



JEE-MAIN-2021

FEBRUARY ATTEMPT

24.02.21_SHIFT-I

MATHEMATICS

1. The locus of mid-point of the line segment joining focus of parabola $y^2 = 4ax$ to a point moving on it, is a parabola equation of whose directrix is

1) $y = 0$

*2) $x = 0$

3) $x = a$

4) $y = a$

2. There are 6 Indians 8 foreigners

Find number of committee form with atleast 2 Indians such that numbers of foreigners is twice the number of Indians.

*1) 1625

2) 1050

3) 1400

4) 575

3. There are two positive number p and q such that $p + q = 2$ and $p^4 + q^4 = 272$. Find the quadratic equation whose roots are p and q .

1) $x^2 + 2x + 2 = 0$

2) $x^2 - 2x + 135 = 0$

*3) $x^2 - 2x + 16 = 0$

4) $x^2 - 2x + 130 = 0$

4. A fair die is thrown n times. The probability of getting an odd number twice is equal to that getting an even number thrice. The probability of getting an odd number, odd number of times is

1) $\frac{1}{3}$

2) $\frac{1}{6}$

*3) $\frac{1}{2}$

4) $\frac{1}{8}$

5. Population of a town at time t is given by the differential equation $\frac{dP(t)}{dt} = (0.5)P(t) - 450$.
Also $P(0) = 850$ find the time when population of town becomes zero.

1) $\ln 9$

2) $3\ln 4$

*3) $2\ln 18$

4) $\ln 18$

6. Which of the following is tautology ?

- 1) $A \wedge (A \rightarrow B) \Rightarrow B$ 2) $B \rightarrow (A \wedge A \rightarrow B)$ 3) $A \wedge (A \vee B)$ 4) $(A \vee B) \vee A$

7. The value of $(-{}^{15}C_1 + 2 \cdot {}^{15}C_2 - 3 \cdot {}^{15}C_3 + \dots + 15 \cdot {}^{15}C_{15}) + ({}^{14}C_1 + {}^{14}C_3 + \dots + {}^{14}C_{11})$ is

1) $2^{16} - 14$

*2) $2^{13} - 14$

3) $2^{13} - 13$

4) 2^{14}

8. Two towers are 150m distance apart. Height of one tower is thrice the other tower. The angle of elevation of top tower from midpoint of their feet are complement to each other then the height of smaller tower is

*1) $25\sqrt{3}\text{m}$

2) $\frac{25}{\sqrt{3}}\text{m}$

3) $75\sqrt{3}\text{m}$

4) 25 m

9. Tangent at point $P(t, t^3)$ of curve $y = x^3$ meets the curve again at Q then ordinate of point which divides PQ in

1 : 2 internally, is

1) 0

2) $2t^3$

*3) $-2t^3$

4) $8t$

10. Let $f(x) = \frac{4x^3 - 3x^2}{6} - 2\sin x + (2x - 1)\cos x$ then $f(x)$

1) decreases in $\left[\frac{1}{2}, \infty\right)$

*2) increases in $\left[\frac{1}{2}, \infty\right)$

3) decreases $(-\infty, \infty)$

4) increases $\left(-\infty, \frac{1}{2}\right]$

11. The area bounded by region inside the circle $x^2 + y^2 = 36$ and outside the parabola $y^2 = 9x$ is

1) $12\pi + 3\sqrt{3}$

2) $36\pi + 3\sqrt{3}$

*3) $24\pi - 3\sqrt{3}$

4) $24\pi + 3\sqrt{3}$

12. The equation of plane perpendicular to planes $3x + y - 2z + 1 = 0$ and $2x - 5y - z + 3 = 0$ such that it passes through point $(1, 2, -3)$

1*) $11x + y + 17z + 38 = 0$

2) $11x - y - 17z + 40 = 0$

3) $11x + y - 17z + 36 = 0$

4) $x + 11y + 17z + 3 = 0$

13. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is a function defined by $f(x) = [x-1] \cos\left(\frac{2x-1}{2}\right)\pi$, where $[x]$ denotes the greatest integer function, then f is

*1) continuous for every real x .

2) discontinuous only at $x = 1$.

3) discontinuous only at non-zero integral values of x .

4) continuous only at $x = 1$.

