# JEE (MAINS) MODEL GRAND TEST

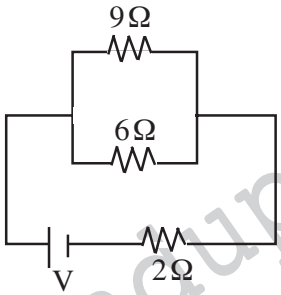
**No. of Questions: 90** **Marks: 360** **Time: 3 Hrs.**

## PHYSICS

**1.** To a man walking at the rate of 3 kmph the rain appears to fall vertically. When he increases his speed to 6 kmph it appears to meet him at an angle of 45° with vertical. The speed of the rain is..

1) $\frac{3}{2}$ kmph 2) $\frac{3}{\sqrt{2}}$ kmph 3) $\sqrt{3}$ kmph 4) $3\sqrt{2}$ kmph

**2.** If power dissipated in the 9 Ω resistor in the circuit shown is 36 w, the potential difference across the 2 Ω resistor is...




1) 4 V

2) 8 V

3) 10 V

4) 2 V

**3.** The position of a particle moving along the x – axis depend on time according to the equation $x = \left(3t^2 - t^3\right)$ m. The distance travelled by the body in first 4 sec is...

1) 16 m 2) 12 m 3) 24 m 4) 40 m

**4.** The power obtained in a reactor using $U^{235}$ disintegration is 1000 KW. The mass decay of $U^{235}$ per hour is..

1) 10μg 2) 20μg 3) 40μg 4) 1μg

**5.** A body is sliding down on an inclined plane inclined at an angle 'θ'. If the first one third of the incline is smooth and the coefficient of friction for the next one third is $\frac{\mu}{2}$ and for the last one third is μ, and the body comes to rest at the bottom of the plane, then μ is equal to..

1) tanθ 2) 2 tanθ 3) $\frac{\tan\theta}{2}$ 4) $\frac{3\tan\theta}{2}$

**6.** The length of a potentiometer wire is *l*. A cell of emf 'e' is balanced at a length $\frac{l}{2}$ from the positive end of the wire. Assuming there is no contribution in resistance from any part of the circuit except the potentiometer wire, the balancing length for the same cell if length of the wire is increased by $\frac{l}{2}$

1) $\frac{2l}{15}$ 2) $\frac{3l}{15}$ 3) $\frac{3l}{10}$ 4) $\frac{4l}{10}$

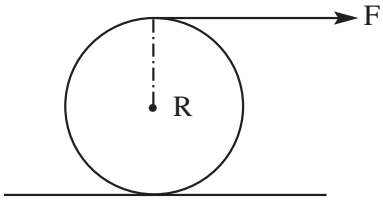
**7.** If the force acting on a body depends on its displacement S as $F \propto S^{-1/3}$, then the power delivered by F will depend on displacement as

1) $S^{2/3}$ 2) $S^{-2/3}$ 3) $S^{1/2}$ 4) $S^0$

**8.** Two points charges +8q and −2q are located at x = 0 and x = L respectively. The location of a point on the x−axis at which the net electric field due to these charges is zero is .....

1) 4 L 2) 8 L 3) $\frac{L}{4}$ 4) 2 L

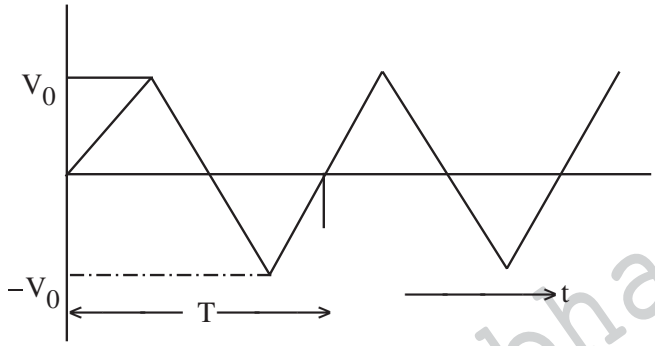
**9.** A tangential force F acts at the top of a solid sphere of mass M and radius R. The acceleration of the sphere if it rolls without slipping




