

MHT CET 27 April Shift 1 Question Paper

Total Time Allowed : 3 hours	Maximum Marks : 200	Total Questions : 200
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General Instructions

Read the following instructions very carefully and strictly follow them:

This question paper is divided into three sections:

1. The total duration of the examination is 3 hours (180 minutes).
2. The total number of questions is **200**, carrying a maximum of **200 marks**.
3. The marking scheme is as follows:
 - (i) For Physics, Chemistry, and Mathematics, 1 mark will be awarded for every correct response.
 - (ii) There is **no negative marking** for any incorrect response.
4. No marks will be awarded for unanswered questions.
5. Follow the instructions provided during the exam for submitting your answers.

1. Evaluate the integral: $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx$

- (A) $\frac{2}{\cos^2 x}$
(B) $\frac{\sin^2 x}{2}$
(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 6, 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) $6! \times 4!$
- (B) $6! \times 3! \times 4!$
- (C) $5! \times 4!$
- (D) $5! \times 3! \times 4!$

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 $\tan^{-1}(\sqrt{\cos \alpha}) - \cot^{-1}(\sqrt{\cos \alpha}) = x$, 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 $\sin\left(x + \frac{\pi}{4}\right)$?

- (A) $\frac{1}{2}$
- (B) $\frac{1}{2\sqrt{2}}$

- (C) $-\frac{1}{2}$
(D) $-\frac{1}{2\sqrt{2}}$
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8. Evaluate the integral: $\int \frac{1}{\sin^2(2x) \cos^2(2x)} dx$

- (A) $\frac{1}{4} \tan(2x)$
(B) $\frac{1}{4} \cot(2x)$
(C) $\frac{1}{2} \cot(2x)$
(D) $\frac{1}{2} \tan(2x)$
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9. Given the equation: $81^{\sin^2 x} + 81^{\cos^2 x} = 30$. Find the value of x .

- (A) $x = \frac{\pi}{6}$
(B) $x = \frac{\pi}{3}$
(C) $x = \frac{\pi}{4}$
(D) $x = \frac{\pi}{2}$
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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°
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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 a + b + c is equal to:

- (A) 29
(B) $\sqrt{29}$
(C) 26
(D) $\sqrt{26}$
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12. A boy tries to message his friend. Each time, the chance the message is delivered is $\frac{1}{3}$, and the chance it fails is $\frac{2}{3}$. He sends 6 messages. Find the probability that exactly 5 messages are delivered.

- (A) $\frac{1}{3}$
- (B) $\frac{5}{36}$
- (C) $\binom{6}{5} \left(\frac{1}{3}\right)^5 \left(\frac{2}{3}\right)$
- (D) $\frac{20}{36}$

13. Given that $\cot\left(\frac{A+B}{2}\right) \tan\left(\frac{A-B}{2}\right) = \dots$, and the equation $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} - 1 = 0$, find the area of $\triangle ABC$. [Note: The question text is reconstructed from a corrupted original.]

- (A) 2
- (B) 3
- (C) 4
- (D) 5

14. Evaluate the following integral: $\int \frac{1}{x^4+5x^2+6} dx$ [Note: The integral is likely mistyped and should have an x in the numerator for the options to be valid.]

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

15. Given that: $\cot\left(\frac{A+B}{2}\right) \tan\left(\frac{A-B}{2}\right)$ and the equation involving coordinates: $\frac{x}{2} + \frac{y}{3} + \frac{z}{6} - 1 = 0$. Find the area of $\triangle ABC$. [Note: The question text is reconstructed from a corrupted original.]

- (A) 2
- (B) 3
- (C) 4
- (D) 5