, –1, 1). Find the resultant force and work done.

44. Find the vector and Cartesian equations of the line passing through (1, 2, 3) and perpendicular to the two lines

$\bar{r}=(0,0,0)+K(1,2,-1), K\in R$ and $\frac{x-1}{3}=\frac{y}{2}=\frac{z}{6}$

OR

Find the measure of the angle between two lines, if their direction cosines l, m, n satisfy $l+m+n=0$, $l^2+m^2-n^2=0$.

45. Find the vector and Cartesian equations of the plane containing the lines $\bar{r}=(1,2,3)+K(2,3,4), K\in R$ and $\frac{x-1}{1}=\frac{y}{3}=\frac{z-5}{4}$.

46. Find $\underset{x\to\frac{1}{\sqrt{2}}}{Lim}\ \frac{x-Cos\left(Sin^{-1}x\right)}{1-Tan\left(Sin^{-1}x\right)}$

47. Prove that, if $x>0$, then $\frac{x}{1+x^2}<Tan^{-1}x<x$.

48. Obtain $\int_0^{\pi/2} Sin\,x\cdot dx$ as the limit of a sum.

49. Prove that $\int_8^{27}\frac{dx}{x-\sqrt[3]{x}}=\frac{3}{2}Log\left(\frac{8}{3}\right)$.

50. Solve $xy\cdot\frac{dy}{dx}=y+2$. If $y(2)=0$, then find the particular solution of the given differential equation.

OR

The population of a city increases at the rate of 3% per year. How many years will take to double the population ?

Section - E

Answer the following **51** to **54** questions. Each carrying **five** marks. **20**

51. A is $(-4, -5)$ in ΔABC and the lines $5x+3y-4=0$ and $3x+8y+13=0$ contain two of the altitudes of the triangle. Find the co-ordinates of B and C.

52. If $f(x)=\dfrac{e^{1/x}-e^{-1/x}}{e^{1/x}+e^{-1/x}}$, $x\neq 0$, $f(0)=1$ then prove that f is not continuous at $x = 0$.

OR

Find $\underset{x\to 0}{Lim}\ \dfrac{(1+mx)^n-(1+nx)^m}{x^2}$, $m, n\in N$.

53. If $x = Sin\ t$, $y = Sin\ pt$ then prove that $\left(1-x^2\right)\dfrac{d^2y}{dx^2}-x\dfrac{dy}{dx}+p^2y=0$.

54. Evaluate $\int \dfrac{1}{1+5e^x+6e^{2x}}\cdot dx$.

OR

Evaluate $\int \dfrac{Sec\,x}{1+Cosec\,x}\cdot dx$.

052 (E)

(JULY, 2006)

(New Course)

Time : 3 Hours] ***[Maximum Marks : 100***

Instructions :

1. There are total **60** questions and **all** are **compulsory**.
2. Write new section on new page and maintain the order of the questions.
3. Write equations, st.formulae and diagram with proper labellings.
4. Write your answer as instructed in the given question with necessary points.
5. Use log-table or simple calculator for calculations.

Section - A

Question Nos. **1** to **16** are multiple choice type. Each of **one** mark. Select the correct option of the following. **16**

