TECHNO INDIA GROUP PUBLIC SCHOOL

Dt. 10-03-2025

JEE Main

Mock Test - 1 (2025)

Time Allowed: **3 hours** Maximum Marks: **300**

General Instructions:

1. There are three subjects in the question paper consisting of Physics (Q. no. 1 to 25), Chemistry (Q, no. 26 to 50), and Mathematics (Q. no. 51 to 75).
2. Each subject is divided into two sections. Section A consists of 20 multiple-choice questions & Section B consists of 5 numerical value-type questions.
3. There will be only one correct choice in the given four choices in Section A. For each question for Section A, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.
4. For Section B questions (Integer type), 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.
5. Any textual, printed, or written material, mobile phones, calculator etc. is not allowed for the students appearing for the test.
6. All calculations/written work should be done in the rough sheet, provided with the Question Paper.

TECHNO INDIA GROUP

Physics

SECTION-A

1. Consider the ratio $x=\frac{(1-y)}{(1+y)}$ to be determined by measuring a dimensionless quantity y. If the error in the measurement of y is Δy ($\Delta y/y << 1$), then what is the error Δx in determining x? [4]

① $\frac{\Delta y}{(1+y)^2}$ ② $\frac{-2\Delta y}{(1+y)^2}$

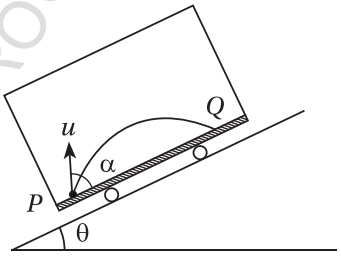
③ $\frac{2\Delta y}{(1-y)^2}$ ④ $\frac{2y\Delta y}{(1-y^2)}$

2. A ball is thrown upward with an initial velocity v_0 from the surface of the earth. The motion of the ball is affected by a drag force equal to mkv (where m is mass of the ball, k is constant). Time taken by the ball to rise to its highest height is [4]

① $mk\ln\left[1+\frac{gv_0}{mk}\right]$ ② $\left(\frac{1}{mk}\right)\ln\left[1+\left(\frac{mk}{g}\right)v_0\right]$

③ $\ln\left[1-\left(\frac{mk}{g}\right)v_0\right]$ ④ $mk\ln\left(\frac{gv_0}{mk}\right)$

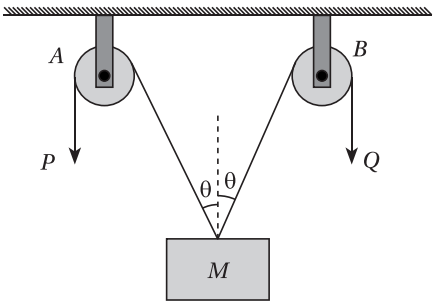
3. A large heavy container is sliding without friction down a smooth plane of inclination θ. From a point P on the bottom of box, a particle is projected with respect to box is u and the direction of projection makes an angle α with the bottom. Then PQ = [4]



① $\frac{u^2\sin 2\alpha}{g}$ ② $\frac{u^2\sin 2\theta}{g\cos\alpha}$

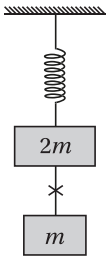
③ $\frac{u^2\sin 2\alpha}{g\cos\theta}$ ④ $\frac{u^2\sin 2\theta}{g}$

4. In this arrangement in the figure, the ends P and Q of the unstretchable string moves downwards with uniform speed u. Mass M moves upwards with a speed [4]



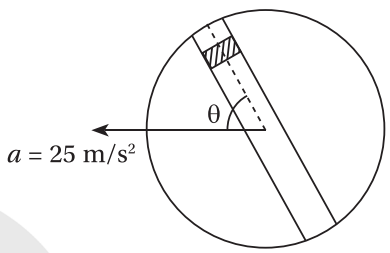
① $u\cos\theta$ ② $2u\cos\theta$ ③ $u\sin\theta$ ④ $u/\cos\theta$

