TED (15) – 2002 Reg. No. ....

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

ENGINEERING MATHEMATICS – II

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer all questions. Each question carries 2 marks.

1. Show that the vectors $\bar{a} = 3\bar{i} + 4\bar{j} - 2\bar{k}$ and $\bar{b} = 4\bar{i} + \bar{j} + 8\bar{k}$ are perpendicular.

2. Solve for x if $\begin{vmatrix} 2x & -2 \\ 8 & -4 \end{vmatrix} = 0$

3. If $A = \begin{bmatrix} -1 & 2 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 4 \\ 3 & -1 \end{bmatrix}$. Find $3A - 2B$.

4. Evaluate $\int \sin^4 x \; dx$.

5. Solve $\dfrac{dy}{dx} = 1 + y^2$ (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Prove that the points whose position vectors are $\bar{a} = 2\bar{i} - \bar{j} + \bar{k}$, $\bar{b} = \bar{i} - 3\bar{j} - 5\bar{k}$, $\bar{c} = 3\bar{i} - 4\bar{j} - 4\bar{k}$ form a right angled triangle.

2. Find the middle term (s) in the expansion of $\left[3x \quad x^3/_6\right]^7$

3. Solve the following system of equations by finding the inverse of the coefficient matrix. Given.

   $x+y+z=1, \quad 2x+2y+3z=6, \quad x+4y+9z=3$

4. Express the matrix $A = \begin{bmatrix} 1 & 4 & 5 \\ 2 & 2 & 3 \\ 3 & 1 & 0 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrices.

Marks

5. Evaluate $\int x^2 \log x \, dx$.

6. Find the volume generated by the rotation of the area bounded by the curve $y = 2x^2 + 1$, the Y – axis and the lines $y = 8$, $y = 9$ about the Y– axis.

7. Solve : $\frac{dy}{dx} + y \cot x = \operatorname{cosec} x$. (5×6 = 30)

PART — C

(Maximum marks : 60)

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

Unit — I

III (a) Find the area of the triangle whose vertices are $A\,(\bar{i} - \bar{k})$, $B\,(2\bar{i} + \bar{j} + 5\bar{k})$ and $C\,(\bar{j} + 2\bar{k})$ 5

(b) Find the moment about the point $\bar{i} + 2\bar{j} - \bar{k}$ of a force represented by $\bar{i} + 2\bar{j} + \bar{k}$ acting through the point $2\bar{i} + 3\bar{j} + \bar{k}$. 5

(c) Find the coefficient of x^{32} in the expansion of $\left[x^4 - \frac{1}{x^3}\right]^{15}$ 5

Or

IV (a) Find the projection of $2\bar{i} + 3\bar{j} + 5\bar{k}$ on $\bar{i} + 2\bar{j} - 2\bar{k}$. 5

(b) Find the workdone by a force $\bar{F} = 2\bar{i} + \bar{j} + \bar{k}$ acting on a particle such that the particle is displaced from the point (3, 3, 3) to a point (4, –1, 2). 5

(c) Find the middle term in the expansion of $\left(x - \frac{1}{x}\right)^6$ 5

Unit — II

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

(b) Solve by Cramer's rule

$$x + 2y - z = -3$$
$$3x + y + z = 4$$
$$x - y + 2z = 6$$ 5

(c) If $A = \begin{bmatrix} 1 & 0 & 5 \\ -2 & 1 & 6 \\ 3 & 2 & 7 \end{bmatrix}$ Compute $A + A^T$ and show that $A + A^T$ is symmetric. 5

Or

VI (a) Solve using determinants.

$$x + y - 4z + 8 = 0$$
$$y + z - 4x = 2$$
$$x - 4y + z - 3 = 0$$ 5

Marks

(b) If $A = \begin{bmatrix} 2 & -1 \\ 3 & 0 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 & 1 \\ 1 & 3 & \text{[illegible]} \end{bmatrix}$ verify that $(AB)^T = B^T A^T$ 5

(c) For any matrix 'A' show that $A + A^T$ is symmetric and $A - A^T$ is skew symmetric. 5

Unit — III

VII (a) Evaluate $\int \frac{2 + 3\sin x}{\cos^2 x} dx$. 5

(b) Evaluate $\int \frac{1 + \cos x}{(x + \sin x)^2} dx$. 5

(c) Evaluate $\int_0^{\pi/2} \frac{\sin x}{\sqrt{1 - \cos x}} dx$. 5

Or

VIII (a) Evaluate $\int \frac{2x^4}{1 + x^{10}} dx$. 5

(b) Evaluate $\int x^2 e^x dx$. 5

(c) $\int_1^2 \frac{x^2 + 1}{x^3 + 3x} dx$. 5

Unit — IV

IX (a) Find the area enclosed between the parabola $y = x^2 - x - 2$ and the X- axis. 5

(b) Find the volume of the solid generated by revolving the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ about the X- axis. 5

(c) Solve $(x^2 + 1)\frac{dy}{dx} + 2xy = 4x^2$. 5

Or

X (a) Find the volume of the solid obtained by rotating one arch of the curve $y = \sin x$ about the X- axis. 5

(b) Solve $\frac{dy}{dx} = \frac{xy^2 + x}{x^2 y + y}$ 5

(c) Solve $x\frac{dy}{dx} = 2y + x^4 \quad x^2$. 5