JEE-MAIN EXAM APRIL, 2025

Date: - 02-04-2025 (SHIFT-2)

MATHEMATICS

SECTION-A

1. If the image of the point P(1,0,3) in the line joining the points A(4,7,1) and B(3,5,3) is $Q(\alpha,\beta,\gamma)$, then $\alpha+\beta+\gamma$ is equal to :

(1) 13 (2) $\frac{47}{3}$ (3) 18 (4) $\frac{46}{3}$

2. If the domain of the function $f(x)=\frac{1}{\sqrt{10+3x-x^2}}+\frac{1}{\sqrt{x+|x|}}$ is (a,b), then $(1+a)^2+b^2$ is equal to:

(1) 30 (2) 26 (3) 29 (4) 25

3. If the mean and the variance of 6,4, a, 8, b, 12,10,13 are 9 and 9.25 respectively, then a + b + ab is equal to :

(1) 100 (2) 105 (3) 103 (4) 106

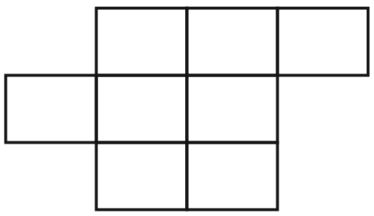
4. The line L_1 is parallel to vector $\vec{a}=-3\hat{i}+2\hat{j}+4\hat{k}$ and passes through the point $(7,6,2)$ and the line L_2 is parallel to vector $\vec{b}=2\hat{i}+\hat{j}+3\hat{k}$ and passes through the point $(5,3,4)$. The shortest distance between the lines L_1 and L_2 is :

(1) $\frac{21}{\sqrt{38}}$ (2) $\frac{23}{\sqrt{57}}$ (3) $\frac{21}{\sqrt{57}}$ (4) $\frac{23}{\sqrt{38}}$

5. If $\lim\limits_{x\to0}\frac{\cos(2x)+a\cos(4x)-b}{x^4}$ is finite, then $(a+b)$ is equal to :

(1) –1 (2) 0 (3) $\frac{3}{4}$ (4) $\frac{1}{2}$

6. The number of ways, in which the letters A, B, C, D, E can be placed in the 8 boxes of the figure below so that no row remains empty and at most one letter can be placed in a box, is :



(1) 5880 (2) 840 (3) 960 (4) 5760

7. Let the point P of the focal chord PQ of the parabola $y^2=16x$ be $(1,-4)$. If the focus of the parabola divides the chord PQ in the ratio $m:n, \gcd(m,n)=1$, then m^2+n^2 is equal to :

(1) 37 (2) 26 (3) 10 (4) 17

8. Let (a,b) be the point of intersection of the curve $x^2=2y$ and the straight line $y-2x-6=0$ in the second quadrant. Then the integral $I=\int_a^b \frac{9x^2}{1+5^x}dx$ is equal to :

(1) 24 (2) 27 (3) 18 (4) 21

9. Let $A=\{1,2,3,\ldots,100\}$ and R be a relation on A such that $R=\{(a,b):a=2b+1\}$. Let $(a_1, a_2),(a_2,a_3),(a_3,a_4),\ldots,(a_k,a_{k+1})$ be a sequence of k elements of R such that the second entry of an ordered pair is equal to the first entry of the next ordered pair. Then the largest integer k, for which such a sequence exists, is equal to :

(1) 6 (2) 7 (3) 5 (4) 8

10. Given three identical bags each containing 10 balls, whose colours are as follows :

	Red	**Blue**	**Green**
Bag I	3	2	5
Bag II	4	3	3
Bag III	5	1	4

A person chooses a bag at random and takes out a ball. If the ball is Red, the probability that it is from bag I is p and if the ball is Green, the probability that it is from bag III is q, then the value of $\left(\frac{1}{p}+\frac{1}{q}\right)$ is :

(1)7 (2) 6 (3) 8 (4) 9

11. Let $f:[1,\infty)\to[2,\infty)$ be a differentiable function. If $10\int_1^x f(t)dt=5xf(x)-x^5-9$ for all $x\geqslant 1$, then the value of $f(3)$ is :

(1) 26 (2) 32 (3) 18 (4) 22

12. If the length of the minor axis of an ellipse is equal to one fourth of the distance between the foci, then the eccentricity of the ellipse is :

(1) $\frac{3}{\sqrt{19}}$ (2) $\frac{4}{\sqrt{17}}$ (3) $\frac{\sqrt{5}}{7}$ (4) $\frac{\sqrt{3}}{16}$

13. If $\sum_{r=0}^{10}\left(\frac{10^{r+1}-1}{10^r}\right)\cdot{}^{11}C_{r+1}=\frac{\alpha^{11}-11^{11}}{10^{10}}$, then α is equal to :

