JEE Main – 07th April – 2025 (Shift-1)

[Memory Based Questions]

MATHEMATICS

1. The number of relations on the set $A = \{1,2,3\}$ containing atmost 6 elements including (1, 2) which are reflexive and transitive but not symmetric is _____

Ans: 12

2. The number of singular matrices of the order 2 whose elements are from the set $\{2,3,6,9\}$ is _____

Ans: 36

3. The remainder when $((64)^{(64)})^{(64)}$ is divided by 7 is equal to

a) 3 b) 4 c) 1 d) 6

Ans: (c)

4. The integral $\int_0^{\pi} \frac{(x+3)\sin x}{1+3\cos^2 x}\,dx$ is equal to

a) $\frac{\pi}{3\sqrt{3}}(\pi+6)$ b) $\frac{\pi}{2\sqrt{3}}(\pi+4)$ c) $\frac{\pi}{\sqrt{3}}(\pi+2)$ d) $\frac{\pi}{\sqrt{3}}(\pi+1)$

Ans: (a)

5. If the area of the region bounded by the curves $y = 4 - \frac{x^2}{4}$ and $y = \frac{x-4}{2}$ is equal to α the 6α equals

a) 240 b) 210 c) 250 d) 220

Ans: (c)

6. Let x_1, x_2, x_3, x_4 be in a geometric progression. If 2,7,9,5 are subtracted respectively from x_1, x_2, x_3, x_4, then the resulting numbers are in an arithmetic progression. Then the value of $\frac{1}{24}(x_1.x_2.x_3.x_4)$ is _____

a) 36 b) 72 c) 18 d) 216

Ans: (d)

7. From a group of 7 batsmen and 6 bowlers, 10 players are to be chosen for a team, which should include at least 4 batsmen and at least 4 bowlers. One batsmen and one bowler who are captain and vice captain respectively of the team should be included. Then the total number of ways such a selection can be made is _____.

a) 165 b) 145 c) 155 d) 135

Ans: (c)

8. $\text{Lim}_{x\to 0^+} \frac{\tan\left[5(x)^{\frac{1}{3}}\right] \log_e\left[1+3x^2\right]}{\left(\tan^{-1} 3\sqrt{x}\right)^2 \left[e^5(x)^{4/3}-1\right]}$ is equal to

a) $\frac{5}{3}$ b) 1 c) $\frac{1}{3}$ d) $\frac{1}{15}$

Ans: (c)

9. Let the set of all values of $p \in R$, for which both the roots of the equation $x^2 - (p+2)x + (2p+9) = 0$ are negative real numbers, be the interval $(\alpha, \beta]$, then $\beta - 2\alpha$ is equal to _____

a) 20 b) 0 c) 5 d) 9

Ans: (c)

10. Let A be 3×3 matrix such that $|\text{adj}(\text{adj}(\text{adj}A))| = 81$.

Let $S = \left\{n \in z: (|\text{adj}(\text{adj}A)|)^{\frac{(n-1)^2}{2}} = |A|^{(3n^2-5n-4)}\right\}$ then $\sum_{n\in S} \left|A^{(n^2+n)}\right|$ is equal to

a) 750 b) 820 c) 732 d) 866

Ans: (c)

11. Let 'P' be the parabola, whose focus is $(-2, 1)$ & directrix is $2x + y + 2 = 0$. Then the sum of the ordinates of the points on P, whose abscissa is –2 is _____

a) 5/2 b) 1/4 c) 3/4 d) 3/2

Ans: (d)

12. Let the angle θ, $0 < \theta < \pi/2$ between two unit vectors $\hat{a}$ and $\hat{b}$ be $\sin^{-1}\left[\frac{\sqrt{65}}{9}\right]$. If the vector $\vec{c} = 3\hat{a} + 6\hat{b} + 9(\hat{a} \times \hat{b})$, then the value of $9(\vec{c}.\hat{a}) - 3(\vec{c}.\hat{b})$ is _____

a) 24 b) 31 c) 29 d) 27

Ans: (c)

13. **Statement-I :** The set $\{z \in C - \{-i\}: |z| = 1$ and $\frac{z-i}{z+i}$ is purely real $\}$ contains exactly two elements and

Statement-II : The set $\{z \in C - \{-1\}: |z| = 1$ and $\frac{z-i}{z+i}$ is purely imaginary$\}$ contains if infinitely many elements. Then

a) only Statement – II is correct b) only Statement – I is correct

c) both are correct d) Both are incorrect

Ans: (a)

14. Let $x = -1 \,\&\, x = 2$ be the critical points of the function $f(x) = x^3 + ax^2 + b\log_e|x| + 1,\ x \neq 0$. Let m and M respectively be the absolute minimum and the absolute maximum values of f in the interval $\left[-2, -\frac{1}{2}\right]$. Then $|M + m|$ is equal to _____ $(\log_e 2 = 0.7)$

a) 20.9 b) 19.8 c) 22.1 d) 21.1

Ans: (d)

15. Let the line L pass through (1,1,1) and intersect the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z}{1}$. Then, which of the following points lies on the line L ?

a) (4,22,7) b) (5,4,3) c) $(10, -29, -50)$ d) (7,15,13)

Ans: (d)

16. The mean and standard deviation of 100 observations are 40 and 5.1 respectively. By mistake one observation is taken as 50 instead of 40. If the correct mean and the correct standard deviation are μ and σ respectively, then $10(\mu + \sigma)$ is equal to

a) 449 b) 451 c) 447 d) 445

Ans: (a)

17. Let C_1 be the circle in the 3rd quadrant of radius 3, that touches both coordinate axes. Let C_2 be the circle with center (1, 3) that touches C_1 externally at the point (α, β). If $(\beta - \alpha)^2 = \frac{m}{n}, \gcd(m, n) = 1$, then $m + n$ is equal to.

a) 31 b) 22 c) 13 d) 9

Ans: (b)

18. Let ABC be the triangle such that the equations of lines AB and AC be $3y - x = 2$ and $x + y = 2$ respectively and the points B and C lies on x-axis. If P is the orthocentre of $\triangle$ ABC, then the area of triangle PBC is equal to

a) 10 b) 8 c) 4 d) 6

Ans: (d)

19. If the shortest distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x}{1} = \frac{y}{2} = \frac{z-5}{1}$ is $\frac{5}{\sqrt{6}}$, then the sum of all possible values of 'α' is

a) 3/2 b) –3 c) 3 d) $-3/2$

Ans: (b)

20. Let the system of equations $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $12x + 3y - (4 + \lambda)z = 16 - \mu$, have infinitely many solutions. Then the radius of the circle centered at (λ, μ) and touching the line $4x = 3y$ is

a) 21/5 b) 17/5 c) 7/5 d) 7

Ans: (c)

21. If for $\theta \in \left[-\frac{\pi}{3}, 0\right]$, the points $(x, y) = \left[3\tan\left(\theta + \frac{\pi}{3}\right), 2\tan\left[\theta + \frac{\pi}{6}\right]\right]$ lie on the $xy + \alpha x + \beta y + \gamma = 0$, then $\alpha^2 + \beta^2 + \gamma^2$ is equal to

a) 75 b) 72 c) 80 d) 96

Ans: (a)