JEE-MAIN EXAM APRIL, 2025

Date: - 03-04-2025 (SHIFT-2)

MATHEMATICS

SECTION-A

1. The shortest distance between the curves $y^2=8x$ and $x^2+y^2+12y+35=0$ is:

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

2. Let f be a function such that $f(x)+3f\left(\frac{24}{x}\right)=4x, x\neq 0$. Then $f(3)+f(8)$ is equal to.

(1) 13 (2) 12 (3) 10 (4) 11

3. Let C be the circle of minimum area enclosing the ellipse $E: \frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ with eccentricity $\frac{1}{2}$ and foci $(\pm 2,0)$. Let PQR be a variable triangle, whose vertex P is on the circle C and the side QR of length 2a is parallel to the major axis of E and contains the point of intersection of E with the negative y-axis. Then the maximum area of the triangle PQR is :

(1) $6(3+\sqrt{2})$ (2) $6(2+\sqrt{3})$ (3) $8(3+\sqrt{2})$ (4) $8(2+\sqrt{3})$

4. If the probability that the random variable X takes the value x is given by $P(X=x)=k(x+1)3^{-x}, x=0,1,2,3\ldots$, where k is a constant, then $P(X\geq 3)$ is equal to

(1) $\frac{4}{9}$ (2) $\frac{1}{9}$ (3) $\frac{7}{27}$ (4) $\frac{8}{27}$

5. The integral $\int_0^{\pi}\frac{8xdx}{4\cos^2 x+\sin^2 x}$ is equal to

(1) π^2 (2) $2\pi^2$ (3) $\frac{3\pi^2}{2}$ (4) $4\pi^2$

6. Let $y=y(x)$ be the solution of the differential equation $\frac{dy}{dx}+3\left(\tan^2 x\right)y+3y=\sec^2 x, y(0)=\frac{1}{3}+e^3$. Then $y\left(\frac{\pi}{4}\right)$ is equal to

(1) $\frac{2}{3}$ (2) $\frac{4}{3}+e^3$ (3) $\frac{4}{3}$ (4) $\frac{2}{3}+e^3$

7. If the domain of the function $f(x)=\log_7\left(1-\log_4\left(x^2-9x+18\right)\right)$ is $(\alpha,\beta)\cup(\gamma,\delta)$, then $\alpha+\beta+\gamma+\delta$ is equal to

(1) 17 (2) 16 (3) 15 (4) 18

8. Line L_1 of slope 2 and line L_2 of slope $\frac{1}{2}$ intersect at the origin O. In the first quadrant, P_1, $P_2,\ldots,P_{12}$ are 12 points on line L_1 and $Q_1,Q_2,\ldots,Q_9$ are 9 points on line L_2. Then the total number of triangles, that can be formed having vertices at three of the 22 points $O,P_1,P_2,\ldots,P_{12}$, $Q_1,Q_2,\ldots,Q_9$, is:

(1) 1134 (2) 1188 (3) 1080 (4) 1026

9. Consider the lines $x(3\lambda+1)+y(7\lambda+2)=17\lambda+5,\lambda$ being a parameter, all passing through a point P. One of these lines (say L) is farthest from the origin. If the distance of L from the point $(3,6)$ is d, then the value of d^2 is

(1) 30 (2) 15 (3) 20 (4) 10

10. Let $f:\mathrm{R}\to\mathrm{R}$ be a function defined by $f(x)=\|x+2|-2|x\|\|$. If m is the number of points of local minima and n is the number of points of local maxima of f, then $m+n$ is

(1) 5 (2) 3 (3) 2 (4) 4

11. The distance of the point $(7,10,11)$ from the line $\frac{x-4}{1}=\frac{y-4}{0}=\frac{z-2}{3}$ along the line $\frac{x-9}{2}=\frac{y-13}{3}=\frac{z-17}{6}$ is

(1) 18 (2) 16 (3) 12 (4) 14

12. The area of the region $\{(x,y):|x-y|\le y\le 4\sqrt{x}\}$ is

(1) $\frac{512}{3}$ (2) $\frac{2048}{3}$ (3) $\frac{1024}{3}$ (4) 512

13. Let the equation $x(x+2)(12-k)=2$ have equal roots. Then the distance of the point $\left(k,\frac{k}{2}\right)$ from the line $3x+4y+5=0$ is