1) $\frac{6F}{5M}$ 2) $\frac{10F}{7M}$

3) $\frac{5F}{2M}$ 4) $\frac{2F}{7M}$

**10.** The voltage time graph of a triangular wave having peak value $V_0$ is as shown in figure. The rms value of V is




1) $\frac{V_0}{3}$ 2) $\frac{V_0}{2}$ 3) $\frac{V_0}{\sqrt{2}}$ 4) $\frac{V_0}{3}$

**11.** Two particles doing identical SHM along the same line with amplitude A. One of them is at $x = \frac{A}{2}$ and moving towards positive x – direction and other at $x = -\frac{A}{2}$ moving towards –ve x–direction, the time after which they will collide is

1) $\frac{2T}{3}$ 2) $\frac{4T}{3}$ 3) $\frac{2T}{5}$ 4) $\frac{5T}{12}$

**12.** A tuning fork is found to give 20 beats in 2 sec when sounded with a stretched string vibrating transversely such that resonance lengths are either 10.2 cm or 9.2 cm. The frequency of the turning fork is

1) 204 Hz 2) 194 Hz 3) 184 Hz 4) 233 Hz

**13.** A straight rod of length/ extends from $x = \alpha$ to $x = l + \alpha$. If the mass per unit length is $a + bx^2$. The gravitational force it exerts on a point mass m placed at x = 0 is given by

1) $Gm\left[a\left(\frac{1}{\alpha} - \frac{1}{\alpha + l}\right) + bl\right]$ 2) $Gm\left[\alpha\left(\frac{1}{a} - \frac{1}{\alpha + l}\right) + bl\right]$

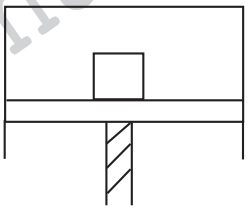
3) $\frac{Gm\left(a + bx^2\right)}{l^2}$ 4) $Gm\left[a\left(\frac{1}{\alpha + l} - \frac{1}{\alpha}\right)\right] + bl$

**14.** In a Youngs double slit both upper and lower slits are covered with glass plates of same thickness but refractive indices 1.4 and 1.7 respectively. Interference pattern is observed with a light of wavelength 5400 A°. It is found that the earlier position of central maxima is coming between $5^{th}$ maxima and $6^{th}$ minima with an intensity of $\frac{3}{4}$ of maximum intensity. Then the thickness of each glass plate is

1) 9.3 μm 2) 19 μm 3) 6.3 μm 4) 12.3 μm

**15.** A block of mass 'm' is resting on a piston which is executing SHM vertically with a time period 1 second. The minimum amplitude of the motion at which the block and piston separate is

1) 0.25 m
2) 0.15 m
3) 0.5 m
4) 2.5 m



**16.** A glass rod of diameter $d_1$ is inserted symmetrically into a glass capillary with inner diameter $d_2$ $(d_2 > d_1)$. Then the whole arrangement is vertically oriented and brought in contact with the surface of water. The height to which water will rise in the capillary... (Given surface tension of water is T, density of water is 'ρ' and contact angle between water and glass is 0°).

1) $\frac{4T}{\rho g\left(d_2 - d_1\right)}$ 2) $\frac{8T}{\rho g\left(d_2 - d_1\right)}$ 3) $\frac{4T}{\rho g\left(d_2 + d_1\right)}$ 4) $\frac{4T\left(d_2^2 - d_1^2\right)}{\rho d_1 g}$

**17.** A hollow sphere of radius R is made of a metal whose specific gravity is ρ. The sphere will float in water if the thickness of wall of the sphere is (density of water is 1 gm/cc)

1) $> \frac{R}{3\rho}$ 2) $= \frac{2R}{3\rho}$ 3) $< \frac{R}{3\rho}$ 4) $< \frac{4R}{3\rho}$

**18.** A liquid is kept in a cylindrical vessel which is rotated along its axis. The liquid rises at the sides. If the radius of the vessel 0.05 m and the speed of rotation is 2 revolutions per second. The difference in the height of the liquid at the centre of the vessel and sides is about

1) 0.2 m 2) 0.02 m 3) 0.03 m 4) 0

**19.** Two blocks of masses m and 2m are connected through a wire of breaking stress S, passing over a frictionless pulley. The minimum radius of the wire used so that it may not break is

