TED (10) – 1002 Reg. No. ....

(REVISION — 2010) Signature ....

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — MARCH, 2015

TECHNICAL MATHEMATICS–I

(Common for all branches except DCP and CABM)

[*Time* : 3 hours

(Maximum marks : 100)

PART—A

(Maximum marks : 10)

Marks

I Answer all questions. Each question carries 2 marks.

1. Find the numerical values of $\begin{vmatrix} \sin\theta & \cos\theta \\ -\cos\theta & \sin\theta \end{vmatrix}$.
2. Evaluate $10C_3$.
3. Find the cofactor matrix of $\begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$.
4. If tan A = 2, tan B =1. Find tan (A – B)
5. Find the equation to the line having Y – intercept 2 and slope $\frac{1}{2}$. (5×2=10)

PART—B

(Maximum marks : 30)

II Answer *any five* questions. Each question carries 6 marks.

1. If $A - \begin{bmatrix} 3 & 5 \\ 2 & 7 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ find A.
2. If $nC_{n-2} = 28$. Find n.
3. Solve $5x - y - 3 = 0$, $4x + 2y + 1 = 0$ using determinant method.
4. Prove that $\frac{\sin 3A}{\sin A} + \frac{\cos 3A}{\cos A} = 4\cos 2A$.
5. Find the term independent of x in the expansion of $\left(\sqrt{x} + \frac{2}{x^2}\right)^{10}$.
6. State and prove Projection formula.
7. Find the foot of the perpendicular from the origin to the line $3x - 2y - 13 = 0$.

(5×6=30)

Marks

PART—C

(Maximum marks : 60)

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

UNIT—I

III (a) Solve the system of equations $3x - 2y + 3z = 8$, $2x + y - z = 1$, $4x - 3y + 2z = 4$. 6

(b) If $\begin{bmatrix} 1 & 2 & 3 \\ 2 & x & 4 \\ 3 & 4 & 5 \end{bmatrix} = 0$ find x. 4

(c) If $A = (3 \;\; 0 \;\; 1)$, $B = (0 \;\; 2 \;\; -1)$ find B^TA. 5

OR

IV (a) Find the value of K so that the system $x + 2y - 3 = 0$, $2x + y - 3 = 0$ and $x + y - K = 0$ is consistent. 5

(b) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$ Show that $(AB)^T = B^TA^T$. 5

(c) Find the inverse of $\begin{bmatrix} 4 & 1 \\ 6 & 5 \end{bmatrix}$. 5

UNIT—II

V (a) Find the middle terms in the expansion of $\left(2x + \frac{3}{x}\right)^9$. 5

(b) Prove that $\frac{1 + \sin\theta}{\cos\theta} + \frac{\cos\theta}{1 + \sin\theta} = 2\sec\theta$. 4

(c) Prove that $nC_r = nC_{n-r}$. 3

(d) If $\sin A = \frac{-4}{5}$, A lies in 3rd quadrant. Find all other functions. 3

OR

VI (a) If $20C_{2r+3} = 20C_{r+7}$ find r. 3

(b) If $\tan x = \frac{7}{24}$ and x in the 3rd quadrant, find the value of $3\sin x - 4\cos x$. 5

(c) Prove that $\operatorname{cosec} 2A + \cot 2A = \cot A$. 4

(d) Prove that $\cos A + \cos 2A + \cos 3A = \cos 2A\,(1 + 2\cos A)$. 3

UNIT—III

VII (a) If $X = (3\cos\theta + 4\sin\theta)$ is written in the form $x = R\sin(\theta + \alpha)$. Find R and α. 5

(b) Prove that $\frac{1 + \sin\theta - \cos\theta}{1 + \sin\theta + \cos\theta} = \tan\frac{\theta}{2}$. 5

(c) Prove that in Δ ABC, $(a + b)\sin\frac{C}{2} = C\cos\frac{A - B}{2}$ 5

OR

Marks

VIII (a) Prove that $\cot A - \cot 2A = \operatorname{cosec} 2A$. 5

(b) If $\tan \alpha = \frac{1}{11}$, $\tan \beta = \frac{5}{6}$. Prove that $\alpha + \beta = 45°$. 5

(c) In Δ ABC prove that $R(a^2 + b^2 + c^2) = abc(\cot A + \cot B + \cot C)$. 5

UNIT—IV

IX (a) Derive the equation of a straight line of the form $\frac{x}{a} + \frac{y}{b} = 1$. 5

(b) Find the equation to the straight line passing through (4, 5) which is (1) parallel and perpendicular to the line $2x + 3y - 4 = 0$. 5

(c) Find the point of intersection of the straight lines $y = 4 - x$ and $y = 2x + 3$. 5

OR

X (a) Solve Δ ABC, given a = 3 cm, b = 7 cm, c = 38° using Napier's formula. 5

(b) Prove that lines $2x - 3y = 7$, $3x - 4y = 13$ and $8x - 11y = 33$ are concurrent. 5

(c) Find the equation to the line through the point of intersection of $2x - y - 3 = 0$ and $x - 2y + 1 = 0$ and perpendicular to $x - y = 5$. 5