TECHNO INDIA GROUP PUBLIC SCHOOLS

Dt. 29-08-2025

JEE (Main)-XII

Monthly Mock Test - 2 (29-08-2025)

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, 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.

Space For Rough Works

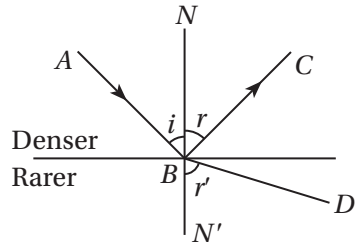
PHYSICS

SECTION A

Section A consists of 20 questions of 4 marks each.

MCQ (One correct Answer)

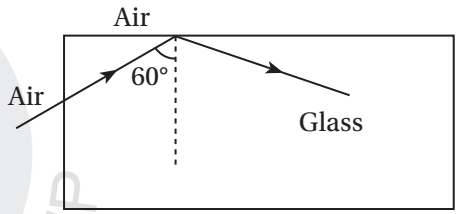
1. A ray of light from a denser medium is incident on a rare medium as shown in figure. The reflected and refracted rays make an angle of 90° with each other. The angles of reflection and refraction are r and r'. Then the, critical angle would be



① $\sin^{-1}(\tan r)$ ② $\sin^{-1}(\cot r)$

③ $\cos^{-1}(\tan r)$ ④ $\tan^{-1}(\sin r)$

2. A light ray going from air is incident (as shown in figure) at one end of a glass fibre (refractive index $\mu = 1.5$) making an incidence angle of 60° on the lateral surface, so that it undergoes a total internal reflection. How much time would it take to traverse the straight fibre of length 1 km?



① 3.3 μs ② 6.6 μs

③ 5.7 μs ④ 3.85 μs

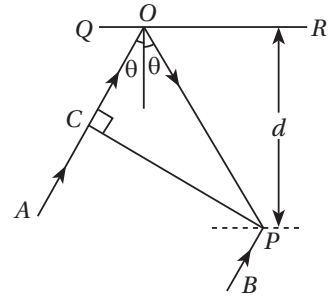
3. Let a light enters at an angle of incidence i in a transparent rod of refractive index n. What should be the value of the refractive index of the material of the rod so that the light once entered into it will not leave it through its lateral face whatsoever be the value of angle of incidence :

① $n > \sqrt{2}$ ② 1.0 ③ 1.3 ④ 1.4

4. The angle of a prism is 30°. One of its refracting surfaces is silvered. Light rays incidention the surface at an angle of incidence 60° on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index μ, of the prism will be

① $\sqrt{5}$ ② $\sqrt{3}$ ③ 1.7 ④ 1.9

5. In the adjacent diagram, CP represents a wavefront and AO & BP, the corresponding two rays. Find the condition on θ so that constructive interference at P between the ray BP and reflected ray OP



① $\cos\theta = \frac{3\lambda}{2d}$ ② $\cos\theta = \frac{\lambda}{4d}$

③ $\sec\theta - \cos\theta = \frac{\lambda}{d}$ ④ $\sec\theta - \cos\theta = \frac{4\lambda}{d}$

6. In the Young's double slit experiment, if the phase difference between the two waves interfering at a point is ϕ, the intensity at that point can be expressed by the expression

① $I = \sqrt{A^2 + B^2\cos^2\phi}$ ② $I = \frac{A}{B}\cos\phi$ ③ $I = A + B\cos\frac{\phi}{2}$ ④ $I = A + B\cos\phi$

Where A and B depend the amplitudes of the two waves.

7. A beam of light travelling in water falls on a glass plate immersed in water when the incidence angle is 51°, then the refracted beam of light is found polarised. Calculate μ of glass. Given μ of water is 4/3.

