



TED (10) 1002
(Revision-2010)

N20-R01427

Reg.No.....

Signature.....

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE, NOVEMBER-2020**

TECHNICAL MATHEMATICS-I

[Maximum marks: 100]

(Time: 3 Hours)

PART – A

[Maximum marks: 10]

(Answer all questions. Each question carries 2 marks)

I. (1). If $A = \begin{pmatrix} 2 & 3 \\ -1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$ find $2A + B$

(2). Evaluate $\begin{vmatrix} 4 & -2 \\ 2 & 3 \end{vmatrix}$

(3). In how many ways 4 athletes can be chosen out of 10.

(4). State the identity for $\sin(A+B)$ and $\cos(A-B)$

(5). Find the slope of the line determined by the pairs of points (5, -2) and (6, 5).

(5 x 2 = 10)

PART – B

[Maximum marks: 30]

(Answer any **five** of the following questions. Each question carries 6 marks)

II. (1). If $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$, show that $A^2 - 4A - 5I = 0$

(2). Solve using determinants.

$$3x + y - z = 3, -x + y + z = 1, x + y + z = 3$$

(3). Find the middle terms of $\left(x^2 + \frac{2}{x}\right)^7$

(4). If $\sin \theta = \frac{3}{5}$, θ lies in second quadrant. Find all other trigonometric functions.

(5). Show that $\cos 5 - \sin 25 = \sin 35$.

(6). Derive the expression for $\sin 3A$

(7). Find the equation of the line passing through the point of intersection of the lines

$$x - y + 1 = 0 \text{ and } 2x + 3y + 2 = 0 \text{ and parallel to } x + y - 6 = 0$$

(5 x 6 = 30)



PART – C

[Maximum marks: 60]

(Answer one full question from each unit. Each question carries 15 marks)

UNIT – I

III. (a). If $\begin{vmatrix} x^2 & 2 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 8 & 3 \\ 6 & 3 \end{vmatrix}$, find x (5)

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

(c). Solve the system of equations by finding the inverse of the coefficient matrix
 $x-y+z = 4$, $2x+y-3z = 0$, $x+y+z = 2$ (5)

OR

IV. (a). Find the values of a, b, c that satisfy the matrix relationship.

$$\begin{pmatrix} a+3 & 3a-2b \\ 3a-c & a+b+c \end{pmatrix} = \begin{pmatrix} 2 & -7+2b \\ b+4 & 8a \end{pmatrix} \quad (5)$$

(b). If $\begin{vmatrix} 2 & 4 & x \\ 3 & -1 & 2 \\ 1 & 1 & 2 \end{vmatrix} = \begin{vmatrix} 4 & x \\ 3 & 1 \end{vmatrix}$ find x (5)

(c). If $A = \begin{pmatrix} 1 & 2 \\ 4 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 1 \\ 6 & -5 \end{pmatrix}$ show that $(A+B)^T = A^T + B^T$ (5)

UNIT-II

V. (a). Expand $\left(x + \frac{1}{x}\right)^6$ binomially. (5)

(b). Prove that $\frac{\operatorname{cosec} \theta}{\operatorname{cosec} \theta - 1} + \frac{\operatorname{cosec} \theta}{\operatorname{cosec} \theta + 1} = 2 \sec^2 \theta$ (5)

(c). Evaluate $4 \sin^3 \frac{\pi}{3} - 3 \cos \frac{\pi}{6}$ (5)

OR

VI. (a). Find the term independent of x in the expansion of $\left(x^2 - \frac{1}{x}\right)^9$ (5)

(b). Prove that $\sec^2 x + \operatorname{cosec}^2 x = \sec^2 x \cdot \operatorname{cosec}^2 x$ (5)

(c). Prove that $\frac{\tan 45 - \tan 30}{1 + \tan 45 \cdot \tan 30} = 2 - \sqrt{3}$ (5)



UNIT-III

- VII. (a). If $\tan A = \frac{3}{4}$, $\tan B = \frac{5}{12}$, A and B are acute angles, find $\tan (A-B)$ (5)
- (b). Prove that $\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 80^\circ = \frac{1}{8}$ (5)
- (c). If $\sin A = 0.6$, A is acute, find $\sin 2A$ (5)

OR

- VIII. (a). Prove that $\frac{\sin 4A + \sin 2A}{\cos 4A + \cos 2A} = \tan 3A$ (5)
- (b). Prove that $\cos 4\theta = 1 - 8 \sin^2 \theta \cos^2 \theta$ (5)
- (c). Show that $a(b \cos C - c \cos B) = b^2 - c^2$ (5)

UNIT-IV

- IX. (a). Solve ΔABC , given $a = 4\text{cm}$, $b = 5\text{cm}$ and $c = 2\text{cm}$ (5)
- (b). Write down the equation of a line having x intercept 4 and passing through (3, 1) (5)
- (c). A straight line is inclined at an angle 45° with the X axis and it passes through the point (4, -5), find its equation. (5)

OR

- X. (a). Solve ΔABC , given $a = 5\text{cm}$, $c = 8\text{cm}$ and $B = 30^\circ$ (5)
- (b). Show that the straight lines $4x + 2y - 10 = 0$ and $2x - 4y + 15 = 0$ are perpendicular to each other. (5)
- (c). Find the angle between the lines $2x - y + 3 = 0$ and $x - 3y + 4 = 0$ (5)
