



C16-EE/CHPP-102

6035

BOARD DIPLOMA EXAMINATION, (C-16)

MARCH/APRIL—2017

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

$$\frac{1}{(x-1)(x-3)}$$

into partial fractions.

2. If

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

then find  $2A - 3B$ .

3. Using Laplace expansion, evaluate the determinant

$$\begin{vmatrix} 8 & 2 & 5 \\ 2 & 1 & 9 \\ 7 & 4 & 12 \end{vmatrix}$$

4. Show that  $\cos^2 15^\circ - \cos^2 75^\circ = \sqrt{3}/2$ .

5. If  $\cos A = 3/5$ , then find  $\cos 2A$ ,  $\sin 2A$ ,  $\cos 3A$ .

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6. Find the <sup>\*</sup> multiplicative inverse and additive inverse of  $(3 - 2i)(1 - 2i)$ .
7. Find the equation of the line passing through the points  $(1, 2)$  and  $(3, 5)$ .
8. Find the angle between the lines  $x - 3y - 1 = 0$  and  $2x - 3y - 5 = 0$ .
9. Evaluate

$$\lim_{x \rightarrow 5} \frac{x^3 - 125}{x - 5}$$

10. Differentiate  $\sin(\log x)$  w.r.t.  $x$ .

**PART—B**

10×5=50

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

11. (a) Prove that

$$\begin{vmatrix} a & b & 2c & a & b \\ & c & b & c & 2a & b \\ & c & a & c & a & 2b \end{vmatrix} = 2(a - b - c)^3$$

- (b) Solve the equations  $x + y + z = 6$ ,  $x - y + z = 2$  and  $2x - y + z = 1$  by Cramer's method.

12. (a) If  $\sin x = \sin y = 3/4$  and  $\sin x = \sin y = 2/5$ , then prove that  $8 \cot((x - y)/2) = 15 \cot((x + y)/2)$ .

- (b) Show that  $\sin^{-1}(3/5) + \sin^{-1}(5/13) = \cos^{-1}(33/65)$ .

13. (a) Solve  $\sqrt{3} \cos x = \sin x = \sqrt{2}$ .

(b) In any triangle  $ABC$ , if  $A = 60^\circ$  then prove that

$$\frac{c}{a} = \frac{b}{a} = \frac{1}{c}$$

14. (a) Find the centre and radius of the circle

$$5x^2 + 5y^2 - 20x - 30y - 1 = 0$$

(b) Find the equation of rectangle hyperbola with focus  $(3, 4)$  and directrix as  $4x - 3y - 1 = 0$ .

15. (a) Differentiate

$$\tan^{-1} \frac{\sin x}{1 - \cos x}$$

w.r.t.  $x$ .

(b) Differentiate  $\sin^m x \cos^n x$  w.r.t.  $x$ .

16. (a) Find all second-order partial derivatives for

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

(b) Differentiate  $\cos^{-1}(4x^3 - 3x)$  w.r.t.  $\sin^{-1} x$ .

17. (a) Find the length of the tangent, normal, sub-tangent and sub-normal to the curve  $y = 2x^2 - 4x + 5$  at the point  $(3, 1)$ .

(b) A particle is moving along a line whose movement is governed by  $S = t^2 - 6t + 8$  ( $t$  in sec). Find the velocity and acceleration at  $t = 2$  sec. Also find the initial velocity.

18. (a) The sum of two numbers is 10. Find them so that the sum of their squares is minimum.

(b) Find approximately the value of  $\sqrt{82}$  using derivatives.

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