



C16-EC/CHPC/PET-102

6028

BOARD DIPLOMA EXAMINATION, (C-16)

OCT/NOV—2018

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

1. Resolve  $\frac{x^4}{(x-2)(x-7)}$  into partial fractions.

2. If  $A = \begin{pmatrix} 9 & 1 \\ 4 & 3 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 5 \\ 6 & 11 \end{pmatrix}$ , then find  $X$  such that  $3A - 5B + 4X = 0$ .

3. If  $A = \begin{pmatrix} \sec & \tan \\ \tan & \sec \end{pmatrix}$ , find  $\det A$ .

4. Prove that  $\sin^2 45^\circ - \sin^2 15^\circ = \frac{\sqrt{3}}{4}$ .

5. If  $x = \frac{1}{2\cos\theta}$ , then show that  $x^2 - \frac{1}{x^2} = 2\cos 2\theta$ .

- \* 6. Express  $\sqrt{3} - i$  in modulus amplitude form.
7. Find the angle between the lines  $2x - y - 3 = 0$  and  $x - y - 2 = 0$ .
8. Find the equation of the line passing through the points  $(1, -2)$  and  $(-2, 3)$ .
9. Evaluate  $\lim_{\theta \rightarrow 0} \frac{1 - \cos 2\theta}{\sin 2\theta}$ .
10. Find  $\frac{dy}{dx}$  if  $y = \sqrt{x} \sec x \log x$ .

**PART—B**

10×5=50

- Instructions :** (1) Answer *any five* questions.  
 (2) Each question carries **ten** marks.  
 (3) All dimensions are in mm.

11. (a) If  $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{pmatrix}$  is a symmetric matrix, then find  $x$ .

(b) Solve the following equations by using Cramer's rule :  
 $x + y + z = 3, x - 2y + 3z = 4$  and  $x + 4y - 9z = 6$

12. (a) Show that  $\frac{\sin^2 A}{\sin A \cos A} = \frac{\sin^2 B}{\sin B \cos B} \tan A = \tan B$ .

(b) If  $\cos^2 x + \cos^2 y + \cos^2 z = 2$ , then show that  $x^2 + y^2 + z^2 = 2xyz$ .

13. (a) Solve  $\cos \theta + \sqrt{3} \sin \theta = 1$ .

(b) In a  $\triangle ABC$  if  $\frac{a}{\cos A} = \frac{b}{\cos B}$  then show that  $\triangle ABC$  is isosceles.

- \* 14. (a) Find the center and radius of the circle  $3x^2 + 3y^2 - 5x - 6y - 4 = 0$ .
- (b) Find the center, lengths of axes, vertices, eccentricity, foci, directrices, latera recta and length of latus rectum of the ellipse represented by  $4x^2 + 9y^2 = 36$ .
15. (a) Find  $\frac{dy}{dx}$ , if  $y = x^{\tan x}$ .
- (b) If  $y = ae^x + be^{-x}$ , then show that  $\frac{d^2y}{dx^2} - y = 0$ .
16. (a) If  $x = a(\sin t)$ , and  $y = a(1 - \cos t)$  find  $\frac{dy}{dx}$ .
- (b) If  $u = \tan^{-1} \frac{x^3 - y^3}{x - y}$ , prove that  $x \frac{du}{dx} - y \frac{du}{dy} = \sin 2u$ .
17. (a) Find the lengths of the tangent, normal, subtangent and subnormal to the curve  $y = x^2 - 3x + 2$  at (2, 3).
- (b) The volume of a cube increases at a rate of  $0.3 \text{ cm}^3 / \text{min}$  at the instant when the edge is 20 cm long. Find the rate at which the surface area changes.
- \* 18. (a) The sum of two numbers is 24. Find the numbers when the sum of their squares is a minimum.
- (b) Find the approximate value of  $\sqrt[3]{127}$ .

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