



C16-C/CM-102

6017

BOARD DIPLOMA EXAMINATION, (C-16)

SEPTEMBER/OCTOBER - 2020

DCE—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  $\frac{1}{(x-5)(x-7)}$  into partial fractions.

2. If  $A = \begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix}$ , then find  $A^2 - 3A$ .

3. Using Laplace's expansion, find the value of  $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$ .

4. Prove that

$$\frac{\cos 11^\circ \sin 11^\circ}{\cos 11^\circ \sin 11^\circ} \tan 56^\circ$$

5. Prove that

$$\frac{1 - \cos 2A}{\sin 2A} \cot A$$

\*

6. Find the real and imaginary parts of the complex number  $\frac{4 - 2i}{1 - 2i}$ .
7. Find the perpendicular distance of the point (3, -2) to the line  $3x - 4y - 10 = 0$ .
8. Find the point of intersection of the lines  $2x - 4y = 6$  and  $x - 4y = 3$ .
9. Evaluate  $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$ .
10. Find the derivative of  $3 \tan x - 4 \log x - 7x^2$  with respect to  $x$ .

**PART—B**

10×5=50

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

11. (a) Prove that

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

- (b) Using matrix inversion method, solve the equations

$$2x + y + z = 4, \quad x + y + z = 1, \quad x - 3y + 2z = 2$$

12. (a) Prove that

$$\frac{\cos 3A - \cos A}{\sin 3A - \sin A} = \cot 2A$$

- (b) If  $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$ , then prove that  $xyz = -1$ .

13. (a) Solve  $\sin^{-1} \cos \sqrt{2}$ .

- (b) Solve the triangle ABC with  $a = 1, b = 2, c = \sqrt{3}$ .

\* 14. (a) Find the equation of the circle with (5, 1) and (3, 7) as the end points of a diameter.

(b) Find the centre, foci, vertices, eccentricity, length of latus rectum and equations of the directrices of the ellipse  $9x^2 + 25y^2 = 225$ .

15. (a) Find  $\frac{dy}{dx}$ , if  $y = \sin^{-1}(3x - 4x^3)$ .

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

16. (a) If  $y = x^{x^{\dots}}$ , then prove that

$$\frac{dy}{dx} = \frac{y^2}{x(1 + y \log x)}$$

(b) If  $y = \log(e^x + e^y)$ , then show that

$$\frac{z}{x} = \frac{z}{y} + 1$$

17. (a) Find the angles between the curves  $y^2 = 4x$  and  $x^2 = 4y$ .

(b) A particle is moving along a straight line according to the law  $s = 2t^3 - 3t^2 + 15t + 18$  ( $t$  in sec). Find its velocity, when its acceleration is zero.

18. (a) The sum of two numbers is 24. Find the numbers when the sum of their squares is a minimum.

(b) The radius of a spherical balloon is increased by 2%. Find the approximate percentage increase in its surface area.

\*\*\*