



C16-EE/CHPP-102

6035

BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER—2020

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.

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

2. If $A = \begin{bmatrix} 2 & 4 \\ -1 & k \end{bmatrix}$ and $A^2 = 0$, then find the value of k

3. Find the determinant of the matrix $\begin{bmatrix} 3 & 1 & 1 \\ 1 & -1 & 2 \\ 1 & 2 & -1 \end{bmatrix}$

4. Prove that $\tan(45^\circ + A) \cdot \tan(45^\circ - A) = 1$

5. If $\cos \theta = \frac{4}{5}$, then find $\cos 2\theta$ and $\sin 2\theta$

6. Find the conjugate of the complex number $\frac{1+8i}{5-2i}$

- * 7. Find the value of x if the slope of the line joining the points $(5, 6)$ and $(x, -7)$ is 7.
8. Find the point of intersection of the lines $x + 3y - 6 = 0$ and $y - 3x = 7$.
9. Evaluate $\lim_{x \rightarrow 3} \left(\frac{x^3 - 27}{x^2 - 9} \right)$
10. Find the derivative of $x e^x \cos x$ with respect to x .

PART—B

10×5=50

- Instructions :** (1) Answer any **five** questions.
 (2) Each question carries **ten** marks.

11. Solve the equations

$$3x + y + z = 3, 2x + 2y + 5z = -1 \text{ and } x - 3y - 4z = 2$$

using matrix inversion method.

12. (a) Prove that $\frac{\cos A - \cos 3A - \cos 5A + \cos 7A}{\sin A - \sin 3A + \sin 5A - \sin 7A} = \tan 2A$

(b) Show that $\sin^{-1} \left(\frac{2x}{1+x^2} \right) + \cos^{-1} \left(\frac{1-y^2}{1+y^2} \right) = 2 \tan^{-1} \left(\frac{x+y}{1-xy} \right)$

- * 13. (a) Solve the equation $2 \sin^2 \theta - \sin \theta - 1 = 0$

(b) In a ΔABC , prove that $c \cos^2 \left(\frac{A}{2} \right) + a \cos^2 \left(\frac{C}{2} \right) = s$

- * 14. (a) Find the equation of the circle with (0, 1) and (3, 0) as end points of a diameter.

- (b) Find the center, vertices, eccentricity, foci and length of latus rectum of the ellipse

$$\frac{x^2}{16} + \frac{y^2}{36} = 1$$

15. (a) Differentiate $\sin^{-1}(2x\sqrt{1-x^2})$ with respect to $\sin^{-1}x$

- (b) Find $\frac{dy}{dx}$, if $y = x^{x^{x^{\dots}}}$

16. (a) If $x = a \cos \theta, y = b \sin \theta$, then find $\frac{d^2y}{dx^2}$

- (b) Verify Euler's theorem for the function

$$u(x, y, z) = x^3y + y^3z + z^3x$$

17. (a) Find the lengths of tangent, normal, sub-tangent and sub-normal to the curve $y = x^2 + 2x - 1$ at the point (1, 2).

- (b) A circular metal expands by heat so that its radius increases at the rate of 0.5 cm/sec. Find the rate of increase of its area when the radius is 10 cm.

18. (a) A wire of length 50 cm is cut into two parts which are bent in the form of a square and circle. Find the least value of the sum of the areas so formed.

- (b) A circular plate expands when heated from a radius 5 cm to 5.03 cm. Find the approximate percentage error in its area. Also find the percentage error in its circumference.

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