



C-14-CHPP/EE-102

4041

BOARD DIPLOMA EXAMINATION, (C-14)

APRIL/MAY-2015

DEEE—FIRST YEAR EXAMINATION

ENGINEERING MATHEMATICS—I

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Resolve $\frac{7x-1}{(3x-1)(2x-1)}$ into partial fractions.

2. Define skew-symmetric matrix. Give an example.

3. Find the value of $\begin{vmatrix} 1 & & 2 \\ & 2 & 1 \\ 2 & & 1 \end{vmatrix}$, where ω is the cube root of unity.

4. Prove that $\sin^2 52\frac{1}{2}^\circ = \sin^2 22\frac{1}{2}^\circ = \frac{\sqrt{3}-1}{4\sqrt{2}}$.

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5. Prove that $\frac{\sin 3}{1 - 2\cos 2} = \sin$.
6. Express $\frac{(1 - i)(2 - i)}{3 - i}$ in $a + ib$ form.
7. Find the perpendicular distance from the point (3, 2) to the line $4x + 5y - 6 = 0$.
8. Find the equation of circle with (2, 3) and (6, 9) as ends of diameter.
9. Evaluate $\lim_{x \rightarrow 0} \frac{x}{1 - \sqrt{1 - x}}$.
10. Find the derivative of $\frac{\sin x}{1 - \cos x}$ with respect to x .

PART—B

10×5=50

- 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) Express the matrix $\begin{pmatrix} 1 & 7 & 1 \\ 2 & 3 & 4 \\ 5 & 0 & 5 \end{pmatrix}$ as sum of symmetric and skew-symmetric matrices.

- (b) Solve the equations $3x + y + 2z = 3$, $2x + 3y + z = 3$, $x + 2y + z = 4$ by determinant method.

12. (a) If $A + B + C = \pi$, then show that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$

- (b) Prove that $\tan^{-1}(n) + \tan^{-1}(n^2 - n + 1) + \cot^{-1}(n + 1) = \pi$.

- * 13. (a) Solve the equation $4 \cos^2 \theta - 6 \sin^2 \theta = 0$.
- (b) In any $\triangle ABC$, if $A = 60^\circ$, then show that $\frac{b}{c} = \frac{c}{a} = \frac{a}{b} = 1$.
14. (a) Find the equation of rectangular hyperbola whose focus is $(-3, 4)$ and directrix is $4x - 3y - 1 = 0$.
- (b) Find the eccentricity, vertices and foci of ellipse $9x^2 + 16y^2 = 144$.
15. (a) Differentiate $\log \frac{1+x^2}{1-x^2}$ with respect to x .
- (b) Find the derivative of $\tan^{-1} \frac{\sin x}{\cos x}$ with respect to x .
16. (a) If $x^y = e^{x-y}$, then show that $\frac{dy}{dx} = \frac{\log x}{(1-\log x)^2}$.
- (b) Verify that $\frac{2u}{x-y} = \frac{2u}{y-x}$ if $u = \log(x^2 + y^2)$.
17. (a) Find the lengths of the tangent, normal, subtangent and subnormal to the curve $x = a(\sin \theta)$, $y = a(1 - \cos \theta)$ at $\theta = \pi/3$.
- (b) The volume of sphere is increasing at the rate of $1 \text{ m}^3/\text{min}$. Find the rate at which the radius and surface area are increasing when the volume is $\frac{32}{3} \text{ m}^3$.
18. (a) Show that maximum rectangle that can be inscribed in a circle is a square.
- * (b) The time of oscillation of a simple pendulum of length l is given by $T = 2\pi \sqrt{\frac{l}{g}}$ if the length is increased by 2%. Find the approximate % increase in its time of oscillation, where g is constant.
