KEAM 2025 April 25 Question Paper

Time Allowed :3 Hours	**Maximum Marks : 600**	**Total Questions :**150

General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question paper comprises 150 questions.
2. The Paper is divided into three parts- Maths, Physics and Chemistry.
3. There are 45 questions in Physics, 30 questions in Chemistry and 75 questions in Mathematics.
4. For each correct response, candidates are awarded 4 marks, and for each incorrect response, 1 mark is deducted.

1. Evaluate the following limit:

$$\lim_{x \to 0} \frac{1 + \cos(4x)}{\tan(x)}$$

(A) 2

(B) 1

(C) 0

(D) 4

---

2. If $f(x) = \frac{1}{x^2}$, $u = f(x)$, and $f'(x)$, then find $\frac{du}{dx}$.

(A) $-\frac{2}{x^3}$

(B) $\frac{2}{x^3}$

(C) $-\frac{1}{x^3}$

(D) $\frac{1}{x^3}$

---

3. Given $y = \sec(\tan^{-1}(x))$, find $\frac{dy}{dx}$ at $x = \sqrt{3}$.

(A) 1

(B) 2

(C) $\sqrt{3}$

(D) 0

---

4. Equation of parabola having focii (-3, 1) and (3, 1)

(A) $y^2 = 4x$

(B) $x^2 = 4y$

(C) $x^2 = 4y - 1$

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

---

5. Solve the following differential equation and integrate:

$$\frac{dy}{dx} + \frac{2x}{1 + x^2} \cdot y = x$$

(A) $y = \frac{x}{1+x^2}$

(B) $y = \frac{x^2}{1+x^2}$

(C) $y = x$

(D) $y = \ln(1 + x^2)$

---

6. Find the value of

$$\sin 60^\circ - \sin 80^\circ + \sin 100^\circ - \sin 120^\circ$$

(A) 0

(B) -1

(C) 1

(D) 2

---

7. Solve for α if:

$$\cos^{-1}(2\sin\alpha) = \frac{47}{12}$$

(A) $\alpha = \sin^{-1}\left(\frac{47}{12}\right)$

(B) $\alpha = \cos^{-1}\left(\frac{47}{12}\right)$

(C) $\alpha = \sin^{-1}\left(\frac{2}{12}\right)$

(D) None of these

---

8. If $\tan\left(\alpha - \frac{\pi}{12}\right) = \frac{1}{\sqrt{3}}$, find α.

(A) $\alpha = \frac{\pi}{6}$

(B) $\alpha = \frac{\pi}{4}$

(C) $\alpha = \frac{\pi}{3}$

(D) $\alpha = \frac{\pi}{2}$

---

9. If $f(x) = \frac{\sqrt{x^4}}{\sqrt{x^2}}$, find $f'(27)$.

(A) 2×27

(B) 3×27^2

(C) 27

(D) 54

10. Find the domain of the function:

$$f(x) = \sqrt{7 - 11x}$$

(A) $x \leq \frac{7}{11}$

(B) $x \geq \frac{7}{11}$

(C) $x \in (-\infty, \infty)$

(D) $x \leq -\frac{7}{11}$

---

11. If a, ar, ar^2 are in a geometric progression (G.P.), then find the value of:

$$|a \quad ar| \quad \left|ar^2 \quad ar^3\right| = \left|ar^3 \quad ar^6\right|$$