1. What is the type of hybridization of each carbon in graphite ?

a) dsp^2 b) sp

c) sp^2 d) sp^3

2. Which does not change with change in temperature ?

a) Molarity b) Normality

c) Formality d) Molality

3. If $\Delta G = 0$, then equilibrium constant is .....

a) < 1 b) > 1

c) 1 d) 0

4. What is the correct value for rate of reaction $R \rightarrow P$

a) $\frac{-\Delta[R]}{t} = \frac{\Delta[P]}{\Delta t}$

b) $\frac{-\Delta[R]}{\Delta t} = \frac{\Delta[P]}{\Delta t}$

c) $\frac{-[R]}{t} = \frac{\Delta[P]}{\Delta t}$

d) $\frac{-\Delta[R]}{\Delta t} = \frac{\Delta t}{\Delta[P]}$

5. Which silver halide is used in photography ?

a) AgI

b) AgF

c) $AgBr$

d) $AgCl$

6. Which complex is the most stable ?

a) $\left[Ni(H_2O)_4\right]^{2+}$

b) $[NiCl_4]^{2-}$

c) $\left[Ni(CN)_4\right]^{2-}$

d) $\left[Ni(NH_3)_4\right]^{2+}$

7. Whose penetration power is very low ?

a) γ - rays

b) α - particles

c) β - particles

d) not given

8. Phenol can be neutralised by which of the following base ?

a) $NaHCO_3$

b) Na_2CO_3

c) $NaOH$

d) None of these

9. Which of the following alcohol is trihydric alcohol ?

a) ethylene glycol

b) benzyl alcohol

c) glycerol

d) tertiary butyl alcohol

10. Which compound is obtained by oxidation of aldehyde ?

a) acetone

b) alcohol

c) carboxylic acid

d) ether

11. Which is the general formula for aldehyde and ketone ?

a) $C_nH_{2n}O$

b) $C_nH_{2n-1}O$

c) $C_nH_{2n+2}O$

d) $C_nH_{2n-2}O$

12. Which compound does not react with Hinsberg's reagent ?

a) $(CH_3)_2NH$ b) $CH_3 \cdot NH_2$

c) $(CH_3)_3 \cdot N$ d) none of these

13. Which is the IUPAC name of CH_3CN ?

a) Acetonitrile b) Methyl cyanide

c) Ethane nitrile d) Ethyl nitrile

14. What is correct for teflon from the following ?

a) Polystyrene b) PVC

c) PTFE d) PAN

15. What is Invert sugar ?

a) Combination of sucrose

b) Mixture of glucose and galactose

c) Type of sucrose

d) Equal mixture of D-glucose and D-fructose

16. Which vitamin is used in cream ?

a) C and E b) A and E

c) A and C d) B and D

Section - B

Question Nos. **17** to **32** are very short answer type. Each of **one** mark. Answer the following in short. **16**

17. What is photoelectric effect ?

18. What defect is found in the *Cu-Au* alloy ?

19. Which substance has appearance and conductivity similar to that of copper ?

20. How many grams of $NaOH$ will be required to prepare 500 gram solution containing 10% w/w $NaOH$? Molecular weight of $NaOH$ is 40 gram $mole^{-1}$.

21. Mention the third law of thermodynamics.

22. $E^0Ni^{2+}/Ni = -0.25$ volt and $E^0Cu^{2+}/Cu = 0.34$ volt, can be aqueous solution of $CuSO_4$ be stored in a nikel vessel, Why ?

23. Mention the instrument used to determine electric charge of a colloid.

24. Write the structural formula : Para per iodic acid.

OR

Give the two uses of *Se*.

25. In which oxidation state '*Mn*' acts as an strong oxidizing agent ? Give an example.

26. Give IUPAC name of 'Hydroquinone'.

27. Complete the reaction : $2H{\cdot}CHO \xrightarrow[+H_2O]{[conc.\ NaOH]}$

OR

Give name and one use of an aqueous solution of formaldehyde.

28. Which compound is obtained from reaction between benzoic acid and $LiAlH_4$? Give equation and IUPAC name of the product.

29. Give the definition of plasticizer with an example.

30. Mention the name and structure of monomar of Nylon-6.

31. Mention any two diseases with deficiency of vitamin '*H*'.

32. What is called leuco salt ?

Section - C

Question Nos. **33** to **48** are short answer type questions. Each of **two** marks. **32**

33. Mention the four conditions for acceptable solution of ψ.

OR

What is nodal plane ? Mention the number of nodes in 1S and 3S orbitals.

34. Explain electronic deficiencies in solids.

35. For how much time the electric current of 1.0 ampere be passed to obtain all the silver metal from the solution containing Ag^+ during electrolysis of 100 ml 0.02 M $AgNO_3$. (1F = 96500 Coulombs)

36. Give the scientific reason : Rate of reaction increases in the presence of catalyst.

37. The rate constant of a first order reaction is 60 S^{-1}. What will be the time taken for concentration to be 1/6 of the initial concentration ?

38. State Hardy-Schulze rules.

39. What is emulsion ? Explain its types giving examples.

40. Give the various forms of phosphorous and write the properties of each one.

OR

How silica gel is prepared ? Give its two uses.