1) $\sqrt{\frac{3}{4}\frac{mg}{\pi s}}$ 2) $\sqrt{\frac{4}{3}\frac{mg}{s}}$ 3) $\sqrt{\frac{4}{3}\frac{mg}{\pi s}}$ 4) $\sqrt{\frac{1}{2}\frac{mg}{\pi s}}$

**20.** When a metal plate is exposed to light of wavelength 400 nm, a negative potential of 1.1 v is found to be needed to stop the photo current. The threshold wavelength of the photoelectrons is

1) 450 nm 2) 500 nm 3) 580 nm 4) 620 nm

**21.** Magnetic flux through a stationary loop of resistance 'R' varies during the time interval τ as $\phi = at(\tau - t)$ where 'a' is a constant. The amount of heat generated in the loop during the time internal τ is .....

1) $\frac{a^2\tau^3}{6R}$ 2) $\frac{a^2\tau^3}{4R}$ 3) $\frac{a^2\tau^3}{3R}$ 4) $\frac{a^2\tau^3}{2R}$

**22.** The factor which is not an advantage of Frequency modulation over Amplitude modulation is .....

1) Better noise immunity is provided 2) Lower band width required for transmission

3) Transmitted power is more useful 4) Less modulating power required

**23.** In a hydrogen atom, the magnetic field at the centre of the atom produced by an electron in the $n^{th}$ orbit is proportional to .....

1) $\frac{1}{n^2}$ 2) $\frac{1}{n^3}$ 3) $\frac{1}{n^4}$ 4) $\frac{1}{n^5}$

**24.** The input resistance of a common – emitter amplifier is 600 Ω and load resistance is 6 kΩ. A change of base current 50 μA results the change of collector current by 5 mA. Its voltage gain is

1) 100 2) 500 3) 1000 4) 5000

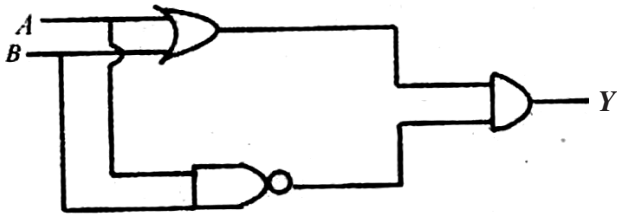
**25.** A radio active element X converts into another stable element Y. Half life of X is 2h. Initially only X is present. After time t, the ratio of atoms of X and Y is found to be 1 : 4, then t in hours will be

1) 2 2) 4 3) Between 4 and 6 4) 6

**26.** The image of an object placed on the principal axis of a concave mirror of focal length 12 cm is formed at a point which is 10 cm more distance from the mirror than the object. The magnification of the image is

1) $\frac{8}{3}$ 2) 2.5 3) 2 4) 1.5

**27.** The following arrangement is equivalent to




1) NAND 2) XOR 3) OR 4) AND

**28.** The specific heat of many solids at low temperatures varies with absolute temperature T according to the relation $S = AT^3$, where A is constant. The heat energy required to raise the temperature of a mass m of such a solid from T = 0 to T = 20 K is

1) $4 \times 10^4$ mA 2) $10 \times 10^3$ mA 3) $8 \times 10^6$ mA 4) $2 \times 10^6$ mA

**29.** In a hydrogen like atom, electron makes transition from an energy level with quantum number 'n' to another quantum number (n – 1). If n >> 1 the frequency of radiation emitted is proportional to

1) $\frac{1}{n^3}$ 2) $\frac{1}{n}$ 3) $\frac{1}{n^2}$ 4) $\frac{1}{n^4}$

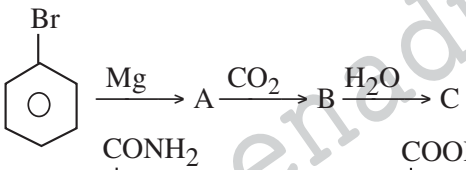
**30.** An insulator container contains 4 moles of an ideal diatomic gas at temperature T. Heat Q is supplied to this gas, due to which 2 moles of the gas are dissociated into atoms but temperature of the gas remains constant. Then

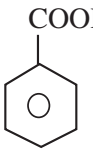
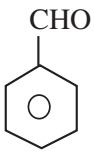
1) Q = 2RT 2) Q = RT 3) Q = 3RT 4) Q = 4RT