5. System shown in figure is in equilibrium and at rest. The spring and string are massless, now the string is cut. The acceleration of mass $2m$ and m just after the string is cut will be [4]



① $g/2$ upwards, g downwards ② g upwards, $g/2$ downwards
③ g upwards, $2g$ downwards ④ $2g$ upwards, g downwards

6. A circular disc with a groove along its diameter is placed horizontally. A block of mass 1 kg is placed as shown. The coefficient of friction between the block and all surfaces of groove in contact is $\mu = 2/5$. The disc has an acceleration of 25 m/s^2. The acceleration of the block with respect to disc is [4]



$\cos\theta = 4/5$
$\sin\theta = 3/5$

① 6 m/s^2 ② 10 m/s^2 ③ 8 m/s^2 ④ 4 m/s^2

7. A time dependent force $F = 6t$ acts on a particle of mass 1 kg. If the particle starts from the rest, the work done by the force during the first 1 s will be [4]

① 22 J ② 9 J ③ 18 J ④ 4.5 J

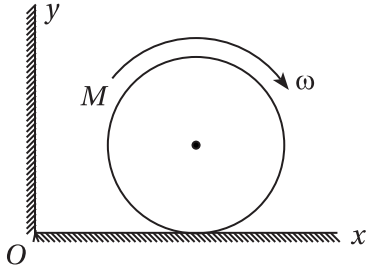
8. A particle is moving in a circular path of radius a under the action of a attractive potential energy $U = -\frac{k}{2r^2}$. Its total energy is [4]

① $-\frac{3}{2}\frac{k}{a^2}$ ② $-\frac{k}{4a^2}$ ③ $\frac{k}{2a^2}$ ④ Zero

9. A man (mass = 50 kg) and his son (mass = 20 kg) are standing on a frictionless surface facing each other. The man pushes his son, so that he starts moving at a speed of 0.70 m/s with respect to the man. The speed of the man with respect to the surface is [4]

① 0.28 ms^{-1} ② 0.20 ms^{-1} ③ 0.47 ms^{-1} ④ 0.14 ms^{-1}

10. A disc of mass M and radius R is rolling with angular speed ω on a horizontal plane as shown. The magnitude of angular momentum of the disc about the origin O is [4]



① $\left(\frac{1}{2}\right)MR^2\omega$ ② $MR^2\omega$ ③ $\left(\frac{3}{2}\right)MR^2\omega$ ④ $2MR^2\omega$

11. The position of a particle of mass m = 2 kg is given by $r(t) = 2t\hat{i} - 3t^2\hat{j}$. Its angular momentum, with respect to the origin, at time t = 2 s is [4]

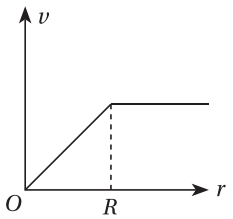
① $36\hat{k}$ ② $-34\left(\hat{k}-\hat{i}\right)$ ③ $-48\hat{k}$ ④ $48\left(\hat{i}+\hat{j}\right)$

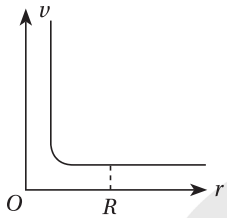
12. A spherically symmetric gravitational system of particles has a mass density [4]

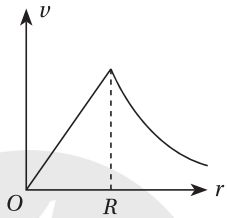
$\rho = \rho_0$ for $r \le R$

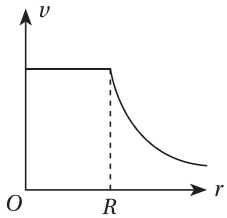
$= 0$ for $r > R$

where ρ_0 is a constant. A test mass can undergo circular motion under the influence of the gravitational field of particles. Its speed v as a function of distance r from the centre of the system is represented by

① 

② 

③ 

④ 

13. A long cylinder vessel is half filled with a liquid. When the vessel is rotated about its own vertical axis, the liquid rises up near the wall. If the radius of vessel is 5 cm and its rotational speed is 2 revolutions per second, then the difference in the heights between the centre and the sides (in cm) will be [4]