① 1.672 ② 1.647 ③ 1.561 ④ None of these

8. In the YDSE, the intensity of the light at a point on the screen (where the path difference is λ) is *K*, (λ being the wavelength of light used). The intensity at a point where the path difference is λ/4, is

① *SK* ② *K*/5 ③ *K*/2 ④ Zero

9. In Young's double slit interference experiment, using two coherent waves of different amplitudes, the intensities ratio between bright and dark fringes is 3. Then, the value of the ratio of the amplitudes of the wave that arrive there is :

① $\left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)$ ② $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$ ③ $\sqrt{3}:1$ ④ $1:\sqrt{3}$

10. In a Fraunhofer diffraction at a single slit of width d with incident light of wavelength 5500 A, the first minima is observed, at an angle 30°. The first secondary maxima is observed at an angle θ equals :

① $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$ ② $\sin^{-1}\left(\frac{1}{4}\right)$ ③ $\sin^{-1}\left(\frac{3}{4}\right)$ ④ $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

11. Single slit of width *d* is illuminated by violet light of wavelength 400 nm and the width of the diffraction pattern is measured as *y*. When half of the slit width is covered and illuminated by yellow light of wavelength 600 nm. Find the width of diffraction pattern :

① The pattern vanishes and the width is zero ② $\frac{y}{3}$

③ 3*y* ④ None of the above

12. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between the first dark fringes on either side of the central bright fringe is :

① 1.2 cm ② 1.2 mm ③ 2.4 cm ④ 2.4 mm

13. Two light rays having equal wavelength λ in vacuum are in phase initially. Then, the first ray travels a path L_1 through a medium of refractive index n_1 while the second ray travels a path of length L_2 through a medium of refractive index n_2. The two waves are then combined to produce interference. What will be the phase difference between two waves?

① $\frac{2\pi}{\lambda}(L_2-L_1)$ ② $\frac{2\pi}{\lambda}(n_1L_1-n_2L_2)$ ③ $\frac{3\pi}{\lambda}(n_2L_1-n_1L_2)$ ④ $\frac{2\pi}{\lambda}\left(\frac{L_1}{n_1}-\frac{L_2}{n_2}\right)$

14. Select the condition under which a convex mirror of focal length *f* produce an image that is erect, diminished and virtual

① Only when $2f > u > f$ ② Only when $u = f$ ③ Only when $u < f$ ④ Always

15. A ray of light is incident at an angle of incidence on one face of a prism of angle *A* (assumed to be small) and emerges normally from the opposite face. If the refractive index of the prism is μ, the angle of incidence *i*, is nearly equal to :

① μA ② $\frac{\mu A}{2}$ ③ $\frac{A}{\mu}$ ④ $\frac{A}{2\mu}$

16. An image of a candle on a screen is found to be twice its size. When the candle is shifted by a distance 5 cm then the image becomes triple its size. Then the nature and radius of curvature of the mirror will be

① Concave, 60 cm ② Convex, 60 cm ③ Concave, 40 cm ④ Convex, 40 cm

17. A thin plano-convex lens acts like a concave mirror of focal length 0.2 m, when silvered from its plane surface. The refractive index of the material of the lens is 1.5. The radius of curvature of the convex surface of the lens is

① 0.5 m ② 0.75 m ③ 0.72 m ④ 0.2 m

18. A prism having refractive index 1.414 and refracting angle 30° has one of the refracting surfaces silvered. A beam of light incident on the other refracting surface will retrace its path, if the angle of incidence is :

① 0° ② 30° ③ 60° ④ 45°

19. A beam of parallel rays is incident on a transparent slab of refractive index $\sqrt{3}$ making an angle 30° with the surface of the slab. If the width of incident beam of light is 1.732 mm, the width of refracted beam is

① 1.00 mm ② 1.50 mm ③ 2.50 mm ④ 3.00 mm

20. Let f_v and f_R be the focal lengths of a convex lens for violet and red light respectively and let F_v and F_R be the focal lengths of a concave lens for violet and red light respectively, then we must have

① $f_v > f_R$ and $F_v > F_R$ ② $f_v < f_R$ and $F_v > F_R$ ③ $f_v > f_R$ and $F_v < F_R$ ④ $f_v < f_R$ and $F_v < F_R$

SECTION B

Section B consists of 5 questions of 4 marks each.