## CHEMISTRY

**31.** The volume strength of 1.5 N $H_2O_2$ solution is .....

1) 4.8 2) 8.4 3) 3.0 4) 8.0

**32.**  What is C in the above conversion?

1)  2)  3)  4) 

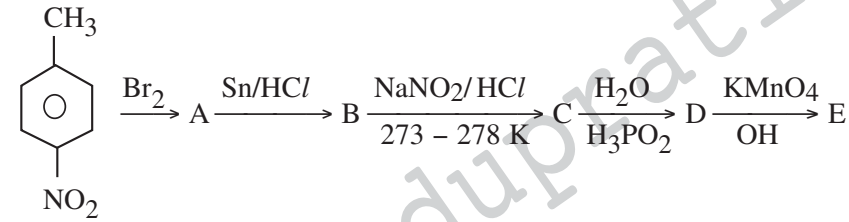
**33.** How many electrons in an atom with atomic number 105 can have $(n + l) = 8$

1) 30 2) 17 3) 15 4) 20

**34.** The hybridisation of the central atoms in the following species is $[PtCl_4]^{2-}$, $[Ni(CN)_4]^{2-}$, $[Fe(CN)_6]^{3-}$, $[NiCl_4]^{2-}$

1) $dsp^2$, $sp^3$, $dsp^3$, $dsp^2$ 2) $sp^3$, $sp^3$, $dsp^2$, $d^2sp^3$

3) $dsp^2$, $dsp^2$, $d^2sp^3$, $sp^3$ 4) $dsp^2$, $d^2sp^3$, $dsp^2$, $sp^3$

**35.** 

What is E?

1) 2 – bromobenzoic acid 2) 1 – bromobenzoic acid

3) 4 – bromobenzoic acid 4) 3 – bromobenzoic acid

**36.** What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition n = 4 to n = 2 of $He^+$ spectrum ?

1) $n_1 = 1$ to $n_2 = 2$ 2) $n_1 = 2$ to $n_2 = 4$

3) $n_1 = 1$ to $n_2 = 3$ 4) $n_1 = 2$ to $n_2 = 3$

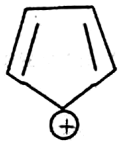
**37.** $\left[(NH_3)_4\,Co\begin{matrix}OH\\ \diagup\ \diagdown\\ OH\end{matrix}Co\,(NH_3)_2\,Cl_2\right]SO_4$ and $\left[Cl(NH_3)_3Co\begin{matrix}OH\\ \diagup\ \diagdown\\ OH\end{matrix}Co\,(NH_3)_3Cl\right]SO_4$

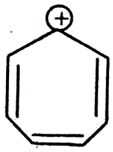
1) Ligand isomers 2) Coordinate position isomers

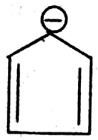
3) Ionisation isomers 4) Coordinate isomers

**38.** Which of the following is/ are aromatic in character?

I) 

II) 

III) 

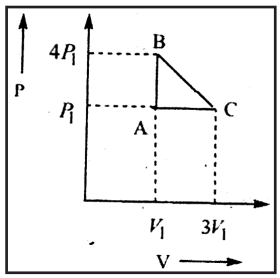
IV) 

1) II Only 2) I and II 3) III and IV 4) I, II, III and IV

**39.** The Vander wall's equation for $CH_4$ at low pressure is

1) $PV = RT - Pb$ 2) $PV = RT - \frac{a}{V}$ 3) $PV = RT + \frac{a}{V}$ 4) $PV = RT + Pb$

**40.** An ideal gas is taken around the cycle ABCA shown in the P – V diagram below. The net work done by the gas during the cycle is equal to




1) $12\ P_1V_1$ 2) $6\ P_1V_1$
3) $3\ P_1V_1$ 4) $P_1V_1$

**41.** Decreasing – I Power of given groups is

a) CN b) $NO_2$
c) $-NH_2$ d) F

1) b > a > d > c 2) b > c > d > a 3) c > b > d > a 4) c > b > a > d

**42.** In the formation of $N_2^+$ from $N_2$ the electron is removed from

1) σ orbital 2) π – orbital 3) σ* orbital 4) π* orbital

**43.** For an ideal gas reaction $2A + B \rightarrow C + D$ the value, of $K_p$ will be

1) $K_p = \frac{n_C n_D}{n_A^2 n_B} \cdot \frac{V}{RT^2}$ 2) $K_p = \frac{n_C n_D}{n_A^2 n_B} \cdot \frac{V}{RT}$