① 0.1 ② 1.2 ③ 0.4 ④ 2.0

14. A simple pendulum has time period T_1. The point of suspension is now moved upward according to the relation $y = kt^2$ where (k = 1 m/s^2), y is the vertical displacement. The time period is now T_2. The ratio of $\frac{T_1^2}{T_2^2}$ is (take g = 10 m/s^2) [4]

① 6/5 ② 5/6 ③ 1 ④ 4/5

15. Four harmonic waves of equal frequencies and equal intensities I_0 have phase angle 0, $\frac{\pi}{3}$, $\frac{2\pi}{3}$, π. When they are superposed, the intensity of resulting wave is nI_0. Then n is [4]

① 1 ② 2 ③ 3 ④ 4

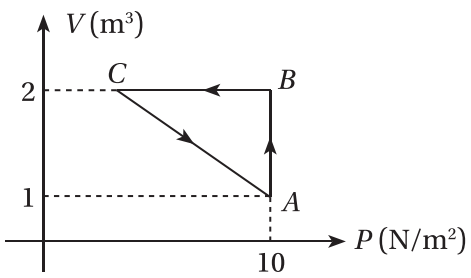
16. Parallel rays of light of intensity I = 912 w/m^2 are incident on a spherical black body kept in surroundings of temperature 300 K. Take Stefan constant $\sigma = 5.7 \times 10^{-8}$ wm^{-2}k^{-4} and assume that the energy exchange with the surroundings is only through radiation. The final steady state temperature of the black body is close to [4]

① 330 K ② 660 K ③ 990 K ④ 1550 K

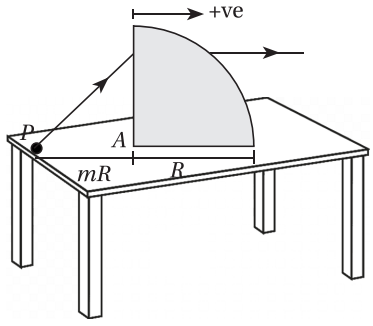
17. An ideal gas is taken through the cycle $A \to B \to C \to A$, as shown in the figure. If the net heat supplied to the gas in the cycle is 5 J, the work done by the gas in the process $C \to A$ is [4]

① –5 J ② –10 J

③ –15 J ④ –20 J



18. A quarter cylinder of radius R and refractive index 1.5 is placed on a table. A point object P is kept at a distance of mR from it. The value of m for which a ray from P will emerge parallel to the table as shown in figure. [4]



① 3/4 ② 4/3 ③ 3/2 ④ 2

19. Space between two concentric conducting spheres of radii a and b $(b > a)$ is filled with a medium of resistivity ρ. The resistance between the two spheres will be [4]

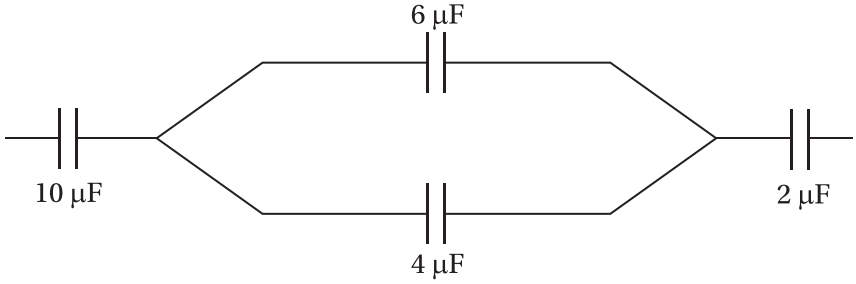
① $\frac{\rho}{2\pi}\left(\frac{1}{a}+\frac{1}{b}\right)$ ② $\frac{\rho}{4\pi}\left(\frac{1}{a}-\frac{1}{b}\right)$ ③ $\frac{\rho}{2\pi}\left(\frac{1}{a}-\frac{1}{b}\right)$ ④ $\frac{\rho}{4\pi}\left(\frac{1}{a}+\frac{1}{b}\right)$