41. In 1st transition series the oxidation state of elements on both ends is lower. Explain.

42. Give one use of the following alloys : i) Nitinol ii) German-silver.

43. Give the scientific reason : $\left[Fe(CN)_6\right]^{3-}$ possesses more paramagnetic moment than $\left[Fe(H_2O)_6\right]^{3+}$

OR

Cu_2Cl_2 is colourless but $CuCl_2$ is colourful.

44. Give IUPAC name of complex compounds :

i) $NH_4\left[Cr(NH_3)_2(OX)_2\right]$ ii) $\left[Co(H_2O)_5(NO_3)\right]Cl_2$

45. The mass of ^2_1H and ^4_2He isotopes are 2.0141 and 4.0026 *amu*. If the velocity of light is 2.998×10^8 meter sec^{-1} then how much energy will produced when two mole of ^2_1H are fused to form ^4_2He ?

46. Define : i) Racemic mixture ii) Resolution

47. Give the organic conversion in two steps with conditions salicylaldehyde from chlorobenzene.

OR

Ethyl chloride from diethyl ether.

48. Explain industrial production and the two uses of the polystyrene.

Section - D

Question Nos. **49** to **60** are long answer type questions. Each of **three** marks. **36**
Answer the following to the points.

49. Give molecular orbitals diagram of O_2 molecule and calculate bond order and magnetic property.

50. State and explain Henry's law and give its two limitations (graph is necessary).

OR

Obtain an equation for determining molal freezing constant (*kf*).

51. Calcualte the equilibrium constant of the following reaction at 25^0C. (R = 1.987 cal)

$$2SO_{3(g)} \rightleftharpoons 2SO_{2(g)} + O_{2(g)}$$

The value of ΔG^0_f for $SO_{2(g)}$ and $SO_{3(g)}$ at 25^0C are – 71.79 and – 88.52 kcal mol^{-1} respectively.

52. Write only equation of reaction taking place at cathode in each of Dry cell, Fuel cell and Lead storage cell.

53. Discuss the industrial production of H_2SO_4 by contact process. (figure not essential)

OR

Describe the method to obtain highly pure silicon from silica.

54. Explain the classification of any three types of ligands with an example.

OR

Write a note on importance of complex compounds obtained from nature.

55. Calculate the rate of α - particles per second obtained from 1 gram of radium. The atomic weight of radium is 226 and its half-life period is 1620 years.

56. Give Fisher projection formula of Bromochlorofluoro methane and glyceraldehyde.

OR

Explain the importance of stereochemistry. (any six points)

57. Write a reaction of hydrolysis, reduction and dehydration with acetamide.

58. Write the equation of diazotization of aniline. Give equations of two reactions of azo-coupling.

59. How are lipids classified ? Give an example of each class.

60. What is pheromones ? Explain its importance with an example.

OR

Explain : Acidic dyes, Basic dyes and Direct dyes with an example.

This Question Paper contains 8 Printed Pages]

AR-22

054 (E)

(JULY, 2006)

Time : 3 Hours] (New Course) *[Maximum Marks : 100*

Instructions :

1. There are **four** sections and total **60** questions in this question paper.
2. Symbols used in this question paper have their usual meanings.
3. Log table or simple calculator can be used.
4. Begin new section on a new page. Follow the sequence.

Section - A

Question Nos. **1** to **16** are multiple choice questions, each carry **one** mark. Choose correct answer (a/ b/ c/ d) from given alternative responses and write it. **16**

1. The energy of a charged capacitor is U. Another identical capacitor is connected parallel to the first capacitor. After disconnecting the battery, the energy of each of the capacitors will be .....

a) $\frac{U}{2}$ b) $\frac{U}{4}$

c) U d) $\frac{3U}{2}$

2. One variable capacitor is connected to a 100 V battery. If the capacitance is increased from $2\mu F$ to $20\mu F$, then the change in energy in the above system will be .....

a) $2.5\times10^{-2}J$ b) $9\times10^{-2}J$

c) $6.5\times10^{-2}J$ d) $4\times10^{-2}J$

3. The distance between two point charges $4q$ and $-q$ is r. A third charge Q is placed at their midpoint. The resultant force acting on $-q$ is zero then Q = ...

a) $-4q$ b) q

c) $-q$ d) $4q$

4. Maximum power in a $0.5\,\Omega$ resistance connected with two batteries of $2V$ *emf* and $1\,\Omega$ internal resistance in parallel, is .....