(1) 24 (2) 20 (3) 15 (4) 11

14. Let A be a 3×3 real matrix such that $A^2(A-2I)-4(A-I)=O$, where I and O are the identity and null matrices, respectively. If $A^5=\alpha A^2+\beta A+\gamma I$, where α,β, and γ are real constants, then $\alpha+\beta+\gamma$ is equal to :

(1) 4 (2) 12 (3) 76 (4) 20

15. The number of terms of an A.P. is even; the sum of all the odd terms is 24 , the sum of all the even terms is 30 and the last term exceeds the first by $\frac{21}{2}$. Then the number of terms which are integers in the A.P. is :

(1) 10 (2) 8 (3) 6 (4) 4

16. If $\theta \in \left[-\frac{7\pi}{6}, \frac{4\pi}{3}\right]$, then the number of solutions of $\sqrt{3}\,\text{cosec}^2\,\theta - 2(\sqrt{3}-1)\,\text{cosec}\,\theta - 4 = 0$, is equal to :

(1) 7 (2) 10 (3) 6 (4) 8

17. If the system of equations

$2x + \lambda y + 3z = 5$

$3x + 2y - z = 7$

$4x + 5y + \mu z = 9$

has infinitely many solutions, then $\left(\lambda^2 + \mu^2\right)$ is equal to :

(1) 26 (2) 18 (3) 22 (4) 30

18. $4\int_0^1 \left(\frac{1}{\sqrt{3+x^2}+\sqrt{1+x^2}}\right)dx - 3\log_e(\sqrt{3})$ is equal to :

(1) $2-\sqrt{2}+\log_e(1+\sqrt{2})$ (2) $2-\sqrt{2}-\log_e(1+\sqrt{2})$

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

19. Let the area of the triangle formed by a straight line $L: x+by+c=0$ with co-ordinate axes be 48 square units. If the perpendicular drawn from the origin to the line L makes an angle of 45° with the positive x-axis, then the value of b^2+c^2 is :

(1) 90 (2) 83 (3) 97 (4) 93

20. Let $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}$, $\vec{b} = 3\hat{i} + 2\hat{j} + 5\hat{k}$ and a vector $\vec{c}$ be such that $(\vec{a}-\vec{c})\times\vec{b} = -18\hat{i} - 3\hat{j} + 12\hat{k}$ and $\vec{a}\cdot\vec{c} = 3$. If $\vec{b}\times\vec{c} = \vec{d}$, then $|\vec{a}\cdot\vec{d}|$ is equal to:

(1) 18 (2) 9 (3) 12 (4) 15

SECTION-B

21. Let $y = y(x)$ be the solution of the differential equation $\frac{dy}{dx} + 2y\sec^2 x = 2\sec^2 x + 3\tan x \cdot \sec^2 x$ such that $y(0) = \frac{5}{4}$. Then $12\left(y\left(\frac{\pi}{4}\right) - e^{-2}\right)$ is equal to _____.

22. Let $A(4,-2), B(1,1)$ and $C(9,-3)$ be the vertices of a triangle ABC. Then the maximum area of the parallelogram AFDE, formed with vertices D, E and F on the sides BC, CA and AB of the triangle ABC respectively, is _____

23. If $y=\cos\left(\frac{\pi}{3}+\cos^{-1}\frac{x}{2}\right)$, then $(x-y)^2+3y^2$ is equal to

24. If the set of all $a \in R-\{1\}$, for which the roots of the equation $(1-a)x^2+2(a-3)x+9=0$ are positive is $(-\infty,-\alpha]\cup[\beta,\gamma)$, then $2\alpha+\beta+\gamma$ is equal to_____

25. If the sum of the first 10 terms of the series $\frac{4\cdot1}{1+4\cdot1^4}+\frac{4\cdot2}{1+4\cdot2^4}+\frac{4\cdot3}{1+4\cdot3^4}+\ldots..$ is $\frac{m}{n}$, where $\gcd(m,n)=1$, then $m+n$ is equal to _____

NTA ANSWERS

1.	**(4)**	**2.**	**(2)**	**3.**	**(3)**	**4.**	**(4)**	**5.**	**(4)**	**6.**	**(4)**	**7.**	**(4)**
8.	**(1)**	**9.**	**(3)**	**10.**	**(1)**	**11.**	**(2)**	**12.**	**(2)**	**13.**	**(2)**	**14.**	**(2)**
15.	**(4)**	**16.**	**(3)**	**17.**	**(1)**	**18.**	**(2)**	**19.**	**(3)**	**20.**	**(4)**	**21.**	**21**
22.	**3**	**23.**	**3**	**24.**	**7**	**25.**	**441**						