TED (10)–1002

(REVISION—2010)

Reg. No.....

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FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—MARCH, 2011

TECHNICAL MATHEMATICS — I

(Common—Except DCP and CABM)

[*Time* : 3 hours

(Maximum marks : 100)

PART—A

(Answer all questions. Each question carries 2 marks) (5×1=5)

Marks

I (a) If $A = \begin{bmatrix} 4 & 3 \\ 1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 3 & 2 \end{bmatrix}$ Find A –3B.

(b) If ${}^nC_7 = {}^nC_2$. Find the value of 'n'.

(c) Find the value of Sin 30° . Cos 60° + Cos 30° . Sin 60°.

(d) Evaluate $\frac{2 \tan 15°}{1 + \tan^2 15°}$.

(e) Write down the equation of the line having slope $\frac{1}{2}$ and y–intercept –1. (5×2=10)

PART—B

(Answer any *five* questions. Each question carries 6 marks) (5×1=5)

II (a) Solve using determinants :

$x + y - z = 4$

$3x - y + z = 4$

$2x - 7y + 3z = -6$ (1×8=8)

(b) If $A = \begin{bmatrix} 3 & 1 & 2 \\ -1 & 2 & 3 \\ 2 & -5 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 & 1 \\ 3 & -1 & 2 \\ 4 & 1 & 3 \end{bmatrix}$ be two matrices, find AB and BA. 4

(c) Find the middle terms in the expansion of $\left(2x + \frac{3}{x}\right)^{11}$. 4

(d) Prove that : (i) $(\text{Cot}A - 1)^2 + (\text{Cot}A + 1)^2 = 2\,\text{Cosec}^2 A$.

(ii) $\frac{1 + \text{Sin } A}{\text{Cos } A} = \frac{\text{Cos } A}{1 - \text{Sin } A}$. 4

(e) Evaluate $\tan 22\frac{1}{2}^\circ$ without using tables.

(f) Prove that $\frac{\text{Sin } A + \text{Sin } 3A + \text{Sin } 5A}{\text{Cos } A + \text{Cos } 3A + \text{Cos } 5A} = \tan 3A$.

(g) The vertices of a triangle are A (3, 4) B(5, 6) and C(–1, –2). Find the equation to the median through A. (5×6=30)

Marks

PART—C

(Maximum marks : 60)

(Answer *one* full question from each unit)

UNIT—I

III (a) If $\begin{vmatrix} 2 & 1 & x \\ 3 & -1 & 2 \\ 1 & 1 & 6 \end{vmatrix} = \begin{vmatrix} 4 & x \\ 3 & 2 \end{vmatrix}$, Find 'x'. 4

(b) If A is a square matrix, show that $A + A^T$ is symmetric and $A - A^T$ is skew-symmetric. 5

(c) Solve the following system of equations by finding the inverse of their coefficient matrix :

$$x - y + z = 4$$
$$2x + y - 3z = 0$$
$$x + y + z = 2.$$

6

OR

IV (a) Solve for 'x' if $\begin{vmatrix} 3 & 1 & 9 \\ 2x & 2 & 6 \\ x^2 & 3 & 3 \end{vmatrix} = 0$. 5

(b) If $A = \begin{bmatrix} 0 & 1 & -1 \\ 2 & 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & -2 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 & 0 & -1 \\ 0 & 1 & 2 & 3 \\ 1 & 0 & 1 & 2 \end{bmatrix}$ show that $(A + B)\,C = AC + BC$. 5

(c) Find the inverse of $A = \begin{bmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix}$. 5

UNIT—II

V (a) If ${}^nC_{n-2} = 210$, find the value of 'n'. 4

(b) Find the term independent of x in the expansion of $\left(2x^2 + \frac{1}{x}\right)^{15}$. 6

(c) Prove that $\frac{\sin\theta}{1 + \cos\theta} + \frac{1 + \cos\theta}{\sin\theta} = 2\,\text{Cosec}\,\theta$. 5

OR

VI (a) Expand $\left(x^3 - \frac{1}{x^2}\right)^5$ binomially. 4

(b) Find the coefficient of x^{10} in the expansion of $\left(2x^2 - \frac{3}{x}\right)^{11}$. 5

(c) If $\cot A = \frac{-15}{8}$, A lies in the fourth quadrant, find all other t-functions. 6

Marks

Marks

UNIT—III

II (a) Show that $\tan 15° + \cot 15° = 4$ without using tables. 5

(b) Show that $\text{Sin } 10° \text{ Sin } 50° \text{ Sin } 70° = \frac{1}{8}$. 5

(c) State and prove Napier's formulae. 5

4

OR

II (a) Express $\sqrt{3} \text{ Cos } x + \text{Sin } x$ in the form $R \text{ Sin } (x + \alpha)$. 4

– A^T is 5 (b) Derive expression for Sin 3A and Cos 3A. 6

efficient (c) Prove that :

$bc \text{ Cos } A + ca \text{ Cos } B + ab \text{ Cos } C = \frac{a^2 + b^2 + c^2}{2}$. 5

6

UNIT—IV

X (a) Solve ΔABC given $a = 4$ cm, $b = 5$ cm, $c = 7$ cm. 5

(b) The x-intercept of a line is 3 times its y-intercept. The line passes through (–6, 3). Find its equation. 5

5

(c) Find the value of 'k' for which the lines :

$3x + y - 2 = 0$

show $kx + 2y - 3 = 0$ and

$2x - y - 3 = 0$ are concurrent. 5

5

OR

5 X (a) Solve Δ ABC given :

$a = 87$ cm, $b = 53$ cm and $C = 70°$. 5

(b) Find the equation to the straight line passing through the point of intersection of the lines $2x - y - 3 = 0$ and $x - 2y + 1 = 0$ and :

(i) Parallel and

4 (ii) Perpendicular to the line $x - y = 5$. 6

6 (c) Find the point of intersection of the lines $2x - 3y = 11$ and $3x + 4y = 8$. 4

5

4

5

6