20. Charge is distributed within a sphere of radius R with a volume charge density $\rho(r)=\frac{A}{r^2}e^{-2r/a}$, where A and a are constants. If Q is the total charge of the charge distribution, the radius R is [4]

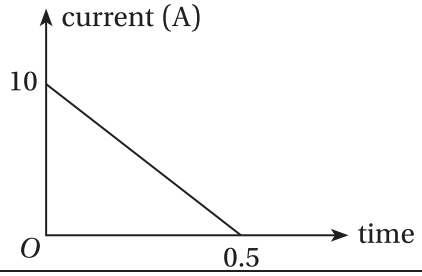
① $a\log\left[\frac{1}{1-\frac{Q}{2\pi aA}}\right]$ ② $a\log\left(1-\frac{Q}{2\pi aA}\right)$ ③ $\frac{a}{2}\log\left(1-\frac{Q}{2\pi aA}\right)$ ④ $\frac{a}{2}\log\left[\frac{1}{1-\frac{Q}{2\pi aA}}\right]$

SECTION-B

21. In the figure shown below, the charge on the left plate of the 10 μF capacitor is –30 μC. The charge on the right plate of the 6 μF is _____. [4]

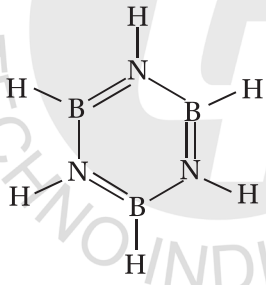
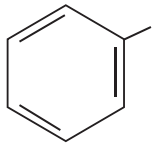
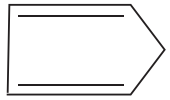


22. Two identical wires A and B, each of length l, carry the same current I. Where A is bent into a circle of radius R and wire B is bent to form a square of side a. If B_A and B_B are the values of magnetic field at the centres of circle and square respectively then $\frac{\pi^2}{\sqrt{2}}\left(\frac{B_B}{B_A}\right)$ is _____, [4]

23.	In a coil of resistance 100 Ω, a current is induced by changing the magnetic flux through it as shown in the figure. The magnitude of change in flux through the coil is (wb) _____ 	[4]
24.	A hydrogen atom, initially in the ground state is excited by absorbing a photon of wavelength 980 Å . The radius of the atom in the excited state in terms of Bohr radius is ka_0. (Take hc = 12500 ev– Å). Then k is _____ (radius of Bohr orbit is a_0)	[4]
25.	The half-life of ^{215}At is 100 μs. The time taken for the activity of a sample of ^{215}At to decay to $\frac{1}{16}$ th of its initial value is (μs) _____	[4]

Chemistry

SECTION-A

26.	What are the formal charges on 'B' and 'N' respectively in the given structure?  ① –1, +1 ② +1, 0 ③ –2, +2 ④ 0, 0	[4]
27.	The sequence that correctly describes the relative bond strengths partaining to oxygen molecule and its cation or anion is ① $O_2^{2-} > O_2^- > O_2 > O_2^+$ ② $O_2 > O_2^+ > O_2^- > O_2^{2-}$ ③ $O_2^+ > O_2 > O_2^{2-} > O_2^-$ ④ $O_2^+ > O_2 > O_2^- > O_2^{2-}$	[4]
28.	Among the following which one of the following is the highest acidic in nature? ① $CH_3CH_2CH_2—CH_2—CH_3$ ②  ③  ④ 	[4]
29.	The number of stereoisomers obtained by bromination of tran-2-butene is ① 1 ② 2 ③ 3 ④ 4	[4]

30. The potential energy of electron present in the ground state of Li^{2+} ion is represented by [4]

① $\frac{+3e^2}{4\pi\varepsilon_0 r}$ ② $\frac{-3e}{4\pi\varepsilon_0 r}$ ③ $\frac{-3e^2}{4\pi\varepsilon_0 r^2}$ ④ $\frac{-3e^2}{4\pi\varepsilon_0 r}$