Integer Type Question

21. A luminious object is placed 20 cm from surface of a convex mirror and a plane mirror is set so that virtual images formed in two mirror coincide. If plane mirror is at a distance of 12 cm from object, then focal length of convex mirror is _____ cm.

22. A bubble inside a glass slab ($\mu = 1.5$) when viewed from one side appears at 5 cm and at 2 cm when viewed from other side, then thickness of the slab is _____ cm (nearest integer).

23. Calculate the limit of resolution of microscope with cone angle of light falling on the objective equal to 60°. (Given $\lambda = 5000$ A, μ for air = 1) : _____ $\times 10^{-7}$ m.

24. A double convex lens made of glass (refractive index $n = 1.5$) has both radii of curvature of magnitude 0.2 m incident light rays parallel to the axis of the lens will converge at a distance L such that, L is _____ cm.

25. A large glass slab ($\mu = 5/3$) of thickness 8 cm is placed over a point source of light on a plane surface. It is seen that light emerges out of the top surface of the slab from a circular area of radius R cm. What is value of R (in cm)? _____.

CHEMISTRY

SECTION A

Section A consists of 20 questions of 4 marks each.

26. The values of the crystal field stabilisation energies for a high spin d^6 metal ion in octahedral and tetrahedral fields respectively, are.

① $-0.4\,\Delta_0$ and $-0.27\,\Delta_t$ ② $-1.6\,\Delta_0$ and $-0.4\,\Delta_t$ ③ $-2.4\,\Delta_0$ and $-0.6\,\Delta_t$ ④ $-0.4\,\Delta_0$ and $-0.6\,\Delta_t$

27. Which one of the following complexes is violet in colour ?

① $[Fe(CN)_6]^{4-}$ ② $[Fe(SCN)_6]^{4-}$ ③ $Fe_4[Fe(CN)_6]_3 . H_2O$ ④ $[Fe(CN)_5NOS]^{4-}$

Assertion and Reason : (Q. 28 - 33)

Directions: Read the following questions and choose any one of the following four responses.

a. Assertion and Reason both are correct and Reason is the correct explanation of Assertion.
b. Assertion and Reason both are correct and Reason is not the correct explanation of Assertion.
c. Assertion is correct but Reason is wrong.
d. Assertion is wrong but Reason is correct.

28. **Assertion (A) :** The total number of geometrical isomers shown by $[Co(en)_2 Cl_2]^+$ complex is three.

Reason (R) : $[Co(en)_2 Cl_2]^+$ Complex ion has an octahedral geometry.

① a ② b ③ c ④ d

29. **Assertion (A) :** $[Fe(H_2O)_5 NO] SO_4$ is paramagnetic

Reason (R) : The Fe in $[Fe(H_2O)_5 NO]SO_4$ has three unpaired electrons.

① a ② b ③ c ④ d

30. **Assertion (A) :** The geometrical isomers of the complex $[M(NH_3)_4 Cl_2]$ are optically inactive.

Reason (R) : Both geometrical isomers of the complex $[M(NH_3)_4 Cl_2]$ posses axis of symmetry.

① a ② b ③ c ④ d

31. **Assertion (A) :** Oxidation state of Cr in K_3CrO_8 is + 6.

Reason (R) : It contains tetraperoxo species i.e. $[Cr(O_2)_4]^{3-}$

① a ② b ③ c ④ d

32. **Assertion (A) :** The molar conductivity of strong electrolyte decreases with increase in concentration.

Reason (R) : At high concentration migration of ion is slow.

① a ② b ③ c ④ d

33. **Assertion (A) :** For a first order reactions rate of the reaction doubles as concentration of reactant gets doubled.

Reason (R) : Rate is directly propotional to concentration of reactant.

