MHT CET 26 April Shift 1 Question Paper

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

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.

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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) $\frac{2}{\sin x}$

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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

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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

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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) $5! \times 3! \times 4!$

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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

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6. If $\tan^{-1}(\sqrt{\cos\alpha}) - \cot^{-1}(\sqrt{\cos\alpha}) = x$**, then what is** $\sin\alpha$**?**

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

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7. If $\tan(\pi\cos x) = \cot(\pi\sin x)$**, then what is** $\sin(x + \frac{\pi}{4})$**?**

(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. Find the angle between the lines whose direction cosines satisfy the equations: $l + m + n = 0$ **and** $m^2 + n^2 - l^2 = 0$**.**

(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) $\frac{20}{36}$

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13. Given that $\cot\left(\frac{A+B}{2}\right)\tan\left(\frac{A-B}{2}\right) = \ldots$, 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

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14. Evaluate the following integral: $\int \frac{1}{x^4+5x^2+6}dx$

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

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

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