3) $K_p = \frac{n_C n_D}{n_A^2 n_B} \cdot \frac{RT}{V}$ 4) $K_p = \frac{n_C n_D}{4n_A^2 n_B} \cdot \frac{V}{RT}$

**44.** The volume of 0.3 M $NH_4OH$ that should be mixed with 30 m*l* of 0.2 M solution of $NH_4Cl$ to give buffer solution of pH 8.65 ($P^Kp = 4.75$)

1) 10 m*l* 2) 20 m*l* 3) 5 m*l* 4) 15 m*l*

**45.** Which of the following combinations is correctly matched?

1) $H_3C - \underset{\displaystyle D}{\overset{\displaystyle H}{\underset{|}{\overset{|}{C}}}} - Cl$, $SN^2$ walden inversion

2) $H_3C - \underset{\displaystyle D}{\overset{\displaystyle H}{\underset{|}{\overset{|}{C}}}} - Cl$, $SN^1$ walden inversion

3) $C_6H_5 - \underset{\displaystyle CH_3}{\overset{\displaystyle C_2H_5}{\underset{|}{\overset{|}{C}}}} - Cl$, $SN^2$, only retention

4) $C_6H_5 - \underset{\displaystyle CH_3}{\overset{\displaystyle C_2H_5}{\underset{|}{\overset{|}{C}}}} - Cl$, $SN^1$, only inversion

**46.** With which of the following diborane liberates dihydrogen gas?

I = $H_2O$ II = $NH_3$ at 120°

III = CO IV = $NH_3$ at above 200° C

1) II, III only 2) II, III, IV Only

3) I, IV Only 4) II, IV Only

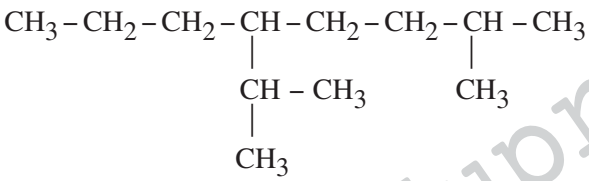
**47.** The solubility $A_2B_3$ is x mol $dm^{-3}$. Its $K_{sp}$ is

1) $6x^4$ 2) $64x^4$ 3) $36x^5$ 4) $108x^5$

**48.** The number of unit cells in 1 gram of NaCl are

1) $1.28 \times 10^{21}$ 2) $2.56 \times 10^{23}$ 3) $2.56 \times 10^{21}$ 4) $1.28 \times 10^{23}$

**49.** IUPAC name of the compound



1) 2 – methyl – 5 – isopropyl octane 2) 2, 6 – dimethyl – 3 – propylheptane

3) 5 – methyl – 2 – isopropyl octane 4) 5 – isopropyl – 2 – methyloctane

**50.** The Van't Hoff factor for 0.1 M $Al_2(SO_4)_3$ solution is 4.2. The degree of dissociation is

1) 80% 2) 90% 3) 78% 4) 83%

**51.** Coal gasification involves

1) Production of 'syngas' from sewage.

2) Synthesis of methanol from water gas.

3) Producing 'syngas' from coal.

4) Producing dihydrogen by the water gas shift reaction.

**52.** Equimolal solutions A and B show depression in freezing point in the ratio 2 : 1. A remains in the normal state in solution. B will be

1) Normal in solution 2) Dissociated in solution

3) Associated in solution 4) Hydrolysed in solution

**53.** Denaturation of protein doesnot disturb ..... structure.

1) Quaternary 2) Secondary 3) Primary 4) Tertiary

**54.** Given that $E^{\ominus}$ $Fe^{2+}$/ Fe = –0.44 V; $E^{\ominus}$ $Fe^{2+}$/ $Fe^{3+}$ = – 0.77 V. If $Fe^{2+}$, $Fe^{3+}$ and Fe solid are kept together, then

1) $Fe^{3+}$ conc. increases 2) $Fe^{3+}$ conc. decreases

3) $Fe^{2+}$, $Fe^{3+}$ conc. remain unchanged 4) $Fe^{2+}$ conc. decreases

**55.** When electricity is passed through a solution of $AlCl_3$ and 13.5 g of Al is deposited, the number of faraday must be

