



C16-A/AA/BM/CH/CHST/AEI/MNG/
MET/TT/IT/PCT—102

6002

BOARD DIPLOMA EXAMINATION, (C-16)
MARCH/APRIL—2017
FIRST YEAR (COMMON) 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

$$\frac{x^4}{x^2 - 5x + 6}$$

into partial fractions.

2. If

$$A = \begin{pmatrix} 3 & 1 \\ 1 & 2 \end{pmatrix}$$

then find $A^2 - 5A - 7I$.

3. If

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & X & 7 \end{pmatrix}$$

is a symmetric matrix, then find X.

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4. If $A + B = 135^\circ$, then prove that $(1 + \cot A)(1 + \cot B) = 2$.

5. Prove that

$$\frac{\sin \theta}{1 + \cos \theta} = \tan \frac{\theta}{2}$$

6. Find the additive and multiplicative inverses of $3 - 4i$.

7. Find the angle between the lines $x - 2y - 9 = 0$ and $3x - y - 7 = 0$.

8. Find the distance between the parallel lines $3x - 4y - 8 = 0$ and $6x - 8y - 5 = 0$.

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{e^{ax} - 1}{e^{bx} - 1}$$

10. Find $\frac{dy}{dx}$ if $y = e^x \log x$.

PART—B

10×5=50

Instructions : (1) Answer any **five** questions.

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

11. (a) Solve the following equations by using Cramer's rule :

$$x + 2y + z = 3$$

$$3x + y + z = 4$$

$$x + y + 2z = 6$$

(b) Show that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a - b)(b - c)(c - a)$$

- * 12. (a) If $\cos x = \frac{3}{7}$ and $\cos y = \frac{5}{9}$, then show that

$$27 \tan \frac{x-y}{2} - 35 \cot \frac{x-y}{2} = 0$$

- (b) Show that

$$\tan^{-1} \frac{1}{7} + \tan^{-1} \frac{3}{4} = \frac{\pi}{4}$$

13. (a) Solve $\sin^2 x - 3 \cos x - 3 = 0$.

- (b) Solve the triangle ABC with $b = 1$, $c = \sqrt{2}$, $A = 30^\circ$.

14. (a) Find the equation of the circle passing through the points (0, 0), (6, 0), (8, 4).

- (b) Find the centre, length of the axes, length of latus rectum and focus of the ellipse

$$\frac{(x-3)^2}{16} + \frac{y^2}{25} = 1$$

15. (a) Find $\frac{dy}{dx}$, if $y = e^t \sin t$, $x = e^t \cos t$.

- (b) Find $\frac{dy}{dx}$, if $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, where a, b, c, f, g, h are constants.

16. (a) If $u = x^2 + y^2 + z^2$, then show that

$$x \frac{u}{x} + y \frac{u}{y} + z \frac{u}{z} = 2u$$

- (b) Find the derivative of $\tan^{-1} \frac{2x}{1-x^2}$ with respect to

$$\sin^{-1} \frac{2x}{1-x^2}.$$

- * 17. (a) Find the lengths of tangent, normal, subtangent and subnormal to the curve $y = x^3 - 2x^2 + 4$ at the point (2, 4).
- (b) A circular metal plate expands by heat so that its radius increases at the rate of 0.02 cm per second. At what rate its area is increases when the radius is 20 cm?
18. (a) The sum of two numbers is 26. Find them, if their product is to be minimum.
- (b) If the radius of a spherical balloon is increasing by 0.1 percent, find the approximate percentage of increase in the volume.

A.A.N.M & V.V.R.S.R POLYTEHNIC, GUDLAVALLERU, KRISHNA DIST. A.P