(A) r^2

(B) r^4

(C) r^6

(D) r^3

---

12. If $a_n = 2^{n-1}$, where $n = 1, 2, 3, \ldots$, then find $\sum_{n=1}^{20} a_n$.

(A) $2^{20} - 1$

(B) $2^{21} - 1$

(C) $2^{19} - 1$

(D) 2^{20}

---

13. Find the limit:

$$\lim_{x \to 0^+} 2\lfloor x \rfloor - \frac{x}{|x|}$$

(A) -2

(B) 0

(C) 2

(D) Undefined

---

14. Given the set $S = \{a, b, c, d, e, f\}$, find the total number of subsets with an odd number of elements.

(A) 16

(B) 32

(C) 64

(D) $2^{6-1} = 32$

---

15. If $\sum_{k=0}^{n+1} C_k^n = 512$, find $\sum_{k=0}^{n} C_k^n$.

(A) 256

(B) 512

(C) 1024

(D) 1023

---

16. Find the limit:

$$\lim_{x \to 0^+} 2\lfloor x \rfloor - \frac{x}{|x|}$$

(A) -2

(B) 0

(C) 2

(D) Undefined

---

17. Given the set $S = \{a, b, c, d, e, f\}$, find the total number of subsets with an odd number of elements.

(A) 16

(B) 32

(C) 64

(D) $2^{6-1} = 32$

---

18. If $\sum_{k=0}^{n+1} C_k^n = 512$, find $\sum_{k=0}^{n} C_k^n$.

(A) 256

(B) 512

(C) 1024

(D) 1023

---

19. Find the limit:

$$\lim_{x \to 11} \frac{x - 11}{\sqrt{49 + x^2} - 13}$$

(A) 0

(B) 1

(C) 2

(D) Undefined

---

20. Find the area of the triangle formed by the lines:

$$y = -4, \quad y = x, \quad y = -4$$

(A) 16

(B) 12

(C) 8

(D) 10

---

21. Evaluate the integral:

$$\int_{-1}^{1} |x - 3| \, dx$$

(A) 0

(B) 3

(C) 4

(D) 6

---

22. Evaluate the integral:

$$\int_{0}^{\pi} \frac{\tan x}{\cos x} \, dx = \int_{0}^{\pi} \frac{\sin x}{\cos^2 x} \, dx$$

(A) ∞

(B) 0

(C) 1

(D) Undefined

---

23. Solve the differential equation:

$$(1+y)\,dx = (1+x)\,dy$$

(A) $x = \frac{y^2}{2}$

(B) $x = \frac{y^2}{2} + C$

(C) $x = y^2 + C$

(D) $x = y^2$

---

24. Find the value of $(1+i)^{10}$.

(A) 2^5

(B) 32

(C) 2^{10}

(D) $2^5 i$

---

25. The ratio of the velocity of light in a vacuum to that in a medium is?

(A) $\sqrt{\epsilon\mu}$

(B) $\frac{1}{\sqrt{\epsilon\mu}}$

(C) $\frac{\epsilon\mu}{2}$

(D) $\sqrt{\mu\epsilon}$

---

26. The velocity of light through a medium of relative permittivity 2 and relative permeability 4.5 is (in terms of c):

(A) $\frac{c}{\sqrt{2 \cdot 4.5}}$

(B) $\frac{c}{\sqrt{2 \cdot 4}}$

(C) $\frac{c}{\sqrt{2 \cdot 5}}$

(D) $\frac{c}{\sqrt{4.5}}$

---

27. The velocity of light through a medium of relative permittivity 2 and relative permeability 4.5 is (in terms of c):

(A) $\frac{c}{\sqrt{2 \cdot 4.5}}$

(B) $\frac{c}{\sqrt{2 \cdot 4}}$

(C) $\frac{c}{\sqrt{2 \cdot 5}}$

(D) $\frac{c}{\sqrt{4.5}}$

---

28. The velocity of light through a medium of relative permittivity 2 and relative permeability 4.5 is (in terms of c):

(A) $\frac{c}{\sqrt{2 \cdot 4.5}}$

(B) $\frac{c}{\sqrt{2 \cdot 4}}$

(C) $\frac{c}{\sqrt{2 \cdot 5}}$

(D) $\frac{c}{\sqrt{4.5}}$

---

29. Which of the following is mismatched pair?

(A) Eddy current - Induction furnace

(B) Transformer - Laminated core

(C) Induced emf - Biot-Savart law

(D) Coaxial coil - Mutual induction

---

30. Which of the following statement is correct? - i) Positive temperature coefficient - ii) Charge carrier in semiconductor are ions and electrons

(A) Statement i is correct

(B) Statement ii is correct

(C) Both i and ii are correct

(D) Both i and ii are incorrect

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31. Moment of inertia of solid sphere having mass M and radius R about an axis

passing through diameter is I. Moment of inertia of sphere of mass 2M and radius 2R is:

(A) $2I$

(B) $4I$

(C) $8I$

(D) $16I$

---

32. Rectangular loop of side a and carrying current I is placed perpendicular to magnetic field. What will be the magnetic moment?