① a ② b ③ c ④ d

34. The number of geometrical isomers that can exist for square planar $[Pt (Cl) (Py) (NH_3) (NH_2OH)]^+$ is (Py = pyridine)

① 2 ② 3 ③ 4 ④ 6

35. The element which shows only one oxidation state other than its elemental form is :

① Cobalt ② Nickel ③ Scandium ④ Titanium

36. The correct statement(s) about Cr^{2+} and Mn^{3+} is (are). [Atomic numbers of Cr = 24, & Mn = 25]

(A) Cr^{2+} is a reducing agent

(A) Mn^{3+} is an oxidising agent

③ both Cr^{2+} & Mn^{3+} exhibit d^4 electronic configuration.

④ When Cr^{2+} is used as a reducing agent, the chromium ion attains d^5 electronic configuration.

① A, B ② A, B, D ③ A, B, C ④ A, B, C, D

37. Which of the following acts as a strong reducing agent ?
[Atomic number : Ce = 58, Eu = 63, Gd = 64, Lu = 71]

① Eu^{2+} ② Lu^{3+} ③ Gd^{3+} ④ Ce^{4+}

38. Mischmetal is an alloy consisting mainly of :

① lanthanide metals ② actinoid and transition metals

③ lanthanoid and actinoid ④ actinoid matals

39. Identify the ion having $4f^6$ electronic configuration.

① Gd^{3+} ② Sm^{3+} ③ Sm^{2+} ④ Tb^{3+}

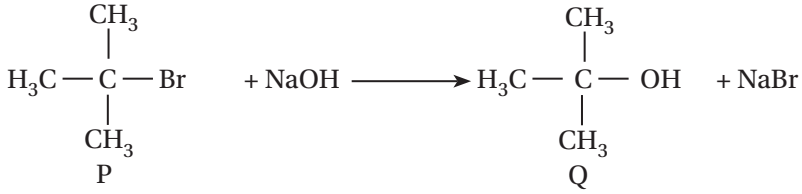
40. Nd^{2+} =

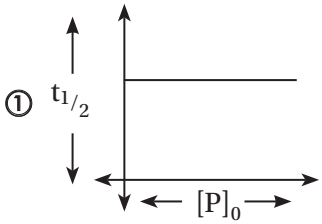
① $4f^3$ ② $4f^4\,6s^2$ ③ $4f^2\,6s^2$ ④ $4f^4$

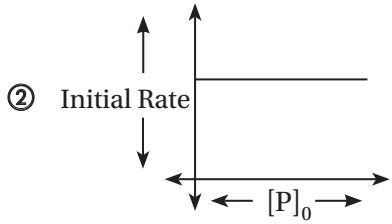
41. For a reaction $A \xrightarrow{K_1} B \xrightarrow{K_2} C$, If the rate of formation of B is set to be zero then the concentration of 'B' is given by :

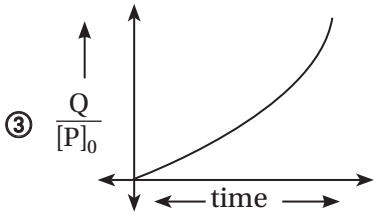
① $(K_1 + K_2)\,[A]$ ② $(K_1 / K_2)\,[A]$ ③ $(K_1 - K_2)\,[A]$ ④ $(K \cdot K_2)\,[A]$.