a) $\frac{8}{9}W$ b) 1.28 W

c) 2.0 W d) 3.2 W

5. Which of the following options for L, C and R give us the dimension of frequency ?

a) $\frac{1}{RC}$ b) $\frac{R}{L}$

c) $\frac{1}{\sqrt{LC}}$ d) $\frac{C}{L}$

6. An A.C. L–R circuit comprises of an inductor whose reactance $x_L = 3R$. Where R is resistance of the circuit. If a capacitor, whose reactance $x_C = R$ is connected in series, then what will be the ratio of the new and old power factor ?

a) $\sqrt{2}$ b) $\frac{1}{\sqrt{2}}$

c) 1 d) 2

7. X and Y coils are joined in a circuit in such a way that when the change of current in X is 0.5 A, the change in the magnetic flux in Y is 0.3 Wb. The mutual inductance of the system of two coils is ..... H.

a) 0.8 b) 0.6

c) 0.2 d) 6

8. The electromagnetic waves in the range of wavelengths 0.3 cm to 1 m are used for the purpose of satellite communication. The range of frequencies corresponding to the above range of wavelengths is ..... ($c = 3 \times 10^8$ ms^{-1})

a) 30 MHz to 10^4 MHz b) 3 MHz to 3×10^8 MHz

c) 300 MHz to 10^5 MHz d) 3 MHz to 10^6 MHz

9. Radii of curvature of both the sides of convex lens are 15 cm. If the refractive index of the material of the lens is 1.5. It's focal length in air is .....

a) 20 cm b) 10 cm

c) 30 cm d) 15 cm

10. The ratio of resolution power of telescope when light of wavelength $\lambda = 4000A^0$ and $\lambda = 5000A^0$ are used is .....

a) 5 : 4 b) 16 : 25

c) 4 : 5 d) 9 : 1

11. A proton and an α-particle are passed through same potential difference. If their initial velocity is zero the ratio of their de-Broglie wavelength after getting accelerated is .....

a) 1 : 2 b) $2\sqrt{2}$: 1

c) 2 : 1 d) 1 : 1

12. According to Bohr's hypothesis, the angular momentum of the electron in any stationary orbit L is proportional to .....

a) $\frac{1}{r}$ b) $\sqrt{r}$

c) r^2 d) r

13. The amplifier has voltage gain equal to 200 and it's input signal is $0.5\,Cos(313\,t)\,V$. The output signal will be equal to ..... volt.

a) $100\,Cos(313t+90^0)$ b) $0.5\,Cos(313t+200)$

c) $100\,Cos(313t+180^0)$ d) $100\,Cos(493t)$

14. The collector current of the *NPN* transistor is equal to 10 mA. If 90% of the electron from the emitter reaches collector, then .....

a) $I_E \approx 9\,mA,\ I_B \approx 1\,mA$ b) $I_E \approx 11\,mA,\ I_B \approx 9\,mA$

c) $I_E \approx 11\,mA,\ I_B \approx 1\,mA$ d) $I_E \approx 1\,mA,\ I_B \approx 1\,mA$

15. If the height of a TV transmitter tower is doubled, then the region covered by this transmitter .....

a) becomes four times b) becomes three times

c) becomes doubles d) no change

16. For efficient transmission of a 100 MHz frequency wave, the minimum length of an antenna should be .....

a) 3/4 m b) 10 m

c) 100 m d) 3 m

Section - B

Question Nos. **17** to **32** are very short answer type questions, each carry **one** mark. **16**

17. What is the energy stored in a capacitor of capacitance 5 pf, charged to 1000 V ?

OR

What is capacitor ?

18. Define mobility (μ).

OR

What is called superconductivity ?

19. Why a small soft iron cylindrical core is placed in galvanometer ?

20. State the Gauss's law for magnetism.

21. What are eddy currents ?

22. How much current is lagging behind the voltage in phase in an a.c. circuit with only inductor ?

23. What would be charge on nucleus of ${}_8O^{16}$ atom ? Charge of proton $= 1.6 \times 10^{-19} C$.

24. What is Hertzian dipole ?

25. Two lens of power 2.5 D and 1.5 D are joined together. Calculate the power of new lens formed.

OR

What are coherent sources ?

26. State the Brewster's law.

27. On which factor the maximum energy of emitted photoelectron depends in photoelectric effect ?

OR

Define threshold frequency.