(A) Ia^2

(B) Ia^3

(C) Ia

(D) $Ia^2\hat{k}$

---

33. If the torque on electric dipole placed with 30° to electric field is τ, then what will be the torque if it is placed 45° with electric field?

(A) τ

(B) $\tau\sqrt{3}$

(C) $\tau \sin 45^\circ$

(D) $\tau \cos 45^\circ$

---

34. Product of P and V of an ideal gas related to translational part of internal energy E as

(A) $E = P \times V$

(B) $E = \frac{PV}{3}$

(C) $E = P \times V^2$

(D) $E = \frac{3}{2}PV$

---

35. Velocity of man swimming along the flow of river is 10 km/h and against the flow is 6 km/h. Velocity of man in still water is

(A) 8 km/h

(B) 7 km/h

(C) 5 km/h

(D) 9 km/h

---

36. Find object distance of concave mirror of $R = 24$ cm which gives magnification of 3.

(A) 16 cm

(B) 12 cm

(C) 8 cm

(D) 6 cm

---

37. 4 masses are placed at 4 corners of square ABCD. If one mass is removed from the corner B, then the centre of mass lies in the line joining

(A) AC

(B) AB

(C) AD

(D) BC

---

38. Mean free path is inversely proportional to (n = number density, d = diameter of particle)

(A) $\frac{1}{n^2}$

(B) $\frac{1}{\sqrt{n}}$

(C) $\frac{1}{d}$

(D) $\frac{1}{d^2}$

---

39. If $X = A \times B$, $A = \begin{bmatrix} 1 & 2 \\ -1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 6 \\ 5 & 7 \end{bmatrix}$, find $x_1 + x_2$.

(A) 12

(B) 15

(C) 10

(D) 8

---

40. If a box has 8 red balls, 12 white balls, 17 black balls. If two balls are taken one by one without replacement, then the probability of taking one red ball and one black ball is

(A) $\frac{136}{567}$

(B) $\frac{136}{561}$

(C) $\frac{80}{561}$

(D) $\frac{128}{561}$

---

41. If ABCD is a rectangle, $AB = 5i + 4j - 3k$ **and** $AD = 3i + 2j - k$**, then find** BD**.**

(A) $6i + 6j - 4k$

(B) $5i + 6j - 4k$

(C) $8i + 6j - 4k$

(D) $6i + 5j - 4k$

---

42. Evaluate the integral:

$$\int e^{-x} \cdot e^{3x}\, dx$$

(A) $\frac{e^{2x}}{2} + C$

(B) $e^{2x} + C$

(C) $\frac{e^{3x}}{3} + C$

(D) $e^{x} + C$

---

43. Given that

$$x = \frac{\sin^2\theta}{\tan\theta - \sec\theta}, \quad y = \frac{\sec\theta + \tan\theta}{\sec^2\theta}, \quad \text{find } \frac{y}{x}$$

(A) $\frac{\sec\theta+\tan\theta}{\sin^2\theta}$

(B) $\frac{\tan\theta+1}{\sin\theta}$

(C) $\frac{\tan\theta+\sec\theta}{\sin^2\theta}$

(D) $\frac{\sec\theta+\sin\theta}{\tan\theta}$

44. Evaluate the integral

$$I = \int \frac{\sin 4x}{\sin 2x}\, dx$$

(A) 2

(B) 4

(C) 1

(D) 0

---

45. Find the term independent of x in

$$\left(2x - \frac{5}{x^2}\right)^6$$

(A) 0

(B) 120

(C) 250

(D) 100

---

46. Given

$$Z_1 = \frac{1}{2} + \frac{\sqrt{3}}{2}i, \quad Z_2 = -\frac{1}{2} - \frac{\sqrt{3}}{2}i, \quad \text{and} \quad w = Z_1 + Z_2, \quad \text{find } w.$$