31. If the radius of first orbit of H-atom is a_0, then de-Broglie wavelength of electron 4^{th} orbit is [4]

① $8\pi a_0$ ② $\frac{a_0}{4}$ ③ $16a_0$ ④ $2\pi a_0$

32. A compound made up of two elements *A* and *B* is found to contain 25% A (atomic mass = 12.5) and 75% *B* (atomic mass = 37.5). The simplest formula of the compound is [4]

① AB ② AB_2 ③ AB_3 ④ A_3B

33. Calculate the degree of dissociation of PCl_5, the density at 230°C is 70. [4]

① 97.8% ② 48.9% ③ 4.89% ④ 24.49

34. Calculate the pH of 0.5 M aqueous solution of NaCN, the pk_b of CN^- is 4.70 [4]

① 4.70 ② 11.5 ③ 7 ④ 6.5

35. The bond dissociation energies of gaseous H_2, Cl_2 and HCl are 104, 58 and 103 Kcal respectively. The enthalpy of formation of HCl gas would be [4]

① –44 Kcal ② 44 Kcal

③ –22 Kcal ④ 22 Kcal

36. For a spontaneous reaction the ΔG, equilibrium constant (k) and E_{cell}^0 [4]

① –ve, > 1, –ve ② –ve, < 1, –ve ③ +ve, > 1, –ve ④ –ve, > 1, +ve

37. The Van't Hoff factor for 0.1 (M) $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is [4]

① 91.3% ② 87% ③ 100% ④ 74

38. The density of 3 M solution of sodium chloride is 1.252 g $(mL)^{-1}$. The molarity of the solution will be [molar mass, NaCl = 58.5 g $(mol)^{-1}$] [4]

① 2.60 m ② 2.18 m ③ 2.79 m ④ 3.00 m

39. Indicate in which of the following processes, the nitrogen is reduced? [4]

① $NO_3^- \rightarrow NO$ ② $NO_2 \rightarrow NO_2^-$ ③ $NO_3 \rightarrow NH_4^+$ ④ All of these

40. In the reaction : [4]

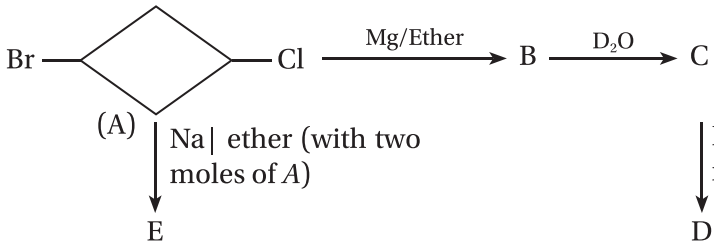
$VO + Fe_2O_3 \rightarrow FeO + V_2O_5$, what is the n-factor for V_2O_5?

① +2 ② +4 ③ +6 ④ +8

41. Given, $E^0_{Cr^{3+}/Cr} = -0.72\ v$, $E^0_{Fe^{2+}/Fe} = -0.42\ v$. The potential for the cell : [4]

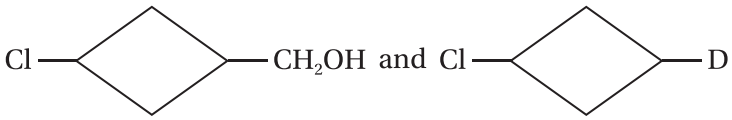
$Cr|Cr^{3+}$ (0.1 M) $||$ Fe^{2+} (0.01 M)$|$ Fe is :

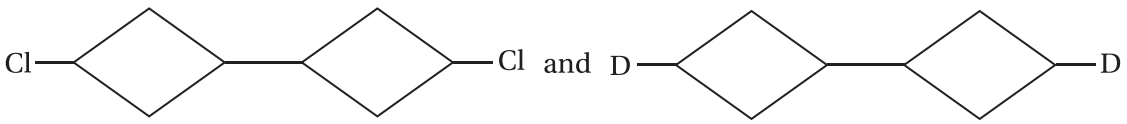
① –0.339 v ② –0.26 v ③ +0.26 v ④ +0.339 v

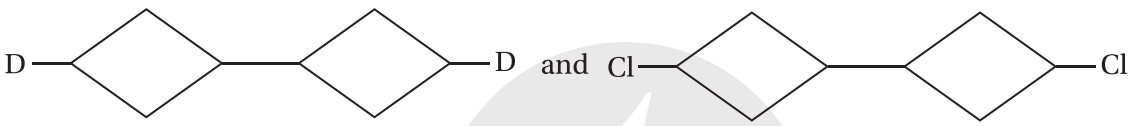
42. 

