MHT CET 2025 PCM 27 April Shift 1 Question Paper

Time Allowed :3 HourMaximum Marks :200Total Questions :150

1. Evaluate the integral:

$$\int \frac{\sqrt{\tan x}}{\sin x \cos x} \, dx$$

(A) $\frac{2}{\cos^2 x}$ (B) $\frac{2}{\sin^2 x}$ (C) $\frac{2}{\cos x}$ (D) $\frac{2}{\sin x}$

2. Population of Town A and B was 20,000 in 1985. In 1989, the population of Town A was 25,000, and Town B had 28,000. What will be the difference in population between the two towns in 1993?

(A) 5950

(B) 6950

(C) 4500

(D) 0

3. A die was thrown n times until the lowest number on the die appeared. If the mean is n, then what is the value of n?
(A) 2
(B) 3
(C) 4
(D) 5

4. There are 6 boys and 4 girls. Arrange their seating arrangement on a round table such that 2 boys and 1 girl can't sit together.

(A) 6! × 4!
(B) 6! × 3! × 4!
(C) 5! × 4!
(D) 5! × 3! × 4!

5. Choose a randomly selected leap year, in which 52 Saturdays and 53 Sundays are to be there. Given the following probability distribution:

x	1	2	3	4
p(x)	0.1	0.2	0.3	0.4

Find the mean and standard deviation.

(A) Mean = 2.7, Standard Deviation = 1.5

(B) Mean = 2.5, Standard Deviation = 1.2

(C) Mean = 2.4, Standard Deviation = 1.4

(D) Mean = 3.0, Standard Deviation = 1.6

6. If $\tan^{-1}(\sqrt{\cos \alpha}) - \cot^{-1}(\cos \alpha) = x$, then what is $\sin \alpha$? (A) $\tan\left(\frac{x}{2}\right)$ (B) $\cot\left(\frac{x}{2}\right)$ (C) $\cot^{2}\left(\frac{x}{2}\right)$ (D) $\tan^{2}\left(\frac{x}{2}\right)$

7. If $\tan(\pi \cos x) = \cot(\pi \sin x)$, then what is $\sin(\frac{\pi}{2} + x)$? (A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $-\frac{1}{2}$ (D) $-\frac{1}{\sqrt{2}}$

8. Evaluate the integral:

$$\int \frac{1}{\sin^2 2x \cdot \cos^2 2x} \, dx$$

(A) $\frac{1}{2} \tan 2x$ (B) $\frac{1}{2} \cot 2x$ (C) $\frac{1}{4} \cot 2x$ (D) $\frac{1}{4} \tan 2x$

9. Given the equation:

$$81\sin^2 x + 81\cos^2 x = 30$$

Find the value of x.

(A) $x = \frac{\pi}{4}$ (B) $x = \frac{\pi}{6}$ (C) $x = \frac{\pi}{3}$ (D) $x = \frac{\pi}{2}$

10. The angle between the lines whose direction cosines satisfy the equations:

l + m + n = 0 and $m^2 + n^2 - l^2 = 0$

Find the angle between the two lines.

(A) 30°

(B) 45°

(C) 60°

(D) 90°

11. Let a, b, and c be vectors of magnitude 2, 3, and 4 respectively. If: - a is

perpendicular to (b + c), - b is perpendicular to (c + a), - c is perpendicular to (a + b),

then the magnitude of $\mathbf{a} + \mathbf{b} + \mathbf{c}$ is equal to:

- (A) 29
- (B) $\sqrt{29}$
- (C) 26
- (D) $\sqrt{26}$

12. A boy tries to message his friend. Each time, the chance the message is delivered is $\frac{1}{6}$, and the chance it fails is $\frac{5}{6}$. He sends 6 messages. Find the probability that exactly 5 messages are delivered.

(A) $\frac{1}{6}$ (B) $\frac{5}{6}$ (C) $\binom{6}{5} \left(\frac{1}{6}\right)^5 \left(\frac{5}{6}\right)$ (D) $\frac{5}{36}$

13. Given that $\cot\left(\frac{A+B}{2}\right) \cdot \tan\left(\frac{A-B}{2}\right) =$, and the equation $\frac{x}{2} + \frac{y}{3} + \frac{2}{6} - 1 = 0$, find the area of $\triangle ABC = 2$. (A) 2 (B) 3 (C) 4 (D) 5

14. Evaluate the following integrals:

$$\int \frac{(x^4+1)}{x(2x+1)^2} \, dx$$

and

$$\int \frac{1}{x^4 + 5x^2 + 6} \, dx$$

(A) $\frac{1}{(2x+1)}$ (B) $\frac{1}{(x^4+5x^2+6)}$ (C) $\frac{1}{2} \left(\ln \left| \frac{x^2+3}{x+2} \right| \right)$ (D) $\frac{1}{3} \left(\ln |x^2+5x+6| \right)$

15. Given that:

$$\cot\left(\frac{A+B}{2}\right) \cdot \tan\left(\frac{A-B}{2}\right)$$

and the equation involving coordinates:

$$\frac{x}{2} + \frac{y}{3} + \frac{2}{6} - 1 = 0$$

Find the area of $\Delta ABC = 2$.

(A) 2

(B) 3

(C) 4

(D) 5