28. Which laws of conservation are obeyed in nuclear reactions ?

OR

Write full form of MASER.

29. Which negative sign means in equation $A_V = -g_m \cdot R_L$?

30. Name any two fundamental gates.

31. What do you mean by depletion barrier ?

32. The maximum electron density of a layer of the ionosphere is $\frac{1}{9} \times 10^{12}\ m^{-3}$. Calculate the critical frequency of this layer.

Section - C

Question Nos. **33** to **48** are short answer type questions, each question carries **two** marks. **32**

33. Derive an expression of torque $\vec{\tau} = \vec{P} \times \vec{E}$ on an electric dipole when placed in an uniform electric field.

34. Define : Static electric potential. Derive an expression for electric potential at a point due to a point charge.

35. Accepting single valuedness of electric potential and with necessary diagram, derive Kirchhoff's second law for a closed loop.

OR

Explain the principle of it with a necessary circuit diagram.

36. Give appropriate circuit diagram for charging process of a secondary cell. Obtain an expression of charging current.

37. What is a toroid ? Using Ampere's circuital law, obtain an expression for magnetic field inside the toroid.

OR

Obtain an expression for magnetic force acting on two very long parallel and straight conducting wires carrying currents.

38. Draw the graph of $B \rightarrow H$ (Hysteresis cycle) and explain in brief for any ferromagnetic material.

39. On what factors does self inductance of coil depend ? From $L = \frac{N\phi}{I}$ derive $E = -L \cdot \frac{dI}{dt}$. Using that formula define self inductance and also its unit.

40. Write a note on Green house effect. Explain the function of ozone layer.

41. Obtain the differential equation for charge Q, when voltage applied to an A.C. circuit with L–C–R in series in $V = V_m Cos\ \omega t$.

42. Obtain an expression for equivalent focal length of a combination of two thin convex lenses. Also write formula for equivalent focal length for combination of more lenses.

43. For Fraunhofer diffraction by single slit, explain first order maximum and derive necessary condition for it.

44. Explain how a wave theory fails to explain the photoelectric effect.

OR

Explain experimental arrangement of Davison-Germer's experiment.

45. Using exponential law of radioactive decay, obtain the expressions for mean lifetime and half life time.

46. Give limitations of the Bohr Model.

47. Draw the circuit diagram of 'NOT' gate using transistor and also circuit symbol. Discuss any one case and give Boolean equation.

OR

Draw a circuit diagram for NPN transistor as CE amplifier. Discuss input circuit.

48. Which are (any four) the advantages of optical fibre communication ?

Section - D

Question Nos. **49** to **60** are short answer type questions, each question carries **three** marks. **36**

49. Two spheres having same radius and mass are suspended by two strings of equal length from the same point, in such a way that their surfaces touch each other. On depositing total $4\times10^{-7}C$ charge on them, they repel each other in such a way that in equilibrium the angle between their strings becomes 60^0. If the distance from the point of suspension to the center of sphere is 20 cm, find the mass of each sphere $k=9\times10^9\ SI$, $g=10ms^{-2}$.

OR

i) A 900 *pf* magnitude of capacitor is charged with the help of 100 V battery. Calculate the steady electric energy on it.

ii) The above capacitor is disconnected from the battery and is connected to another identical capacitor. What will be the total energy of the system ?

50. 0.366 A current is obtained when 4Ω resistor is connected with an unknown battery having r as an internal resistance. 0.149 A current is obtained if the above battery is connected to 10Ω resistor. Calculate the *emf* and the internal resistance of the battery.

51. A battery having an *emf* E and an internal resistance is connected with a resistor R. Prove that the power in the external resistance is maximum when $R = r$.

52. A very long straight wire is carrying a current of 10 A. If an electron is moving parallel to this wire in a direction opposite to the current at a distance of 40 cm from the wire, with a velocity of $5\times10^{5} ms^{-1}$, find the force of attraction experienced by the electron. $\left(e = 1.6\times10^{-19}C,\ \mu_0 = 4\pi\times10^{-7}SI\right)$

53. The region inside a current carrying toroidal winding is filled with tungsten of susceptibility 7×10^{-5}. What is the percentage increase in the magnetic field in presence of material with respect to the magnetic field without it ?