[4]

D and E are respectively :

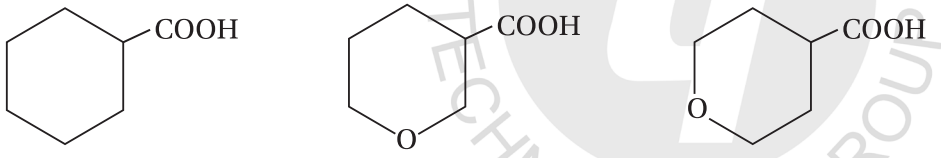
① 

② 

③ 

④ None of the above

43. The correct order of strengths of the carboxylic acids is : [4]



(I) (II) (III)

① I > II > III ② II > III > I ③ III > II > I ④ II > I > III

44. In chromic acid anhydride (CrO_3), Cr has d^0 configuration but it is bright orange coloured solid, the colour is due to [4]

① *d*–*d*–transition ② Charge transfer (L → M) transition
③ Charge transfer (M → L) transition ④ *p*–*d*–transition

45. The reagents used in the preparation of aspirin from salicylic acid is [4]

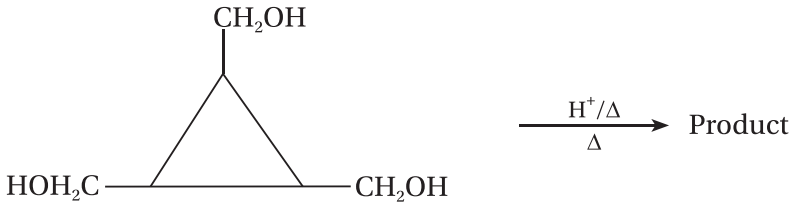
① $SOCl_2$, Pyridine ② CH_3COOH, HCl ③ CH_3Cl, $AlCl_3$ ④ $(CH_3CO)_2O$, H^+

SECTION-B

46. A current of 3 ampere has to be passed through a solution of $AgNO_3$ solution to coat a metal surface of 80 cm^2 with 0.005 mm thick layer for a duration of approximately y^3 seconds. What is the value of *y*? (Density of Ag is 10.5 g/cm^3) _____. [4]

47. The number of chiral carbon in one molecule of α–D(+) glucose is _____. [4]

48. What is the maximum number of compounds with the molecular formula $C_4H_{11}N$ which give an alkali soluble precipitate with benzyl sulphonyl chloride? _____ [4]

49.	 The degree of unsaturation of product is _____.	[4]
50.	Total number of monochloro derivatives (including stereoisomers) possible for the given compound would be _____.	[4]

