

MHT CET 20 April Shift 1 PCM 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. Water is being poured at the rate of $36 \text{ m}^3/\text{min}$ into a cylindrical vessel whose circular base is of radius 3 meters. Then the water level in the cylinder increases at the rate of:

- (A) 4 m/min
(B) $\frac{4}{\pi} \text{ m/min}$
(C) $\frac{\pi}{4} \text{ m/min}$
(D) $\frac{1}{\pi} \text{ m/min}$

2. If $\mathbf{a} = 2\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$, $\mathbf{b} = -\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ and $\mathbf{c} = 3\mathbf{i} + \mathbf{j}$ are the vectors such that $\mathbf{a} + \mathbf{b}$ is perpendicular to $\mathbf{c}$, then the value of $\mathbf{c} \cdot \mathbf{a}$ is:

- (A) 6
(B) -6
(C) 8
(D) -8

3. If $\cos^{-1}\left(\frac{4}{5}\right) + \sin^{-1}\left(\frac{3}{5}\right) = \sin^{-1} P$, then the value of P is:

- (A) $\frac{24}{25}$
 - (B) 1
 - (C) $\frac{3}{5}$
 - (D) $\frac{4}{5}$
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4. The area enclosed between the parabola $y^2 = 4x$ and the line $y = 2x - 4$ is:

- (A) $\frac{17}{3}$ sq. units
 - (B) 15 sq. units
 - (C) $\frac{8}{3}$ sq. units
 - (D) 9 sq. units
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5. If $y = \tan^{-1} \left(\frac{2x}{1-x^2} \right) + \tan^{-1} \left(\frac{3x-x^3}{1-3x^2} \right)$, then $\frac{dy}{dx} =$

- (A) $\frac{1}{1+x^2}$
 - (B) $\frac{5}{1+x^2}$
 - (C) $-\frac{5}{1+x^2}$
 - (D) $\frac{7}{1+x^2}$
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6. The particular solution of the differential equation, $xy \frac{dy}{dx} = x^2 + 2y^2$ when $y(1) = 0$ is:

- (A) $\frac{x^4}{4} + y^2 = 1$
 - (B) $x^2 + y^2 = x$
 - (C) $x^2 + y^2 = x^4$
 - (D) $x^4 + 2y^2x^2 = x^4$
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7. If the angle between the line $2(x+1) = y = z$ and the plane $2x - y + \sqrt{\lambda}z + 4 = 0$ is $\frac{\pi}{3}$, then the value of λ is:

- (A) $\frac{45}{23}$
- (B) $\frac{23}{45}$
- (C) $\frac{25}{7}$
- (D) $\frac{45}{7}$

8. If the volume of the tetrahedron, whose vertices are A(1, 2, 3), B(-3, -1, 1), C(2, 1, 3) and D(-1, 2, z), is $\frac{28}{3}$ cubic units, then the value of z is:

- (A) 3
- (B) -2
- (C) 4
- (D) -1

9. A 5-ohm resistor is connected to a 10 V battery. Calculate the current flowing through the resistor.

- (A) 1.0 A
- (B) 2.0 A
- (C) 0.5 A
- (D) 0.2 A

10. A charge of 2 μC is placed in an electric field of intensity $4 \times 10^5 \text{ N/C}$. What is the force experienced by the charge?

- (A) $8 \times 10^{-3} \text{ N}$
 - (B) $8 \times 10^{-6} \text{ N}$
 - (C) $4 \times 10^{-3} \text{ N}$
 - (D) $4 \times 10^{-6} \text{ N}$
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