



C20-A-AA-AEI-CH-CHST-PCT-BM-TT-

IT-MET-MNG-AMT-AMG-WD-CAI-102
7002

BOARD DIPLOMA EXAMINATION, (C-20)

SEPTEMBER/OCTOBER—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. If $A = \{2, 3\}$ and $B = \{a, b, c\}$, then find $A \times B$.
2. Resolve $\frac{1}{(x+3)(x+4)}$ into partial fractions.
3. If $A = \begin{bmatrix} 2 & 3 \\ -3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix}$, then compute $A + B$ and $A - B$.
4. Show that $\tan\left(\frac{\pi}{4} + A\right)\tan\left(\frac{\pi}{4} - A\right) = 1$.
5. Show that $\frac{\sin 2A}{1 - \cos 2A} = \cot A$.
6. Find the modulus and conjugate of $z = 1 - i$.

7. Find the equation of the straight line passing through the point (1, 1) with slope - 1.
8. Evaluate $\lim_{\theta \rightarrow 0} \frac{\tan 5\theta}{\sin 2\theta}$
9. If $y = \cos x + e^x - x^2$, then find $\frac{dy}{dx}$.
10. If $u = x^3 + 3xy^2 + y^3$, then find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.

PART—B

8×5=40

- Instructions :** (1) Answer **all** questions.
 (2) Each question carries **eight** marks.

11. (a) If $i^2 = -1$, then show that $\begin{vmatrix} 1 & i & -i \\ i & -i & 1 \\ -i & 1 & i \end{vmatrix} = 2$.

OR

(b) Solve the following system of linear equations by using Cramer's Rule $x - y + z = 2$, $2x + 3y - 4z = -4$ and $3x + y + z = 8$.

12. (a) Show that $\sin A + \sin(120^\circ + A) + \sin(120^\circ - A) = 0$.

OR

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

13. (a) Solve : $6\sin^2\theta - \cos\theta - 4 = 0$

OR

(b) In a ΔABC , show that $a \cos\left(\frac{B-C}{2}\right) = (b+c) \sin\left(\frac{A}{2}\right)$.

14. (a) Find the equation of the circle with centre (3, -7) and having radius 5 units.

OR

(b) Find the equation of the rectangular hyperbola whose focus is the point (1, -5) and directrix $x + y + 3 = 0$.

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

OR

(b) Find $\frac{d^2y}{dx^2}$, if $ax^2 + 2hxy + by^2 = 1$.

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) It carries **ten** marks.

16. A circular metal plate expands by heat so that its radius increases at the rate of 0.02 cm/sec. At what rate is the surface increasing when the radius is 4 cm.

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