1) 0.5 2) 1.0 3) 1.5 4) 2.0

**56.** The non–essential amino acid among the following is

1) Valine 2) Leucine 3) Histidine 4) Glutamic acid

**57.** Rate law for $2A + B \longrightarrow C + D$ from following data:

| S.No. | [A] (M) | Rate (M/s) | Rate (M/s) |
|---|---|---|---|
| 1. | 0.01 | 0.01 | 2.5 |
| 2. | 0.01 | 0.02 | 5 |
| 3. | 0.03 | 0.02 | 45 |

1) $r = K[A]^{1/3}[B]$ 2) $r = K[A][B]^{1/3}$ 3) $r = K[A]^2[B]$ 4) $r = K[A]^{2/3}[B]^{1/3}$

**58.** 'x' and 'y' are monomers used in the preparation of biodegradable polymer of Nylon–2–Nylon–6. What are 'x' and y?

1) Caprolactam, hexamethylene diamine
2) Glycine, β – hydroxy valeric acid
3) Ethylene glycol, pthalic acid
4) Glycine, aminocaproic acid

**59.** In a first order reaction, the concentration of the reactants is reduced to 25% in one hour. The half life period of the reaction is

1) 2 hr
2) 4 hr
3) $\frac{1}{2}$ hr
4) $\frac{1}{4}$ hr

**60.** 0.25 g of an organic compound gave 22.4 m*l* of $N_2$ at STP by Duma's method. The percentage of nitrogen in the compound is

1) 15%
2) 28%
3) 11.2%
4) 14%

## MATHEMATICS

**61.** The number of irrational terms in the expansion of $\left(5^{1/6} + 2^{1/8}\right)^{100}$ is .....

1) 96
2) 97
3) 98
4) 99

**62.** The maximum value of $|z|$ satisfying the equation $\frac{1}{12}(z + \overline{z})^2 = 1 - \frac{1}{3}|z|^2$ is .....

1) $\sqrt{2}$
2) $\sqrt{3}$
3) 4
4) 6

**63.** If the lines $2x - 3y + 6 = 0$ and $mx + 2y + 12 = 0$ meets the co-ordinate axes at concyclic points then m = .....

1) 3
2) –3
3) 2
4) –2

**64.** The equation of the curve obtained by reflecting the parabola $y^2 = 4x$ about the line $x - y + 13 = 0$ is .....

1) $(2y - x - 13)^2 = 4(y + 13)$
2) $(2y + x - 13)^2 = 4(y - 13)$
3) $(2y - x - 13)^2 = 4(y - 13)$
4) $(x + 13)^2 = 4(y - 13)$

**65.** **Assertion (A):** Equation of the normal to the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ at $P\left(\frac{\pi}{4}\right)$ is $5x - 3y - 8\sqrt{2} = 0$.

**Reason (R):** Equation of the normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at $P(x_1, y_1)$ is $\frac{a^2 x}{x_1} + \frac{b^2 y}{y_1} = a^2 - b^2$

1) Both A and R are true but R is not the correct explanation of A.
2) Both A and R are true, R is the correct explanation of A.
3) A is true but R is false.
4) A is false but R is true.

**66.** OPQR is a square and M, N are the middle points of the sides PQ and QR respectively then the ratio of the areas of the square and the triangle OMN is .....

1) 4 : 1
2) 2 : 1
3) 8 : 3
4) 4 : 3

**67.** Area of the parallelogram formed by the pairs of lines $x^2 + xy - y^2 = 0$ and $x^2 + xy - y^2 - 3x - 4y + 1 = 0$ is .....

1) $\sqrt{5}$
2) $\frac{1}{\sqrt{5}}$
3) $2\sqrt{5}$
4) $\frac{2}{\sqrt{5}}$

**68.** If the straight lines $x = 1 + s$, $y = -3 - \lambda s$, $z = 1 + \lambda s$ and $x = \frac{1}{2}$, $y = 1 + t$, $z = 2 - t$ with parameters 's' and 't' respectively are coplanar, then λ equal to:

1) – 2
2) –1
3) $-\frac{1}{2}$
4) 0

**69.** The length of the perpendicular from (1, 0, 2) on the line $\frac{x+1}{3} = \frac{y-2}{-2} = \frac{z+1}{-1}$ is .....