Mathematics

SECTION-A

51.	In a triangle ABC, D is the midpoint of BC and AD is perpendicular to AC. Then cosA cosC = ① $\frac{3(c^2+a^2)}{2ca}$ ② $\frac{b^2-a^2}{2ab}$ ③ $\frac{2(c^2-a^2)}{3ca}$ ④ $\frac{(c^2+b^2)}{2bc}$	[4]
52.	For what values of *x*, the given function *f(x)* non differentiable or discontinuous? $f(x)=\begin{cases}1-x, & x<1\\(1-x)(2-x), & 1\le x\le 2\\3-x, & x>2\end{cases}$ ① x = 1 ② x = 2 ③ Both (a) and (b) ④ None of these	[4]
53.	Let, $f(x)=\frac{x-1}{x+1}$ $f^2(x) = f(f(x))$, $f^3(x) = f\{f^2(x)\}$ ..... $f^{k+1}(x) = f.\{f^k(x)\}$ for k = 1, 2, 3, ... Then $\left\|f^{1999}(2)\right\|$ is ____?____ ① –2 ② –3 ③ –1 ④ 0	[4]
54.	For every real number $c \ge 1$ and $c^2 \in Z$. The number of all the complex numbers z that satisfy the equation $z+c\|z+1\|-i=0$ are ① 1 ② 2 ③ 3 ④ Infinite	[4]
55.	Let $f : (0, \infty) \to R$ be a differentiable function such that $x f'(x) + f(x) - 2x = 0 \ \forall \ x \in (0, \infty)$ and $f(1) \ne 1$. Then ① $\lim_{x\to 0^+} f'\left(\frac{1}{x}\right)+xf\left(\frac{1}{x}\right)=1$ ② $\lim_{x\to 0^+} xf\left(\frac{1}{x}\right)=1$ ③ $\lim_{x\to 0^+} x^2 f'(x)=0$ ④ $\|f(x)\|\le 2$ for all $x\in(0,2)$	[4]

56. A curve is such that the length of tangent intercept between point of contact and x-axis is 1. Then the equation of the curve is [4]

① $\log\left|\frac{1-\sqrt{1-y^2}}{y}\right|+\sqrt{1-y^2}=x+c$ ② $\log\left|\frac{y}{1-\sqrt{1-y^2}}\right|+\sqrt{1-y^2}=x+c$

③ Both (a) and (b) ④ None of these

57. If λ is minimum positive value of f(x) for which the derivative of $e^{f(x)}\sin f(x)$ is zero, $(f'(x) > 0)$, then $[\lambda]$ is where [x] represents greatest integer function. [4]

① 2.355 ② 3 ③ 2 ④ 3.456

58. Let the coefficients of p^{th}, $(p+1)^{th}$ and $(p+2)^{th}$ terms in the binomial expansion of $(1+y)^n$ are in A.P., then n and p satisfy the equation. [4]

① $n^2-n(4p-1)+4p^2+2=0$ ② $n^2-n(4p+1)+4p^2-2=0$

③ $n^2-n(4p+1)+4p^2+2=0$ ④ $n^2-n(4p-1)+4p^2-2=0$

59. The value of $\left[\lim_{x\to0}\left(\frac{\sin x}{x}\right)^{\frac{\sin x}{x-\sin x}}+\lim_{x\to1}(x)^{\frac{1}{1-x}}\right]$ is $\frac{m}{e}$. Then m is [4]

① 2 ② 1 ③ – 2 ④ None of these.

60. The locus of point P such that angle between pair of tangents drawn from it to the parabola $y^2 = 4ax$ is 45°, is a [4]

① Parabola ② Elipse ③ Hyperbola ④ Circle

61. Let $A=\begin{bmatrix}1&5&25\\0&1&5\\0&0&1\end{bmatrix}$. If $B=[b_{ij}]$ is a matrix such that $A^{50}-B=I$, where I is the identity matrix of order 3. Then [4]

$2\left(\frac{b_{13}}{b_{12}}\right)+\frac{2b_{23}}{b_{12}}$ equals

① 255 ② 256 ③ 257 ④ 0

62. Let the normal makes an angle θ with x-axis intersect the axis of parabola $y^2 = 8ax$ at a distance of 8a from the focus and which is not parallel to either of the axis, then θ is equal to [4]

① $\pi/6$ ② $\pi/4$ ③ $\pi/3$ ④ None of these

63. Consider the horizontal ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. . From any point P on the ellipse a line Parallel to y-axis is drawn to intersect the auxiliary circle at Q. Find the locus f point R such that PR : RQ = r : s. [P and Q lie on the same side of x-axis]. [4]

① $\frac{(r+s)^2}{(ra+sb)^2}x^2+\frac{y^2}{b^2}=1$ ② $\frac{x^2}{a^2}+\frac{(r+s)^2}{(ra+sb)^2}y^2=1$ ③ $x^2+y^2=(a+5b)^2$ ④ None of these