(A) $w = 0$

(B) $w = \sqrt{3}i$

(C) $w = 1$

(D) $w = \sqrt{2}$

---

47. Evaluate the expression

$$\frac{3\tan 15^\circ - \tan 3 \times 15^\circ}{1 - 3\tan^2 15^\circ}$$

(A) 1

(B) $\sqrt{3}$

(C) 0

(D) -1

---

48. Find the half-life of a first order reaction if $K = 2.31 \times 10^5\,\mathrm{s}^{-1}$.

(A) $2.99 \times 10^{-6}\,\mathrm{s}$

(B) $1.17 \times 10^{-5}\,\mathrm{s}$

(C) $3.00 \times 10^{-5}\,\mathrm{s}$

(D) $1.00 \times 10^{-6}\,\mathrm{s}$

---

49. Which complex has dsp^2 hybridisation? (A) $[Ni(CN)_4]^{2-}$

(B) BF_4^-

---

50. What is the hydration enthalpy of sucrose?

(A) $-100\,\mathrm{kJ/mol}$

(B) $-200\,\mathrm{kJ/mol}$

(C) $-300\,\mathrm{kJ/mol}$

(D) Cannot be determined

---

51. Find the log K value, if $\Delta G = -11.4$ and $2.303 \cdot RT = 5.7 \times 10^1$.

(A) 0.2

(B) 0.4

(C) 1.5

(D) 3.2

---

52. Formula of chromium ore?

(A) Cr_2O_3

(B) Cr_2O_4

(C) CrO_2

(D) Cr_3O_4

---

53. Bromomethane on reaction with Na and dry ether gives:

(A) n-propane

(B) n-butane

(C) isopropane

---

54. Which of the following are neutral?

(A) KF

(B) KBr

(C) NaCl

(D) $Na(NO_3)_2$

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55. What is the de Broglie wavelength of the particle having kinetic energy of $2E$?

(A) $\frac{h}{\sqrt{2mE}}$

(B) $\frac{h}{\sqrt{2m2E}}$

(C) $\frac{h}{2\sqrt{mE}}$

(D) $\frac{h}{\sqrt{mE}}$

---

56. Write the product of the reaction:

$$CH_3CH_2CH_2ONa + C_6H_5Br \rightarrow ?$$

(A) $CH_3CH_2CH_2OC_6H_5$

(B) $C_6H_5CH_3CH_2CH_2$

(C) $CH_3CH_2CH_2Br + C_6H_5O$

(D) $CH_3CH_2CH_2O$

---

57. What is incorrect for Bond order?

(A) Represents the number of bonds present between a compound/molecule

(B) Bond order decreases with bond energy

(C) Bond order increases with bond energy

(D) Bond order inversely proportional to bond length

---

58. Which has a higher boiling point, ethanol or propanol?

(A) Ethanol

(B) Propanol

---

59. Ethyl alcohol on reaction with H_2SO_4 at 413 K gives:

(A) Ethene

(B) Propane

(C) Acetylene

(D) Methane

---

60. If μ_s and μ_k are static and kinetic friction, then:

(A) $\mu_s > \mu_k$ maximum value of μ_s

(B) μ_s is opposing impending motion

(C) μ_s depends on area

(D) Both doesn't depend on area

---

61. The angular velocity of the minute hand and the second hand is?

(A) Same

(B) Minute hand has higher angular velocity

(C) Second hand has higher angular velocity

(D) None of the above

---

62. The wavelength of body radiation having maximum energy is λ_m at temperature T. If the wavelength of radiation corresponds to maximum energy is $\frac{\lambda}{3}$, then temperature is:

(A) $3T$

(B) $\frac{T}{3}$

(C) $9T$

(D) $\frac{T}{9}$

63. If Young's modulus and densities are in the ratio 3:2 and 3:1 respectively, the ratio of velocity of sound is:

(A) $3:1$

(B) $3:2$

(C) $1:3$

(D) $1:2$

---

64. If maximum height and range are equal in projectile motion, then $\tan\theta = \ldots$:

(A) 1

(B) 2

(C) 3

(D) $\frac{1}{2}$

---

65. Three identical resistors are connected as triangle ABC. Voltage across AB = 12V. Find the ratio of current through AB to ACB:

