TED (15) – 2002

(REVISION — 2015)

Reg. No. ....

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SECOND SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — MARCH, 2016

ENGINEERING MATHEMATICS – II

(Common to 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 sum of the vector $\vec{a} = \hat{i} - 2\hat{j} + \hat{k}, \vec{b} = -2\hat{i} + 4\hat{j} + 5\hat{k}, \vec{c} = \hat{i} - 6\hat{j} + 7\hat{k}$.
2. If $\begin{vmatrix} x^2 & 3 \\ 4 & 1 \end{vmatrix} = \begin{vmatrix} 9 & 4 \\ 8 & 5 \end{vmatrix}$, find x.
3. Subtract $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ from $\begin{bmatrix} 8 & 6 \\ 2 & 3 \end{bmatrix}$.
4. Evaluate $\int_0^1 x^3 (x^2 + 1)\, dx$.
5. Find the order and degree of the differential equation
$$\left(\frac{d^3y}{dx^3}\right)^2 + 4\left(\frac{d^2y}{dx^2}\right)^4 + 5\frac{dy}{dx} - 4y = 0.$$ (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Given $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ $\vec{b} = -\hat{i} + 3\hat{j} + 2\hat{k}$. If a unit vector in the direction of $\overrightarrow{3a} + 4\vec{b}$ and $x\hat{i} + y\hat{j} + z\hat{k}$ are equal, find x, y, z.
2. Find the coefficient of x^{18} in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$.
3. Solve the following system of equations using determinants. $2x + 3y + z = 11$ $2x - y + 4z = 13$, $3x + 4y - 5z = 3$.

Marks

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

5. Evaluate $\int_0^{\pi/2} \cos 4x \cos x\, dx$.

6. Find the area of enclosed between the line $2x + y = 1$ and the curve $y = x^2 - 6x + 4$.

7. Solve $\frac{dy}{dx} + y\cot x = 2\cos x$. (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 values of λ so that the two vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $4\hat{i} + 6\hat{j} - \lambda\hat{k}$ are :
(i) Parallel (ii) Perpendicular 5

(b) Find the workdone by the force $\vec{F} = \hat{i} + 2\hat{j} + \hat{k}$ acting on a particle which is displaced from the point with position vector $2\hat{i} + \hat{j} + \hat{k}$ to the point with position vector $3\hat{i} + 2\hat{j} + 4\hat{k}$. 5

(c) Find the middle terms in the expansion of $(x + 2y)^7$. 5

OR

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

(b) A force $\vec{F} = 4\hat{i} - 3\hat{k}$ passes through the point 'A' whose position vector is $2\hat{i} - 2\hat{j} + 5\hat{k}$. Find the moment of force about the point 'B' whose position vector is $\hat{i} - 3\hat{j} + \hat{k}$. 5

(c) If $\vec{a} = 3\hat{i} + 2\hat{j} - 2\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} + \hat{k}$, Calculate :
(i) $(\vec{a} + \vec{b}).(\vec{a} - \vec{b})$ (ii) $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$ 5

UNIT – II

V (a) Solve for x, if $\begin{vmatrix} x+1 & 2 & 3 \\ 1 & x+2 & 3 \\ 1 & 2 & x+3 \end{vmatrix} = 0$. 5

(b) If $A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 3 & 4 \\ -1 & 1 \end{bmatrix}$ compute AB and BA and hence show that $AB \pm BA$. 5

(c) Solve the system of equations by finding the inverse of the coefficient matrix $x - y + z = 4,\ 2x + y - 3z = 0,\ x + y + z = 2$. 5

OR

Marks

VI (a) Find the adjoint of the matrix. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ 5

(b) Solve $\frac{1}{x} - \frac{2}{y} + 1 = 0,\ \frac{3}{x} + \frac{2}{y} = 3$. 5

(c) 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

UNIT – III

VII (a) Evaluate :
(i) $\int \sin^2 x\, dx$ (ii) $\int \frac{x^2 + 2}{x}\, dx$ 3+2

(b) Evaluate $\int_1^e \log x\, dx$ 5

(c) Evaluate $\int_0^1 \frac{1 - 2x}{x^2 - x + 1}\, dx$. 5

OR

VIII (a) Evaluate $\int \frac{\cos 2x}{\cos^2 x \sin^2 x}\, dx$. 5

(b) Evaluate :
(i) $\int \frac{1 + \cos x}{(x + \sin x)^2}\, dx$ (ii) $\int e^x \sec^2(e^x)\, dx$ 3+2

(c) Evaluate $\int_0^{\pi/2} \sqrt{1 + \sin 2x}\, dx$ 5

UNIT – IV

IX (a) Find the area enclosed by the curve $y = x^2$ and the straight line $y = 3x + 4$. 5

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

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

OR

X (a) Find the volume of the solid formed by the revolution of the area bounded by the parabola $y^2 = 25x$, the x-axis and the lines $x = 1$ and $x = 2$ about the x-axis. 5

(b) Solve $\frac{d^2y}{dx^2} = \operatorname{cosec}^2 x$. 5

(c) Solve $\frac{dy}{dx} + \frac{1 + y^2}{1 + x^2} = 0$. 5