



C14-A/AA/AEI/BM/CH/CHST/
C/CM/EC/EE/CHPP/CHPC/CHOT/
PET/M/RAC/MET/MNG/
IT/TT/PCT-**102**

4002

**BOARD DIPLOMA EXAMINATION, (C-14)
SEPTEMBER/OCTOBER - 2020
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 $\frac{3x}{(x-2)(x+1)}$ into partial Fractions.

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

3. Prove that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ b+c & c+a & a+b \end{vmatrix} = 0$$

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4. If $A + B = 45^\circ$, prove that $(1 + \tan A)(1 + \tan B) = 2$.
 5. Prove that $\cos^4 A - \sin^4 A = \cos 2A$.
 6. Find the multiplicative inverse of $2 + 3i$.
 7. Find the intercepts made by the line $13x + 7y + 11 = 0$ on the coordinate axes.
 8. Find the equation of the circle with centre at $(-1, 2)$ and having radius 2 units.
 9. Evaluate

$$\text{Lt}_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{2x}$$

10. Differentiate $\frac{2x+3}{5x-2}$ with respect to x .

PART—B

10×5=50

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

11. (a) Find the adjoint of the matrix

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$$A = \begin{bmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 1 & -1 \end{bmatrix}$$

- (b) Solve

$$\begin{aligned} x + y + z &= 6 \\ x + 2y + 3z &= 14 \\ x + 4y + 9z &= 36 \end{aligned}$$

by Gauss-Jordan method.

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 any triangle ABC , prove that

$$a \cos A + b \cos B + c \cos C = \frac{2\Delta}{R}$$

14. (a) Find the equation of the parabola with focus at $(3,1)$ and directrix is $x + y + 1 = 0$.

- (b) Find the eccentricity of the ellipse whose latus rectum is equal to half of the length of major axis.

15. (a) Evaluate

$$\frac{d}{dx} \left(\cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) \right)$$

- (b) If

$$y = x^{\tan x}, \text{ find } \frac{dy}{dx}.$$

16. (a) If $y = \sin(\log x)$, prove that $x^2 y_2 + x y_1 + y = 0$.

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

$$\frac{dz}{dx} + \frac{dz}{dy} = 1$$

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- 17.** (a) Find the lengths of tangent, normal, subtangent and subnormal to the curve $x^2 - y^2 = 9$ at the point (5,4).
- (b) A particle is moving along a straight line according to the law $S = 2t^3 - 3t^2 + 15t + 18$, (t in sec, S is distance). 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 minimum.
- (b) The radius of a spherical baloon is increased by 0.1%. Find the approximate percentage increase in its volume.

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