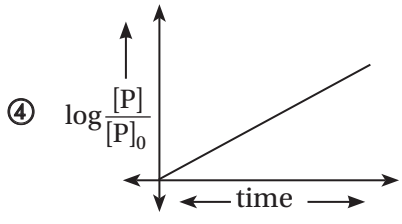
42. Which of the following plots is correct for the given reaction?
($[P]_0$ is the initial concentration of 'P')



① 

② 

③ 

④ 

43. The rate of a reaction quadruples when the temperature changes from 300 k to 310 k. The activation energy of this reaction is : (Assume activation energy and pre-exponential factor are independent of temperature :

$\log_e 2 = 0.693$; $R = 8.314$ J $(mole)^{-1}$ $(K)^{-1}$

① 53.6 KJ $(mole)^{-1}$ ② 26.8 KJ $(mole)^{-1}$ ③ 107.2 KJ $(mole)^{-1}$ ④ 214.4 KJ $(mole)^{-1}$

44. To find the standard potential of M^{3+}/M electrode, the following cell is considered :

$Pt\,|\,M\,/\,M^{3+}\,(0.001\ mole(L)^{-1})\,||\,Ag^{+}\,(0.01\ mole(L)^{-1})/Ag$. The emf of the cell is formed to be 0.421 volt at 298 k. The standard potential of half reaction $M^{3+} + 3e^{-} \longrightarrow M$ at 298 k will be :

(Given : E° Ag+/Ag at 298 k = 0.80 volt.)

① 0.32 v ② 0.66 v ③ 0.38 v ④ 1.28 v

45. The vapour pressure of A and B at 25°C are 90 mm Hg and 15 mm Hg respectively. If A and B are mixed such that the mole fraction of 'A' in the mixture is 0.6, then the mole fraction of 'B' in the vapour phase is :

① 2×10^{-1} ② 3×10^{-1} ③ 4×10^{-1} ④ 1×10^{-1}

SECTION B

Section B consists of 5 questions of 4 marks each.

46. At 20° C, the vapour pressure of benzene is 70 torr and that of methyl benzene is 20 torr. The mole fraction of benzene in the vapour phase at 20° C above an equimolar mixture of benzene and methyl benzene is : _____ .
(nearest integer)

47. The specific conductance of 0.0025 M acetic acid is 5×10^{-5}, S cm^{-1} at a certain temperature. The dissociation constant of acetic acid is _____ $\times 10^{-7}$. (Nearest integer). Consider limiting molar conductivity of CH_3COOH as 400 S $cm^2(mol)^{-1}$.

48. The resistivity of 0.8 & M solution of an electrolyte is $5 \times 10^{-3}\ \Omega$ cm. It's molar conductivity is _____ $\times 10^4\ \Omega^{-1}$ $Cm^2(mol)^{-1}$. (nearest integer)

49. The number of f electron in the ground state electronic configuration of Np (Z = 93) is _____ .

50. The vapour pressure of 30% ($^{W}/_{v}$) aqueous solution of glucose is _____ mm Hg at 25°C.
[Given : The density of 30% ($^{W}/_{v}$) aqueous solution of glucose is 1.2 g/cc & vapour pressure of pure water is 24 mm. Hg] (Molar mass of glucose is 180 $g(mole)^{-1}$]

MATHEMATICS

SECTION A

Section A consists of 20 questions of 4 marks each.

Multiple Questions:

51. $\int_0^{\pi/2} \frac{\sin x}{1+\cos x+\sin x}\,dx =$

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

52. $\int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}dx =$

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

53. $\lim_{n\to\infty}\left[\frac{n+1}{n^2+1^2}+\frac{n+2}{n^2+2^2}+\frac{n+3}{n^2+3^2}+.....+\frac{n+2n}{n^2+4n^2}\right]=$

① $\tan^{-1}2+\frac{1}{2}\log 3$ ② $\frac{\pi}{4}+\frac{1}{2}\log 3$ ③ $\tan^{-1}2+\frac{1}{2}\log 5$ ④ $\frac{\pi}{4}+\frac{1}{2}\log 5$

54. $\int_{\frac{\pi}{4}}^{\pi/3} \frac{\cos x-\sin x}{\sin 2x}dx =$

① $\frac{1}{2}\log\left(\frac{(3+2\sqrt{2})(2-\sqrt{3})}{\sqrt{3}}\right)$ ② $\frac{1}{2}\log\left(\frac{(3-2\sqrt{2})(2+\sqrt{3})}{\sqrt{3}}\right)$

