TED (15) 2002B
(Revision - 2015)

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

ENGINEERING MATHEMATICS – II

[Maximum Marks: 75] [Time: 2.15 Hours]

PART-A

(Answer ***any three*** questions in one or two sentences. Each question carries 2 marks)

1. Find a unit vector in the direction of $\vec{a} = 3\hat{\imath} + 2\hat{\jmath} - \hat{k}$
2. Evaluate $\begin{vmatrix} \sec\theta & \tan\theta \\ \tan\theta & \sec\theta \end{vmatrix}$
3. If $A = \begin{bmatrix} 4 & 5 \\ 3 & 6 \end{bmatrix}$ *and* $B = \begin{bmatrix} 0 & 2 \\ -3 & -4 \end{bmatrix}$ Find $(A+B)^T$.
4. Evaluate $\int \sin^2 x\, dx$
5. Solve $\frac{dy}{dx} = 4x + 5$ (3 x 2 = 6)

PART-B

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

II.

1. Find the dot product and angle between the pairs of vectors $\hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ and $3\hat{\imath} - 2\hat{\jmath} + \hat{k}$.
2. Find the coefficient of x^4 in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$.
3. Solve the following system of equations using determinants.
   x +2y – z = -3, 3x + y + z = 4, x – y +2z=6
4. Find the inverse of $\begin{bmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix}$
5. Evaluate $\int_0^{\frac{\pi}{2}} \sin 3x \cos x\, dx$
6. Find the area enclosed between the curve $y = x^2$ and the straight line y = 3x + 4
7. Solve $\frac{dy}{dx} + y\tan x = \sec x$ (4 x 6 = 24)

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PART-C

(Answer ***any of the three units*** from the following. Each full question carries 15 marks)

UNIT I

III.

(a) If $\vec{a} = 5\hat{\imath} - \hat{\jmath} - 3\hat{k}$, $\vec{b} = \hat{\imath} + 3\hat{\jmath} - 5\hat{k}$ $show\ that\ \vec{a} + \vec{b}\ and\ \vec{a} - \vec{b}\ are\ perpendicular\ to\ each\ other.$ 5

(b) Find the area of a triangle whose vertices are A ($\hat{\imath} - \hat{k}$), B($2\hat{\imath} + \hat{\jmath} + 5\hat{k}$), C($\hat{\jmath} + 2\hat{k}$) 5

(c) Expand $(2x+3y)^5$ binomially. 5

OR

IV. (a) Find the middle term in the expansion of $\left(2a - \frac{b}{3}\right)^{12}$ 5

(b) Find the work done by a force $\vec{F} = 2\hat{\imath} + \hat{\jmath} + \hat{k}$ 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 moment of a force represented by $\hat{\imath} + \hat{\jmath} + \hat{k}$, acting through the point $-2\hat{\imath} + 3\hat{\jmath} + \hat{k}$ about the point $\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ 5

UNIT II

V. (a) Find a, b, c if $\begin{bmatrix} a+3 & 3a-2b \\ 3a-c & a+b+c \end{bmatrix} = \begin{bmatrix} 2 & -7+2b \\ b+4 & 8a \end{bmatrix}$ 5

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

(c) Solve $\frac{5}{x} + \frac{2}{y} = 4,\quad \frac{2}{x} - \frac{1}{y} = 7$ by determinant method 5

OR

VI. (a) If $\begin{vmatrix} 4 & 1 & 3 \\ 2x & 3 & 6 \\ x^2 & 1 & 3 \end{vmatrix} = 0$ find x. 5

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

(c) $F\ indA\ and\ B\ if\ A - B = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}\ and\ A + B = \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$ 5

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UNIT III

VII (a) Evaluate (1) $\int_0^1 \frac{1}{1+x^2}dx$ (2) $\int(3x+4)(2x-1)dx$ 5

(b) Evaluate $\int \frac{4\cos x+5}{\sin^2 x}dx$ 5

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

OR

VIII.(a) Evaluate $\int_0^{\pi} \cos^2 2x\ dx$ 5

(b) Evaluate $\int \frac{\sec^2 x}{\sqrt{1-\tan^2 x}}\ dx$ 5

(c) Evaluate $\int_0^2 x^2 log x\ dx$ 5

UNIT IV

IX. (a) Find the area enclosed between one arch of the curve y = sin3x and the x – axis 5

(b) Find the volume generated when the portion of the parabola $y^2 = 4x$ between x =0 and x = 4 revolves about the x – axis . 5

(c) Solve $\frac{dy}{dx} = e^{3x+2y}$ 5

OR

X. (a) 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

(b) Solve $x\frac{dy}{dx} + 3y = 5x^2$ 5

(c) Solve $\frac{d^2y}{dx^2} = \sec^2 x$ 5

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