14. A point is moving on the line such that the AM of reciprocal of intercepts on axis is $\frac{1}{4}$.

There are 3 stones whose position are (2, 2) (4, 4) and (1, 1). Find the stone which satisfies the line

*1) (2, 2)

2) (4, 4)

3) (1, 1)

4) All of above

15. If $e^{(\cos^2\theta + \cos^4\theta + \dots) \ln 2}$ is a root of equation $t^2 - 9t + 8 = 0$ then the value of $\frac{2 \sin \theta}{\sin \theta + \sqrt{3} \cos \theta}$ when

$0 < \theta < \frac{\pi}{2}$, is

*1) $\frac{1}{2}$

2) 1

3) 2

4) 4

16. if $I = \int \frac{\cos \theta - \sin \theta}{\sqrt{8 - \sin 2\theta}} d\theta = a \sin^{-1} \left(\frac{\sin \theta + \cos \theta}{b} \right) + C$

then ordered pair (a, b) is

*1) (1, 3)

2) (3, 1)

3) (1, 1)

4) (-1, 3)

17. Such that $f : \mathbb{R} \rightarrow \mathbb{R}, f(x) = 2x - 1, g(x) = \frac{2}{x-1}$, then $f(g(x))$ is

- 1) one-one, onto 2) many-one, onto *3) one-one, into 4) many-one, into

18. The distance of the point $P(1, 1, 9)$ from the point of intersection of plane $x + y + z = 17$ and line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$

1) $\sqrt{38}$

2) $\sqrt{39}$

3) 6

4) 7

19. The value of $\lim_{x \rightarrow 0^+} \frac{\int_0^{x^2} \sin \sqrt{t} dt}{x^3}$

1) $\frac{1}{15}$

*2) $\frac{2}{3}$

3) 3

4) 2

20. The values of k and m such that system of equations $3x + 2y - kz = 10$, $x - 2y + 3z = 3$, $x + 2y - 3z = 5m$ are inconsistent

- * 1) $k = 3$ and $m \neq \frac{7}{10}$ 2) $k = 3$ and $m = \frac{7}{10}$ 3) $k \neq 3$ and $m = \frac{7}{10}$ 4) $k = 2$ and $m \neq \frac{7}{10}$

$$21. \quad \tan\left(\lim_{n \rightarrow \infty} \sum_{r=1}^n \tan^{-1}\left(\frac{1}{1+r^2+r}\right)\right) =$$

Ans: 01.00

22. Of the three independent events B_1 , B_2 and B_3 , the probability that only B_1 occurs is α , only B_2 occurs is β and only B_3 occurs is γ . Let the probability p that none of events B_1 , B_2 or B_3 occurs satisfy the equations $(\alpha - 2\beta)p = \alpha\beta$ and $(\beta - 3\gamma)p = 2\beta\gamma$. All the given probabilities are assumed to lie in the interval $(0, 1)$.

Then $\frac{\text{Probability of occurrence of } B_1}{\text{Probability of occurrence of } B_3} =$

Ans: 6

23. \vec{c} is coplanar with $\vec{a} = -\hat{i} + \hat{j} + \hat{k}$ & $\vec{b} = 2\hat{i} + \hat{k}$, $\vec{a} \cdot \vec{c} = 7$ & $\vec{c} \perp \vec{b}$, then the value of $2|\vec{a} + \vec{b} + \vec{c}|^2$ is.

Ans: 75.00

24. One of the diameter of circle $C_1 : x^2 + y^2 - 2x - 6y + 6 = 0$ is chord of circle C_2 with centre (2,1) then radius of C_2 is

Ans: 3

25. Let $P = \begin{bmatrix} 3 & -1 & -2 \\ 2 & 0 & \alpha \\ 3 & -5 & 0 \end{bmatrix}$, where $\alpha \in \mathbb{R}$. Suppose $Q = [Q_{ij}]$ is a matrix such that $PQ = kI$,

where $k \in \mathbb{R}$, $k \neq 0$ and I is the identity matrix of order 3. If $q_{23} = -\frac{k}{8}$ and $\det(Q) = \frac{k^2}{2}$,

then value of $k^2 + \alpha^2$ is equal to

Ans: 17

26. How many 3×3 matrices M with entries from $\{0,1,2\}$ are there, for which the sum of the diagonal entries of $M^T M$ is 7?

Ans: 540

27. $z + \alpha|z-1| + 2i = 0$; $z \in \mathbb{C}$ & $\alpha \in \mathbb{R}$, then the value of $4[(\alpha_{\max})^2 + (\alpha_{\min})^2]$ is

Ans: 10

28. Let $A = \{x : x \text{ is 3 digit number}\}$

$$B = \{x : x = 9K + 2, k \in I\}$$

$$C : \{x : x = 9K + \ell, k \in I, \ell \in I, 0 < \ell < 9\}$$

If sum of elements in $A \cap (B \cup C)$ is 274×400 then ℓ is

Ans: 5.00

29. The least value of α such that $\frac{4}{\sin x} + \frac{1}{1 - \sin x} = \alpha$ has at least one solution in $x \in \left(0, \frac{\pi}{2}\right)$

Ans: 9.00

30. $\int_{-a}^1 |x| + |x - 2| = 22$, $a > 2$ then the value of $\int_{-a}^a x + [x]$ is

(where $[.]$ represent greatest integer function)

Ans: -3