54. A conducting loop of radius r is placed concentric with another loop of a much larger radius R, so that both loops are coplanar. Find the mutual inductance of the system of two loops. Take $R >>> r$.

OR

Prove that the average value of an AC voltage source given by $V = V_m.Sin\,\omega t$ is equal to $\frac{2V_m}{\pi}$ for half period of its cycle.

55. A narrow beam of light is incident at 53^0 angle made with the normal on a glass plate of refractive index 1.6. If the thickness of plate is 20 mm, calculate the lateral shift of the beam when it emerges out from the plate. $\left(Sin\ 53^0 = 0.8\right)$

OR

An object is moving towards concave mirror along its principal axis with uniform velocity V_0. Prove that when the object is at distance U from concave mirror, velocity of image is $V_i = -\left(\frac{R}{2U-R}\right)^2 V_0$.

R is the radius of curvature of the mirror.

56. In Young experiment width of one slit is 3 times that of another. If we assume that the intensity of light is proportional to the width of the slit, find the ratio of maximum to minimum intensity.

57. Find the energy of photon in each of the following :

i) Microwaves of wavelength 1.5 cm.

ii) Red light of wavelength 660 nm.

iii) Radiowaves of frequency 96 MHz.

58. Calculate the quantum number for which the radius of the orbit of electron in Be^{3+} would be equal to that for the ground state of electron in a hydrogen atom. Also compare the energy of the two states.

59. If the activity of 1g of Ra^{226} sample is 3.7×10^{10} Bequerel, calculate its half life. Take Avogadro number = $6.02\times10^{23} mol^{-1}$.

60. The current gain of a Common Base (CB) circuit is equal to α and current gain of a Common Emitter (CE) circuit is equal to β. Find the relationship between α and β.

OR

In a tuned collector oscillator circuit an output signal of 1 MHz frequency is obtained. The value of capacitance $C = 100pF.$, what should be the value of the capacitor if a signal of 2 MHz frequency is to be obtained ?

056 (E)

(JULY, 2006)
(New Course)

Time : 3 Hours] ***[Maximum Marks : 100***

Instructions :

1. Attempt **all** questions.
2. Follow the instructions.
3. Begin new section on a new page.

Section - A

Question Nos. **1** to **16** are multiple choice questions, each carry **one** mark. Choose the correct answer (a/ b/ c/ d) from the given alternative responses and write it. **16**

1. Which type of parasite is plasmodium ?

a) Ectoparasite
b) Total parasite
c) Paratical Parasite
d) Endoparasite

2. What is the effect of PIF on LTH ?

a) Because of PIF secretion of LTH increases.
b) No effect of PIF on LTH is observed.
c) PIF inhibits the effects of LTH.
d) PIF activates LTH more.

