



C09-A/AA/AEI/BM/C/CM/CH/CHPC/  
CHPP/CHOT/CHST/EC/EE/IT/M/MET/

MNG/PET/TT/RAC-102  
**3002**

**BOARD DIPLOMA EXAMINATION, (C-09)**

**SEPTEMBER/OCTOBER - 2020**

**FIRST YEAR (COMMON) EXAMINATION**

**ENGINEERING MATHEMATICS—I**

*Time : 3 hours ]*

*[ Total Marks : 80*

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**PART—A**

3×10=30

**Instructions :** (1) Answer **all** questions.

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

1. If  $a \sin x = y$ ,  $b \sin y = z$ ,  $c \sin z = x$ , then find the value of  $2a^2 + b^2 + c^2$  in terms of  $x$ ,  $y$  and  $z$ .

2. Rationalize the denominator of  $\frac{\sqrt{6}}{2 - \sqrt{5}}$ .

3. Resolve  $\frac{1}{(x-3)(x-4)}$  into partial fraction.

4. Prove that

$$\frac{\sin 2A}{1 - \cos 2A} = \tan A$$

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5. Prove that  $\tan(45^\circ - A) \tan(45^\circ + A) = 1$ .
6. Find the amplitude of  $1 - \sqrt{3}i$ .
7. Find the equation of the line with slope  $-1$  and passing through the point  $(-1, 0)$ .
8. Find the centre and radius of the circle  $x^2 + y^2 + 4x + 6y + 1 = 0$ .
9. Evaluate :

$$\lim_{\theta \rightarrow 0} \frac{\sin 4\theta}{\tan 3\theta}$$

10. Differentiate  $\frac{2x + 3}{x + 4}$ .

**PART—B**

10×5=50

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

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

11. (a) Solve the following equations by Cramer's rule :

$$\begin{array}{r} x + 2y + z = 1 \\ 3x + y + 2z = 5 \\ x + y + 3z = 0 \end{array}$$

- (b) Find the inverse of the matrix

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$$

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

$$\cos 2A + \cos 2B + \cos 2C = 1 + 4 \sin A \sin B \cos C$$

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

- \* **13.** (a) Solve  $\cos \theta = \sqrt{3} \sin \theta$     1
- (b) In a  $\triangle ABC$ , prove that  $(b - c) \sin A = 0$ .
- 14.** (a) Find the vertex, focus of the parabola  $x^2 - 2x - 4y - 8 = 0$ .
- (b) Find the equation of the ellipse passing through the points (1, -3) and (-2, 2).
- 15.** (a) Find the equation of the rectangular hyperbola with focus at (1, 2) and directrix  $3x - 4y - 5 = 0$ .
- (b) Reduce the plane equation  $2x - 3y - 4z - 1 = 0$  into the intercept form.
- 16.** (a) Find the derivative of  $x^{\sin x}$ .
- (b) If  $y = \sin^{-1}(3x - 4x^3)$ , find  $\frac{dy}{dx}$ .
- 17.** (a) Find the angle between the curves  $x^2 - y^2 = 8$  and  $x^2 = 2y$ .
- (b) If  $s = 2t^3 - 15t^2 + 36t - 70$ , then find the initial velocity.
- \* **18.** (a) Find the maximum and minimum values of  $2x^3 - 9x^2 - 12x + 15$ .
- (b) If an error of 1% is made in measuring the side of a square plate, find the corresponding percentage error in its area.

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