(1) $15\sqrt{5}$ (2) 15 (3) $5\sqrt{3}$ (4) 12

14. Let $A=\{-2,-1,0,1,2,3\}$. Let R be a relation on A defined by $x\mathrm{R}y$ if and only if $y=\max\{x,1\}$. Let l be the number of elements in R. Let m and n be the minimum number of elements required to be added in $\mathbf{R}$ to make it reflexive and symmetric relations, respectively. Then $l+m+n$ is equal to

(1) 12 (2) 14 (3) 11 (4) 13

15. If $z_1,z_2,z_3\in\mathbb{C}$ are the vertices of an equilateral triangle, whose centroid is z_0, then $\sum_{k=1}^{3}\left(z_k-z_0\right)^2$ is equal to

(1) 0 (2) i (3) -i (4) 1

16. The sum $1+\frac{1+3}{2!}+\frac{1+3+5}{3!}+\frac{1+3+5+7}{4!}+\ldots$ upto ∞ terms, is equal to

(1) 3e (2) 6e (3) 2e (4) 4e

17. Let the Mean and Variance of five observations $x_1=1, x_2=3, x_3=a, x_4=7$ and $x_5=b, a>b$, be 5 and 10 respectively. Then the Variance of the observations $n+x_n, n=1,2,\ldots,5$ is

(1) 17.4 (2) 17 (3) 16 (4) 16.4

18. If the four distinct points $(4,6),(-1,5),(0,0)$ and $(k,3k)$ lie on a circle of radius r, then $10k+r^2$ is equal to

(1) 32 (2) 35 (3) 34 (4) 33

19. Each of the angles β and γ that a given line makes with the positive y - and z -axes, respectively, is half of the angle that this line makes with the positive x -axes. Then the sum of all possible values of the angle β is

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

20. The number of solutions of the equation $(4-\sqrt{3})\sin x-2\sqrt{3}\cos^2 x=-\frac{4}{1+\sqrt{3}}, x\in\left[-2\pi,\frac{5\pi}{2}\right]$ is

(1) 3 (2) 5 (3) 4 (4) 6

SECTION-B

21. If $\lim\limits_{x\to 0}\left(\frac{\tan x}{x}\right)^{\frac{1}{x^2}}=p$, then $96\log_e p$ is equal to _____

22. Let I be the identity matrix of order 3×3 and for the matrix $A=\begin{bmatrix}\lambda & 2 & 3\\ 4 & 5 & 6\\ 7 & -1 & 2\end{bmatrix}$, $|A|=-1$. Let B be the inverse of the matrix $\text{adj}\left(\text{Aadj}\left(A^2\right)\right)$. Then $|(\lambda B+I)|$ is equal to _____

23. Let $\vec{a}=\hat{i}+2\hat{j}+\hat{k}, \vec{b}=3\hat{i}-3\hat{j}+3\hat{k}, \vec{c}=2\hat{i}-\hat{j}+2\hat{k}$ and $\vec{d}$ be a vector such that $\vec{b}\times\vec{d}=\vec{c}\times\vec{d}$ and $\vec{a}\cdot\vec{d}=4$. Then $|(\vec{a}\times\vec{d})|^2$ is equal to

24. If the equation of the hyperbola with foci $(4,2)$ and $(8,2)$ is $3x^2-y^2-\alpha x+\beta y+\gamma=0$, then $\alpha+\beta+\gamma$ is equal to _____ .

25. Let $\left(1+x+x^2\right)^{10}=a_0+a_1x+a_2x^2+\ldots+a_{20}x^{20}$. If $\left(a_1+a_3+a_5+\ldots+a_{19}\right)-11a_2=121k$, then k is equal to _____ .

NTA ANSWERS

1.	**(3)**	**2.**	**(4)**	**3.**	**(4)**	**4.**	**(2)**	**5.**	**(2)**	**6.**	**(3)**	**7.**	**(4)**
8.	**(1)**	**9.**	**(3)**	**10.**	**(2)**	**11.**	**(2)**	**12.**	**(3)**	**13.**	**(2)**	**14.**	**(1)**
15.	**(1)**	**16.**	**(3)**	**17.**	**(3)**	**18.**	**(2)**	**19.**	**(4)**	**20.**	**(2)**	**21.**	**(32)**
22.	**(38)**	**23.**	**(128)**	**24.**	**(141)**	**25.**	**(239)**						