64. Let z_1 and z_2 be any two complex numbers and a, b, $\in$ R, then $|az_1+bz_2|^2+|bz_1-az_2|^2=$ [4]

① $\left(a^2+b^2\right)\left(|z_1|^2+|z_2|^2\right)$ ② $\left(a^2-b^2\right)\left(|z_1|^2-|z_2|^2\right)$

③ a^2+b^2 ④ None of these

65. For the given triangle ABC, $\frac{b+c}{11}=\frac{c+a}{12}=\frac{a+b}{13}$ then [4]

① $\cos A : \cos B : \cos C : = 19 : 17 : 25$ ② $\cos A + \cos B + \cos C : = \frac{35}{51}$

③ $\cos A : \cos B : \cos C : = 7 : 19 : 25$ ④ None of these

66. The locus of midpoint of chord of contact drawn from any point on the hyperbola $4x^2 - 9y^2 = 36$ to the circle $x^2 + y^2 = 9$ is [4]

① $9x^2+\frac{81y^2}{4}=(x^2+y^2)^2$ ② $9x^2-\frac{81y^2}{4}=(x^2+y^2)^2$

③ $9x^2 - 81y^2 = (x^2 + y^2)^2$ ④ None of these

67. Out of 100 cards numbered from 00 to 99, a card is chosen randomly. An event is said to have occurred, if product of digits of the card number is 18. If card is selected 8 times with replacement each time, then the probability that the event occurs exactly three times is [4]

① ${}^8C_2(0.04)^2(0.96)^5$ ② ${}^8C_3(0.04)^5(0.96)^3$ ③ ${}^8C_3(0.03)^2(0.97)^5$ ④ $56(0.04)^3(0.96)^5$

68. The number of value of 'b' for which the following system of linear equations $x + y + z = 1$, $x + ay + z = 1$, $ax + by + z = 0$ has no solution, is [4]

① 1 ② 2 ③ 0 ④ Infinite

69. For the function $f(x)=\frac{x}{2}-1$, $x \in [0, \pi]$ which of the following is correct. ([x] denotes G.I.F.) [4]

① $\tan [f(x)]$ $\tan[f(x)]$ and $1/f(x)$ are both continuous

② $\tan[f(x)]$ and $1/f(x)$ are both discontinuous

③ $\tan[f(x)]$ and $f^{-1}(x)$ are both continuous

④ $\tan[f(x)]$ is continuous but $1/f(x)$ is discontinuous

70. Let R be the real line. Consider the following subsets of the plane $R \times R$: [4]

$A = \{(x, y) : y = x + 2 \text{ and } 0 < x < 3\}$

$B = \{(x, y) : x - y \text{ is an integer}\}$.

Which one of the following is true ?

① B is an equivalence relation on R but A is not

② neither A nor B is an equivalence relation on R

③ both A and B are equivalence relations on R

④ A is an equivalence relation on R but B is not

SECTION-B

71. Find the natural number 'a' for which $\sum_{k=1}^{n} f(a+k)=32(2^n-1)$, [4]

where the function 'f' satisfies the relation $f(x + y) = f(x) f(y)$ for all natural numbers x, y and further $f(1) = 2$.

72.	The perpendicular tangents are drawn from a point to the ellipse $x^2 + 3y^2 = 6$. The chord of contact touches a circle concentric with the given ellipse. The sum of the maximum and minimum areas of the circles is πk. Find k.	[4]
73.	If ${}^1P_1 + 2.\ {}^2P_2 + 3.\ {}^3P_3 + ... + 15.\ {}^{15}P_{15} + 16\ {}^{16}P_{16} = {}^qP_{r-s}$, where $0 \le s \le 1$, then for $q \ne r$ the value of ${}^{q+s}C_{r-s}$ is _____ .	[4]
74.	The box of nine times of volume enclosed by the planes $\lvert 4x-5\rvert + \lvert 3y-4\rvert + \lvert z+5\rvert = 4$ is _____ .	[4]
75.	The number of values of x such that $\sin^{-1} 2x + \cos^{-1} x = \frac{\pi}{3}$ is _____ .	[4]