3. A fat soluble vitamin responsible for clotting of blood is .....

a) Vitamin - D
b) Vitamin - A
c) Vitamin - E
d) Vitamin - K

4. Which ion is needed for the activity of carboxylase type of enzymes and auxin synthesis ?

a) Magnesium
b) Boron
c) Zinc
d) Copper

5. A defensive barrier which prevents entry of pathogens is .....

a) skin
b) Mucus membrane
c) mucus secretion
d) cilia

6. The glands on lateral sides of urethra, below the prostate gland is .....

a) Seminal vesicles
b) Prostate gland
c) Bulbo-urethral gland
d) Testis

7. A treatment used in breaking stone in kidneys is .....

a) Sonography
b) MRI
c) CAT
d) Endoscopy

8. Which enzyme is present in gastric juice of children ?

a) Trypsin
b) Cassein
c) Casseinogen
d) Renin

9. In plants it hinders seed germination and the development of excised embryo.

a) Ethylene
b) Gibberrelins
c) Cytokinins
d) Abscisic Acid

10. In which of the following animal, is nephridia found ?

a) Cockroach
b) Earthworms
c) Frog
d) Fish

11. Which of the following bacteria is symbiotic ?

a) Azotobacter
b) Pseudomonas
c) Nitrobacter
d) Rhizobium

12. During the process of opening of stomata which ions are entering into guard cells ?

a) H^+ and Mg^{++}
b) K^+ and Cl^-
c) K^+ and Fe^{+++}
d) Malate ion and Mg^{++}

13. Which organ can be regenerated by birds ?

a) Fractured bones
b) kidney
c) Beak
d) Liver

14. How many ATP are formed during dephosphorylation of glycolysis ?

a) 3 ATP
b) 2 ATP
c) 4 ATP
d) 6 ATP

15. In human, which blood cells are without nucleus ?

a) Lymphocytes
b) R.B.C.
c) W.B.C.
d) Neutrophils

16. The genetic complex of such organisms is the same yet fertilization does not occur, what's it called ?

a) Parthenogenesis
b) Polyembryony
c) Incompatibility
d) Parthenocarpy

Section - B

Question Nos. **17** to **32** are very short answer type questions, each question carry **one** mark. Give answer in the limit of 1 to 10 words. **16**

17. What is endosporic development ?

18. Give names of the drugs excreted in distal convoluted region of uriniferous tubule. (any two)

19. Which hormone has profound effects on efficiency of endocrine system ?

20. Write the function of neutrophils.

21. State the deficiency effects of chlorine.

22. Which process does not take place during cyclic photophosphorylation ?

23. What is egg-apparatus ?

24. What is lenticular transpiration ?

25. State the location and function of sertoli cells.

26. Define : Respiratory Quotient.

27. State the main goals of 'Conservation' in Biosphere reserves. (Any two)

28. What is 'Vertebro-chondrial ribs' ?

29. State the names of countries, which have 0.6 % natural growth rate. (Any two)

30. State the function of LH in women.

31. What is 'tillage' ?

32. Which stage succeeds floating stage ?

Section - C

Question Nos. **33** to **44** are short answer type questions, each question carries **two** marks. Give answers in the limit of 30 words. **24**

33. Explain : Antigen.

34. Explain : Placenta.

35. Describe the factors affecting the process of osmosis.

36. State any four goals of animal breeding.

37. State the disorders resulting due to deficiency of Riboflavin and Thiamine and write any two symptoms of each.

38. Explain the synthesis of aminoacids.

39. State the oxides of nitrogen and particulate matter as type of air pollutants.

40. State the location : Caecum and vermiform appendix.

41. Which type of asexual reproduction is observed in Amoeba and Paramoecium ? Explain it.

42. Write a short note on : Factors, affecting the Growth of plants.

OR

Write the factors responsible for seed dormancy. (any four)

43. Explain chemosynthetic nutrition, with examples.

44. Explain : the Theory of Error catastrophe and somatic mutation theory.

OR

What is nastism ? Explain nastism in plants.

Section - D

Question Nos. **45** to **52** are short answer type questions, each question carries **three** marks. Give answers in the limit of 50 words. **24**

45. Explain bar diagrams of age and sex structure. (Bar graph necessary)

46. In which region of chloroplast the photo chemical phase takes place ? Explain photolysis of water.

47. What is the meaning of Harmful relationships ? Describe exploitation and predation.

48. On the basis of penetration of light, describe the various zones of lake.

OR

Explain : Soil profile.

49. Describe O_2 transport through blood.

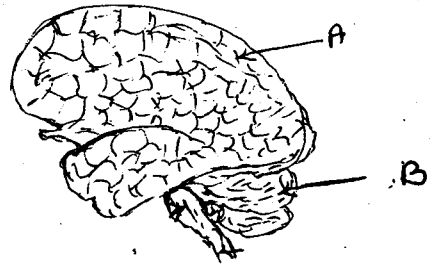
50. Describe : Hormones of adrenal cortex.

OR

Describe the effects of testosterone. (Any six points)

51. Explain Amoeboid movement and ciliary movement.

52. In the given diagram what does 'A' and 'B' represent ? Write their function.



OR

Describe the digestion of food in cockroach.

Section - E

Question Nos. **53** to **57** are long answer type questions, each question carries **four** marks. Give answers in the limit of 100 words. **20**

53. Describe Anthropogenic Extinction.

OR

What is Endoscopy ? Describe methodology and usefulness of endoscopy.

54. Describe capsella type of embryo development with a diagram.

OR

Describe the types of regeneration.

55. Explain the professional Induced-lung diseases and protective measures against them.

OR

Draw the diagram showing blood circulation path in heart and describe blood circulation through heart.

56. Explain Anaerobic respiration in plant cell and animal cell.

57. Describe the process of decomposition.