1) $3\frac{\sqrt{6}}{2}$ 2) $6\frac{\sqrt{3}}{5}$ 3) $3\sqrt{2}$ 4) $2\sqrt{3}$

**70.** An object is moving in the clockwise direction around the unit circle $x^2 + y^2 = 1$. As it passes through the point $\left[\frac{1}{2}, \frac{\sqrt{3}}{2}\right]$, its y – coordinate is decreasing at the rate of 3 units per second.

The rate at which the x – coordinate changes at this point is (in units per second).

1) 2 2) $3\sqrt{3}$ 3) $\sqrt{3}$ 4) $2\sqrt{3}$

**71.** If $\alpha, \beta$ $(\beta > \alpha)$ are the roots of $g(x) = ax^2 + bx + c = 0$ and f(x) is a even function, then

$$\int_{\alpha}^{\beta} \frac{f\left(\frac{g(x)}{x-\alpha}\right)}{f\left(\frac{g(x)}{x-\alpha}\right) + f\left(\frac{g(x)}{x-\beta}\right)} dx \text{ is equal to ...}$$

1) $\left|\frac{b}{2a}\right|$ 2) $\frac{\sqrt{b^2-4ac}}{|2a|}$ 3) $\left|\frac{b}{a}\right|$ 4) $\left|\frac{2b}{a}\right|$

**72.** If $\alpha, \beta$ are the roots of $ax^2 + bx + c = 0$ then

$$\lim_{x \to \frac{1}{\alpha}} \frac{\sin(cx^2 + bx + a)}{x\alpha - 1}$$

1) $c\left(\frac{\beta-\alpha}{\alpha\beta}\right)$ 2) $\frac{\beta-\alpha}{\alpha}$ 3) $\frac{1}{\alpha}$ 4) $\frac{c}{\alpha}\left(\frac{1}{\alpha} - \frac{1}{\beta}\right)$

**73.** Let R be the real line. Consider the following subsets of the plane R × R:

S = {(x, y) : y = x + 1 and 0 < x < 2}

T = {(x, y) : x – y is an integer} which one of the following is true.

1) T is an equivalence relation on R but S is not.

2) Neither S nor T is an equivalence relation on R.

3) Both S and T are equivalence relations on R.

4) S is an equivalence relation on R but T is not.

**74.** The value of $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1 + a^x} dx \ (a > 0) =$

1) $\pi$ 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{3}$

**75.** $\int_{\pi}^{2\pi} [2 \sin x] dx$, where [.] represents the greatest integer function is .....

1) $-\frac{5\pi}{3}$ 2) $-\pi$ 3) $\frac{5\pi}{3}$ 4) $-2\pi$

**76.** The general solution of the D.E. $x^2 \frac{dy}{dx} = x^2 + xy + y^2$ is .....

1) $\tan^{-1}\left(\frac{y}{x}\right) = \log x + c$ 2) $\tan^{-1}\left(\frac{x}{y}\right) = \log x + c$

3) $\tan^{-1}\left(\frac{x}{y}\right) = \log y + c$ 4) $\tan^{-1}\left(\frac{y}{x}\right) = \log y + c$

**77.** If $I = \int e^x (x \cos x + \sin x)\, dx$ then I equals ....

1) $\frac{1}{2} e^x [x \sin x + \sin x] - \frac{1}{2} e^x \cos x + c$ 2) $\frac{x}{2} e^x [\sin x + \cos x - x \cos x] + c$

3) $\frac{1}{2} e^x [x \sin x + x \cos x - \cos x] + c$ 4) $\frac{x}{2} e^x [x \sin x + x \cos x - \cos x] + c$

**78.** The statement $p \rightarrow (q \rightarrow p)$ is equivalent to:

1) $p \rightarrow (p \leftrightarrow q)$ 2) $p \rightarrow (p \rightarrow q)$ 3) $p \rightarrow (p \vee q)$ 4) $p \rightarrow (p \wedge q)$

**79.** The exponent of 7 in ${}^{100}C_{50}$ is .....

1) 0 2) 2 3) 4 4) 100

**80.** In a multiple choice question there are four alternative answers of which one or more than one is correct. A candidate will get marks on the question only if he ticks all the correct answers. The candidate decides to tick answers at random. If he is allowed upto three chances to answer the question, the probability that he will get marks on it is given by .....

