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C16-A-AA-BM-CH-CHST-AEI-MNG-  
CHOT-CHPC-EC-C-CM-M-RAC-CHPP-  
EE-PET-MET-TT-IT-PCT-**102**

**6002**

**BOARD DIPLOMA EXAMINATION, (C-16)**

**MARCH/APRIL 2021**

**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  $\frac{1}{(x+1)(x+2)}$  into partial fractions.

2. If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$ , find  $A + A^T$ .

3. If  $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \\ 1 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ , find  $AB$ .

4. Show that  $(\cos A - \sin A)^2 = 1 - \sin 2A$ .

5. Show that  $\cos 70^\circ \cos 10^\circ + \sin 70^\circ \sin 10^\circ = \frac{1}{2}$ .

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6. Find the modulus of  $z = 2 - 3i$ .
7. Find the slope of line joining two points (1, 2) and (2, 1).
8. Find the distance between the two parallel lines  $2x + 3y - 5 = 0$  and  $2x + 3y + 1 = 0$ .
9. Evaluate  $\lim_{\theta \rightarrow 0} \frac{\sin m\theta}{\sin n\theta}$ .
10. If  $y = x^2 + \sin x - \tan x$ , find  $\frac{dy}{dx}$ .

**PART—B**

10×5=50

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

11. (a) Solve the following system of linear equations by using Cramer's rule  $x + y - z = 0$ ,  $2x + y - z = 1$  and  $3x + 2y + 2z = 5$ .

(b) If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$ , show that  $A^2 - 2A - 5I = 0$ .

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

(b) Show that  $\tan^{-1}\left(\frac{3}{4}\right) - \tan^{-1}\left(\frac{5}{12}\right) = \tan^{-1}\left(\frac{16}{63}\right)$ .

13. (a) Solve  $2\sin^2\theta - \sin\theta - 1 = 0$ .

(b) In a  $\Delta ABC$ , show that  $\sin A + \sin B + \sin C = \frac{S}{R}$ .

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14. (a) Find the equation of the circle with centre at (1, 1) and radius 2 units.  
(b) Find the eccentricity, foci, length of major and minor axes, vertices of an ellipse  $\frac{x^2}{16} + \frac{y^2}{9} = 1$ .

15. (a) If  $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots \infty \text{ times}}}}$ , then find  $\frac{dy}{dx}$ .

(b) If  $x = at^2$  and  $y = 2at$ , find  $\frac{dy}{dx}$ .

16. (a) If  $y = Ae^x + Be^{-x}$ , show that  $\frac{d^2y}{dx^2} - y = 0$ .

(b) If  $u = x^2 + y^2$  show that  $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial y^2}$ .

17. (a) Find the lengths of tangents, normal, sub tangent and sub normal to the curve  $y = x^2 + 7x + 4$  at (1, 4).

(b) Find the maximum and minimum values of  $2x^3 - 6x^2 - 18x + 2$ .

18. (a) The radius of a circle is increasing at the rate of 2cm/sec. Find the rate of increase of its area when the radius is 24 cm.

- (b) If there is an error of 1% in measuring the side of a square plate, find the percentage error in its area.

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