③ $\log\left(\frac{(3-2\sqrt{2})(2-\sqrt{3})}{\sqrt{3}}\right)$ ④ $\log\left(\frac{(3+2\sqrt{2})(2-\sqrt{3})}{\sqrt{3}}\right)$

55. If $\int\frac{dx}{\sin^3 x+\cos^3 x}=A\log\left|\frac{\sqrt{2}+t}{\sqrt{2}-t}\right|+B\tan^{-1}(t)+C$, then $\left(\frac{B}{A},t\right)=?$

① $(3\sqrt{2},\sin x-\cos x)$ ② $(2\sqrt{2},\sin x-\cos x)$

③ $\left(\frac{\sqrt{2}}{3},\sin x-\cos x\right)$ ④ $\left(\frac{3}{\sqrt{2}},\sin x+\cos x\right)$

56. $\int\frac{\sin 2x}{\sin^2 x+3\cos x-3}dx =$

① $2\log\left|\frac{\cos x-2}{\cos x-1}\right|+C$ ② $\log\left(\frac{(\cos x-2)^2}{(\cos x-1)^4}\right)+C$

③ $\log\left(\frac{(\cos x-2)^2}{|\cos x-1|}\right)+C$ ④ $\log\left(\frac{(\cos x-2)^4}{(\cos x-1)^2}\right)+C$

57. $\int(\log x)^3.x^4dx =$

① $x^5\left[\frac{1}{5}(\log x)^3-\frac{3}{25}(\log x)^2+\frac{6}{125}\log x-\frac{6}{625}\right]+C$ ② $x^5\left[\frac{1}{5}(\log x)^3-\frac{2}{25}(\log x)^2+\frac{6}{125}\log x-\frac{12}{125}\right]+C$

③ $x^5\left[\frac{1}{5}(\log x)^3-\frac{4}{25}(\log x)^2-\frac{9}{125}\log x-\frac{8}{125}\right]+C$ ④ $x^5\left[\frac{1}{5}(\log x)^3+\frac{3}{25}(\log x)^2-\frac{6}{125}\log x-\frac{6}{125}\right]+C$

58. If $\int\left(3t^2\sin\frac{1}{t}-t\cos\frac{1}{t}\right)dt = f(t)\sin\left(\frac{1}{t}\right)+C$ then $f(2) =$

① 2 ② –12 ③ 8 ④ –16

59. $\int\frac{e^{\sin x}(\sin 2x-8\cos x)}{2(\sin x-3)^2}dx =$

① $e^{\sin x}(\sin x-3)+C$ ② $\frac{e^{\sin x}}{(\sin x-3)^2}+C$ ③ $e^{\sin x}(\sin x-3)^2+C$ ④ $\frac{e^{\sin x}}{\sin x-3}+C$

60. If the function y = g(x) representing the slopes of the tangents drawn to the curve $y = 3x^4 - 5x^3 - 12x^2 + 18x + 3$ is strictly increasing then the domain of g(x) is

① $\left[-\frac{1}{2},\frac{4}{3}\right]$ ② $\left(-\frac{1}{2},\frac{4}{3}\right)$ ③ $R-\left(-\frac{1}{2},\frac{3}{4}\right)$ ④ $R-\left[-\frac{1}{2},\frac{4}{3}\right]$

61. The derivative of $\sec^{-1}\left(\frac{1}{2x^2-1}\right)$ with respect to $\sqrt{1-x^2}$ at $x=\frac{1}{2}$ is

① –2 ② 1 ③ 2 ④ 4

62. If $5f(x)+3f\left(\frac{1}{x}\right)=x+2$ and $y = xf(x)$, then $\frac{dy}{dx}$ at $x = 1$ is equal to

① 14 ② $\frac{7}{8}$ ③ 1 ④ 7

63. If a real valued function $f(x)=\begin{cases}\frac{x^2+(a+3)x+(a+1)}{x+3} & ; \ x\neq -3\\ -\frac{5}{2} & ; \ x=-3\end{cases}$