1) $1 - \left(\frac{14}{15}\right)^3$ 2) $\left(\frac{1}{15}\right)^3$ 3) $\frac{1}{5}$ 4) $\left(\frac{14}{15}\right)^3$

**81.** If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3 then .....

1) $a < 2$ 2) $a < 3$ 3) $a < \frac{3}{2}$ 4) $a < 4$

**82.** If a, b, c, d are in H.P., then ab + bc + cd is equal to:

1) 3ad 2) (a + b) (c + d) 3) 3ac 4) bc

**83.** Let $x_1, x_2, \ldots x_n$ be n observations such that $\Sigma x_i^2 = 400$ and $\Sigma x_i = 80$, then a possible value of n among the following is .....

1) 9 2) 12 3) 15 4) 18

**84.** If $\cot\theta + \tan\theta = m$ and $\sec\theta - \cos\theta = n$, then which of the following is correct?

1) $m(mn^2)^{1/3} - n(nm^2)^{1/3} = 1$ 2) $m(m^2n)^{1/3} - n(mn^2)^{1/3} = 1$

3) $n(mn^2)^{1/3} - m(nm^2)^{1/3} = 1$ 4) $n(m^2n)^{1/3} - m(mn^2)^{1/3} = 1$

**85.** $\sin^{-1}(\sin 3) + \sin^{-1}(\sin 4) + \sin^{-1}(\sin 5) =$

1) $-1$ 2) $-2$ 3) 12 4) $2 - \pi$

**86.** Let ABCDEF be a regular hexagon. If $\overline{AD} = x\overline{BC}$ and $\overline{CF} = y\overline{BA}$ then $(x + y)^2 + 8 =$

1) 24 2) $-4$ 3) 2 4) $-24$

**87.** The system of equations .....

$\alpha x - y - z = \alpha - 1$

$x - \alpha y - z = \alpha - 1$

$x - y - \alpha z = \alpha - 1$ has no solution, if $\alpha$ is

1) either $-2$ or 1 2) $-2$ 3) 1 4) 3

**88.** The values of $\lambda$ for which the matrix $A = \begin{pmatrix} \lambda & 0 & \lambda \\ \lambda & 0 & -\lambda \\ 0 & 1 & 0 \end{pmatrix}$ is orthogonal is .....

1) $\pm 1$ 2) $\pm \frac{1}{\sqrt{3}}$ 3) $\pm \frac{1}{2}$ 4) $\pm \frac{1}{\sqrt{2}}$

**89.** The area bounded by the curves $y = \sqrt{5 - x^2}$ and $y = |x - 1|$ is....

1) $\frac{5\pi - 1}{4}$ 2) $\frac{5\pi + 1}{4}$ 3) $\frac{5\pi - 2}{4}$ 4) $\frac{5\pi - 3}{4}$

**90.** The orthogonal trajectories of the family of ellipses $x^2 + 2y^2 - y = c$ are the family of parabolas $y = cx^2 + k$, where k =

1) 1 2) $\frac{1}{2}$ 3) $\frac{1}{3}$ 4) $\frac{1}{4}$

## KEY

1-4; 2-3; 3-3; 4-3; 5-2; 6-3; 7-4; 8-4; 9-2; 10-4; 11-4; 12-2; 13-1; 14-1; 15-1; 16-1; 17-3; 18-2; 19-3; 20-4; 21-3; 22-2; 23-4; 24-3; 25-3; 26-4; 27-2; 28-1; 29-1; 30-2; 31-2; 32-2; 33-2; 34-3; 35-1; 36-1; 37-2; 38-3; 39-2; 40-3; 41-1; 42-1; 43-2; 44-3; 45-1; 46-3; 47-4; 48-3; 49-2; 50-1; 51-3; 52-3; 53-3; 54-2; 55-3; 56-4; 57-3; 58-4; 59-3; 60-3; 61-2; 62-2; 63-2; 64-4; 65-2; 66-3; 67-2; 68-1; 69-1; 70-2; 71-2; 72-4; 73-1; 74-2; 75-1; 76-1; 77-3; 78-3; 79-1; 80-3; 81-1; 82-1; 83-4; 84-1; 85-2; 86-1; 87-2; 88-4; 89-3; 90-4.

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