



C09-CHPP-102/C09-EE-102

3034

BOARD DIPLOMA EXAMINATION, (C-09)

OCT/NOV—2013

DEEE—FIRST YEAR EXAMINATION

ENGINEERING MATHEMATICS—I

Time : 3 hours]

[Total Marks : 80

PART—A

- Instructions :** (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Simplify

$$1 \frac{\frac{x}{2x-3} - \frac{3x-2}{5x-1}}{\frac{x}{2x-3} - \frac{3x-2}{5x-1}}$$

2. Solve

$$\frac{x^2 - 3x - 4}{3x - 4} = \frac{x^2 - 2x - 5}{2x - 5}$$

3. Resolve $\frac{3x - 1}{(x - 2)(x - 3)}$ into partial fractions.

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4. If $(A - B) = 45^\circ$, prove that $(1 + \tan A)(1 + \tan B) = 2$.
5. Prove that $\sin(60^\circ - x) \cdot \sin(60^\circ + x) = \frac{1}{4}(3 - \sin^2 x)$.
6. Find the modulus of $\frac{(1 - i)}{(1 + i)}$.
7. Find the angle between the lines $2x - y - 3 = 0$ and $x - y - 2 = 0$.
8. Evaluate $\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - x - 6}$.
9. Find the center and radius of the circle $x^2 + y^2 - 6x - 4y - 12 = 0$.
10. If $y = (\sin x / \cos x)$, find (dy / dx) using quotient rule.

PART—B

- Instructions :** (1) Answer *any five* questions.
(2) Each question carries **ten** marks.
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. (a) If

$$A = \begin{bmatrix} 4 & 3 & 3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$$

find inverse of matrix A.

(b) Solve the following equations by Cramer's rule :

$$x + y + z = 6, x - y + z = 2, 2x - y + z = 1$$

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12. (a) If $\sin x = a$ and $\cos x = b$, prove that

$$\tan \frac{x}{2} = \frac{a}{b}$$

- (b) Prove that

$$\tan^{-1} \frac{4}{3} + 2 \tan^{-1} \frac{1}{7} = \cot^{-1} \frac{44}{117}$$

13. (a) Solve $\sin 2x = \sin 3x$.

- (b) Solve the triangle ABC, if $a = 6$, $b = 7$ and $B = 60^\circ$.

14. (a) Find the focus, equations of directrix, equations of latus rectum of parabola $(y - 2)^2 = \frac{3}{2}(x - 4)$.

- (b) Find the equation of ellipse whose center is at (0,0) and axes are coordinate axes, eccentricity is $(1/\sqrt{2})$ and length of latus rectum is 8.

15. (a) Find the equation of hyperbola whose foci are (1,3), (1,-7) and $e = (5/3)$.

- (b) Find the distance between the two points (3,2,-1) and (-1,0,5).

16. (a) Find the derivative of $\log(1 + \tan^{-1} x)$.

- (b) Differentiate $\sec x$ with respect to $\tan x$.

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17. (a) Find the equation of tangent and normal to the curve $x^2 + y^2 = 25$ at (3, 4).

- (b) A spherical balloon is pumped air at the rate of 10 cu.inch/min. Find the rate of increase in its surface area when the radius is 10 inches.

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- 18.** (a) An open box is to be made out of the square sheet of side 8 cm by cutting off equal squares at each corner and turning up the sides. What is the size of the square should be cut to get the maximum volume of the box and final maximum volume of the box?
- (b) The time T of a complete oscillation of a simple pendulum of length l is given by the equation $T = 2\pi \sqrt{\frac{l}{g}}$, where g is a constant. Find the approximate percentage error in the value of T correspond to an error in the value l is 4%.
