TED (10)–1002

(REVISION—2010)

Reg. No.....

Signature .....

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—OCTOBER, 2010

TECHNICAL MATHEMATICS–I

(Common–Except DCP and CABM)

[*Time* : 3 hours

(Maximum marks : 100)

PART—A

(Answer *all* questions. Each question carries 2 marks.)

Marks

I (a) Find the values of a, b, c and d, given that :

$$\begin{bmatrix} 2a & a+3b \\ 5-c & d \end{bmatrix} = \begin{bmatrix} 4 & 11 \\ 7 & 0 \end{bmatrix}$$

(b) Evaluate $\begin{vmatrix} \text{Sin } \theta & \text{Cos } \theta \\ -\text{Cos } \theta & \text{Sin } \theta \end{vmatrix}$

(c) If ${}^{n}c_{12} = {}^{n}c_{13}$, what is the value of n ?

(d) Prove that tan A + cot A = 2 cosec 2A.

(e) Find the angle of inclination of the line joining the points (5, 3) and (–8, 3).

(5×2=10)

PART—B

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

II (a) If $A = \begin{bmatrix} 2 & 3 & ,4 \\ 1 & 2 & 3 \\ -1 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$, find

AB and BA and show that AB ≠ BA.

(b) Solve the following equations using Cramer's rule :

$2x + 3y - z = 5$

$x - 2y + 3z = 6$

$3x - y + 2z = 7.$

(c) Obtain the coefficient of x^{12} in the expansion of : $\left(x^2 - \frac{1}{x^2}\right)^{10}$

Marks

(d) Prove that $\text{Sin}^2 A - \text{Cos}^2 A = 2\,\text{Sin}^2 A - 1 = 1 - 2\,\text{Cos}^2 A$.

(e) If $\text{Sin } A = \frac{4}{5}$ and $\text{Sin } B = \frac{12}{13}$, A and B are acute angles, find $\text{Cos } (A - B)$.

(f) Prove that $\text{Sin } (A + B)\,\text{Sin } (A - B) = \text{Sin}^2 A - \text{Sin}^2 B$.

(g) Express the equation $3x + 4y - 12 = 0$ in (i) Slope-intercept form and (ii) intercept form. Hence find the slope and the intercepts made on the axes.

$(5 \times 6 = 30)$

PART—C

(Answer *four* full questions. Each question carries 15 marks.)

III (a) If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$, find $A^2 - 3A + 5I$. 4

(b) Express the matrix $\begin{bmatrix} 1 & 0 & 5 \\ -2 & 1 & 6 \\ 3 & 2 & 7 \end{bmatrix}$ as the sum of a symmetric and skew-symmetric matrices. 4

(c) Solve the following system of equations using the inverse of the coefficient matrix :

$3x - 2y + 3z = 4$

$2x + y - z = 2$

$4x - 3y + 2z = 3$. 7

OR

IV (a) If $A = \begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 4 \\ 2 & 1 \end{bmatrix}$, verify that $(A + B)^T = A^T + B^T$. 5

(b) Solve for x if $\begin{vmatrix} 1 & 2 & 3 \\ 2 & x & 4 \\ 3 & 4 & 5 \end{vmatrix} = 0$. 3

(c) If $P = \begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$ and $Q = \begin{bmatrix} 4 & 1 \\ 6 & 5 \end{bmatrix}$, verify that $(PQ)^{-1} = Q^{-1} P^{-1}$. 7

V (a) Find the middle terms in the expansion of $\left(x^2 + \frac{2}{x}\right)^7$ 6

(b) Expand $(3x + 2y)^5$. 4

(c) Show that $\text{Sin } 60° \text{ Cos } 30° - \text{Cos } 60° \text{ Sin } 30° = ½$. 5

OR

Marks

VI (a) Find the constant term in the expansion of $\left(x^3 + \frac{3}{x^2}\right)^{15}$. 5

(b) Evaluate $\tan^2 60° + 3 \tan^2 45°$. 4

(c) If $\sin\theta = \frac{-4}{5}$, θ is in the 3rd quadrant, find all other trigonometric functions of θ. 6

VII (a) Prove that $\sin\theta + \sin 3\theta + \sin 5\theta + \sin 7\theta = 4 \cos\theta \cos 2\theta \sin 4\theta$. 6

(b) Prove that $2 \tan 10° + \tan 40° = \tan 50°$. 5

(c) In any triangle ABC, prove that $a^2 + bc = b^2 + c^2$, if $A = 60°$. 4

OR

VIII (a) Prove that $\cos 20° \cos 40° \cos 80° = \frac{1}{8}$. 5

(b) If $A + B = 45°$, show that $(1 + \tan A)(1 + \tan B) = 2$. 4

(c) State and prove Sine rule. 6

IX (a) Solve the triangle with $a = 2$ cm, $b = 3$ cm and $c = 4$ cm. 5

(b) Find the acute angle between the lines $2x - y + 3 = 0$ and $3x - 3y + 4 = 0$. 5

(c) If A (1, –1), B (–2, 1) and C (3, 5) are the vertices of a triangle, then find the equation of the median through B. 5

OR

X (a) Using Napier's formula, find the values of the angles A and B in Δ ABC, if $a = 5$ cm, $b = 8$ cm and $C = 30°$. 5

(b) Find the angles of the triangle having vertices (3, 2), (5, –4) and (1, –2). 5

(c) Show that the three lines are concurrent :

$5x + 2y - 4 = 0$

$2x + 5y + 11 = 0$ and

$3x - 4y - 18 = 0$. 5