(A) $1:2$

(B) $1:1$

(C) $2:1$

(D) $3:1$

---

66. The transition of an atom from $n = \infty$ to $n = 3$ represents:

(A) Shortest wavelength of Paschen series

(B) Longest wavelength of Paschen series

(C) Shortest wavelength of Balmer series

(D) Longest wavelength of Balmer series

---

67. The ratio of the wavelength of two particles with energy E and $3E$ respectively, is:

(A) $1:\sqrt{3}$

(B) $\sqrt{3}:1$

(C) $1:3$

(D) $3:1$

---

68. The ratio of angular velocity of two satellites at a distance r and $2r$ from the centre of the earth is:

(A) $1:1$

(B) $1:2$

(C) $2:1$

(D) $4:1$

---

69. When a rectangular coil having length l and breadth b are placed perpendicular to the magnetic field. The torque experienced by the coil is:

(A) lbB

(B) $\frac{1}{2}lbB$

(C) lbB^2

(D) $lbB^2 \sin\theta$

---

70. If the kinetic energy decreases by 49%, what is the percentage change in speed?

(A) 5% decrease

(B) 10% decrease

(C) 7% decrease

(D) 14% decrease

---

71. The dimensional formula of product of moment of inertia and square of angular velocity is:

(A) $[ML^2T^{-2}]$

(B) $[ML^2T^{-4}]$

(C) $[ML^2T^{-3}]$

(D) $[ML^2T^{-1}]$

---

72. The ratio of distance of the sun from the earth to that of the moon from the earth is in the order:

(A) 10^6

(B) 10^3

(C) 10^4

(D) 10^5

---

73. If $\cos^{-1}(x) - \sin^{-1}(x) = \frac{\pi}{6}$**, then find** x.

(A) $\frac{1}{2}$

(B) $\frac{\sqrt{3}}{2}$

(C) $\frac{1}{\sqrt{2}}$

(D) $\frac{\sqrt{2}}{2}$

---

74. If $n(A) = 7$ **and the number of relations from A to B is 128. Then find** $n(B)$.

(A) 7

(B) 8

(C) 16

(D) 14

---

75. Evaluate the integral:

$$\int \frac{1}{x(x^4+1)}\,dx$$

(A) $\frac{1}{2}\log|x|$

(B) $\frac{1}{2}\log|x^4+1|$

(C) $\frac{1}{x^4+1}$

(D) $\frac{1}{2}\log|x^2+1|$

---

76. If $|\vec{a}| = 3, |\vec{b}| = 2,$ **then find** $(3\vec{a} - 2\vec{b}) \cdot (3\vec{a} + 2\vec{b})$.

(A) 27

(B) 0

(C) 15

(D) 25

---

77. Evaluate the integral:

$$\int \frac{\sec^2(\sqrt{2x+5})}{\sqrt{2x+5}}\,dx$$

(A) $\frac{1}{2}\log|2x+5|$

(B) $\frac{1}{\sqrt{2x+5}}$

(C) $\frac{1}{2}\sec^2(\sqrt{2x+5})$

(D) $\frac{1}{\sqrt{2x+5}} + C$

---

78. The value of $i^3 + i^4 + i^5 + \ldots + i^{93}$ is:

(A) 0

(B) 1

(C) -1

(D) 2

---

79. If $|\vec{a}| = 5$, $|\vec{b}| = 8$, $|\vec{a} - \vec{b}| = 7$, find the angle between $\vec{a}$ and $\vec{b}$.

(A) $60°$

(B) $45°$

(C) $30°$

(D) $90°$

---

80. Find the value of

$$\cot^{-1}(1) + \cot^{-1}(2) + \cot^{-1}(3)$$

(A) $\frac{\pi}{2}$

(B) π

(C) $\frac{\pi}{4}$

(D) 2π
