



C14-EC/CHPC/PET-102

4034

BOARD DIPLOMA EXAMINATION, (C-14)

OCT/NOV—2016

DECE—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

$$\frac{1}{(x-4)(x-9)}$$

into partial fractions.

2. If

$$A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 3 & 4 \end{pmatrix} \text{ and } B = \begin{pmatrix} 0 & 2 & 1 \\ 4 & 3 & 2 \end{pmatrix}$$

then find  $2A - 3B$ .

3. If

$$A = \begin{pmatrix} 1 & 2 & 3 \\ x & 2 & 4 \\ 2 & 3 & 1 \end{pmatrix}$$

is a singular matrix, then find  $x$ .

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[ Contd...

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4. Prove that \*

$$\frac{\cos 19^\circ \sin 19^\circ}{\cos 19^\circ \sin 19^\circ} \tan 26^\circ$$

5. Show that

$$\frac{\sin 2^\circ}{1 - \cos 2^\circ} \cot$$

6. Find the multiplicative inverse of  $z = 2 - 3i$ .

7. Find the equation of the straight line passing through  $(-2, -4)$  and parallel to the line  $3x - 7y - 1 = 0$ .

8. Find the equation of the circle whose centre is  $(2, 5)$  and radius 6.

9. Evaluate :

$$\lim_{x \rightarrow 0} \frac{\sqrt{5-x} - \sqrt{5+x}}{x}$$

10. Find the derivative of  $x^6 - 3x^5 - 4x^3 - 9x^2 - 6x - 7$ .

### PART—B

10×5=50

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

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

11. (a) Show that

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

(b) Solve the equations

$$\begin{cases} x + 2y + 3z = 6 \\ 2x + 4y + z = 7 \\ 3x + 2y + 9z = 14 \end{cases}$$

by Cramer's rule.

12. (a) If  $A + B + C = 180^\circ$ , then prove that  

$$\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$$

(b) Prove that

$$\tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{5} + \tan^{-1} \frac{4}{7}$$

13. (a) Solve the following equation :

$$\cos \theta - \sqrt{3} \sin \theta = 1$$

(b) In any triangle  $ABC$ , prove that  $2bc \cos A = a^2 - b^2 - c^2$ .

14. (a) Find the equation of the parabola whose focus is the point  $(3, -4)$  and directrix is the line  $x + y - 5 = 0$ .

(b) Find the centre, length of axes, length of latus-rectum, eccentricity and foci of the ellipse  $9x^2 + 16y^2 = 144$ .

15. (a) Find

$$\frac{dy}{dx}$$

$$\text{if } x^2 + y^2 = 3xy + 7.$$

(b) If

$$y = \sqrt{x + \sqrt{x + \sqrt{x + \dots}}}$$

then show that

$$\frac{dy}{dx} = \frac{1}{2y + 1}$$

16. (a) If  $y = a \sin(\log x) + b \cos(\log x)$ , then show that  
 $x^2 y_2 + xy_1 + y = 0$ .

(b) If

$$u = \tan^{-1} \frac{x^3 + y^3}{x + y}$$

then show that

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

17. (a) Find the <sup>\*</sup> equations of the tangent and normal to the curve  $y = 2x^2 - 4x + 5$  at  $(3, 11)$ .
- (b) A circular metal plate expands by heat so that its radius is increasing at the rate of 0.02 cm per second. Find at what rate its area is increasing when the radius is 20 cm.
18. (a) The sum of two numbers is 20. Find the numbers so that the sum of their square is minimum.
- (b) If there is an error of 2% in measuring the side of a square plate, then find the percentage error in its area.

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