is continuous at x = –3, then $\lim\limits_{x\to a}(x^2+x+1) =$

① $\frac{7}{4}$ ② $\frac{5}{2}$ ③ $\frac{4}{7}$ ④ $\frac{2}{5}$

64. If $f(x) = [x^2]$ where $x \in [-2, 2]$ then the number of points of discontinuity is

① 0 ② 4 ③ 8 ④ 16

65. $\tan^{-1}\frac{\sqrt{8-2\sqrt{15}}}{\sqrt{15}+1}+\tan^{-1}\frac{1}{\sqrt{5}} =$

① $\frac{\pi}{6}$ ② $\frac{\pi}{4}$ ③ $\frac{\pi}{3}$ ④ $\frac{\pi}{2}$

66. The domain and range of a real valued function f(x) = cos x – 3 are respectively

① R\{0} and [–1, 1] ② R and [–1, 1] ③ R\{0} and [–4, –2] ④ R and [–4, –2]

67. If $f : R \to R$ and $g : R \to R$ are two functions defined by $f(x) = 2x - 3$ and $g(x) = 5x^2 - 2$, then the least value of the function (gof) (x) is

① –2 ② 2 ③ –4 ④ 4

68. If A and B are both 3×3 matrices, then which of the following statements are true?

(i) $AB = 0 \Rightarrow A = 0$ or $B = 0$

(ii) $AB = I_3 \Rightarrow A^{-1} = B$

(iii) $(A - B)^2 = A^2 - 2AB + B^2$

① (i) is false and (ii), (iii) are true ② (ii) is true and (i), (iii) are false

③ (i) and (ii) are true, (iii) is false ④ All are true

69. If $A = \begin{bmatrix} 1 & -1 & 2 \\ -2 & 3 & -3 \\ 4 & -4 & 5 \end{bmatrix}$ is the given matrix and A^T represents the transpose of A, then $AA^T - A - A^T =$

① $\begin{bmatrix} 4 & 8 & 12 \\ 8 & 16 & -28 \\ 12 & -28 & 47 \end{bmatrix}$ ② $\begin{bmatrix} 4 & -8 & 12 \\ -8 & 16 & -28 \\ 12 & -28 & 47 \end{bmatrix}$ ③ $\begin{bmatrix} 4 & -8 & 12 \\ -8 & 16 & 28 \\ 12 & 28 & 47 \end{bmatrix}$ ④ $\begin{bmatrix} 4 & -8 & -12 \\ -8 & 16 & -28 \\ -12 & -28 & 47 \end{bmatrix}$

70. Let A and B are square matrices of order 3 such that $A + B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$. If a is a symmetric matrix, then the value of $|B|$ is

① 0 ② 1 ③ 3 ④ 27

SECTION B

Section B consists of 5 questions of 4 marks each.

Numerical Answer Type:

71. Find $\sum_{t=1}^{39} f(t)$; if $f : R \to R$ is defined as $f(x + y) = f(x) + f(y)$, $x, y \in R$ and $f(1) = 7$

72. If $\begin{bmatrix} 1 & -1 & x \\ 1 & x & 1 \\ x & -1 & 1 \end{bmatrix}$ has no inverse, then the real value of x is—

73. Find the positive value of a for which the equality $2\alpha + \beta = 8$ holds, where 'α' and 'β' are the points of maximum and minimum respectively, of the function $f(x) = 2x^3 - 9ax^2 + 12a^2x + 1$.

74. $\int_{-\frac{1}{2}}^{\frac{1}{2}} \left\{[x] + \log\left(\frac{1+x}{1-x}\right)\right\} dx = -m$. Find the value of 2m_____

75. If x is complex, the expression $\frac{x^2 + 34x - 71}{x^2 + 2x - 7}$ takes all values which lie in the interval (a, b), then the value of a + b is _____.