TED (15) – 2002

(REVISION — 2015)

Reg. No. ..............................

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# SECOND SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — APRIL, 2017

## ENGINEERING MATHEMATICS - II

(Common to all branches except DCP & 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 length of the vector $3\hat{i} + 4\hat{j} + \hat{k}$.
2. Evaluate $\begin{vmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{vmatrix}$.
3. If $A = \begin{bmatrix} 1 & 2 & 4 \\ 3 & 5 & 7 \\ -1 & 0 & 1 \end{bmatrix}$ Find $3A$.
4. Evaluate $\int 2x + 3e^x + \sin x \, dx$.
5. Solve $\frac{dy}{dx} = 4x + 5$. (5 × 2 = 10)

### PART — B

(Maximum marks : 30)

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

1. (i) Find the value of $\lambda$ so that $\lambda\hat{i} + 2\hat{j} \mp 3\hat{k}$ and $-\hat{i} + 3\hat{j} - 4\hat{k}$ are perpendicular.

   (ii) For the given vectors $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = -\hat{i} + \hat{j} - \hat{k}$ find the unit vector in the direction of $\vec{a} + \vec{b}$.
2. Find the coefficient of $x^{11}$ in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$.
3. Solve the following system of equations using determinants. $x + y - z = 4$, $3x - y + z = 4$, $2x - 7y + 3z = -6$.
4. Find A and B if $2A - B = \begin{bmatrix} 3 & -3 & 0 \\ 3 & 3 & 2 \end{bmatrix}$, and $A + 2B = \begin{bmatrix} 4 & 1 & 5 \\ -1 & 4 & -4 \end{bmatrix}$.
5. Evaluate $\int_0^{\pi/2} \sin 5x \cos 2x \, dx$.
6. Find the area enclosed between the line $2x - y + 3 = 0$ and the curve $y = x^2$.
7. Solve $x(1 + y^2)dx + y(1 + x^2)dy = 0$. (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) Find the area of a triangle whose vertices are $A(\hat{i} - \hat{k})$, $B(2\hat{i} + \hat{j} + 5\hat{k})$, and $C(\hat{j} + 2\hat{k})$. 5

(b) Find the dot product and angle between the pairs of vectors $7\hat{i} - \hat{j} + 11\hat{k}$ and $\hat{i} + \hat{j} + \hat{k}$. 5

(c) Find the term independent of $x$ in the expansion of $\left(x^2 - \frac{1}{x}\right)^9$. 5

OR

IV (a) Find the middle term in the expansion of $(x + 2y)^7$. 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) Find the unit vector perpendicular to the vectors $\hat{i} + \hat{j} + \hat{k}$ and $\hat{i} + 3\hat{j} - \hat{k}$. 5

### UNIT — II

V (a) Find the inverse of $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$. 5

(b) Solve for $x$, if $\begin{bmatrix} x & 2x & 2 \\ x & 3x & 3 \\ 1 & 2 & 2 \end{bmatrix} = 0$. 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 first one is symmetric and the other one is skew symmetric. 5

OR

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

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

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

### UNIT — III

VII (a) Evaluate (i) $\int (\tan x + \cot x)^2\, dx$, (ii) $\int \frac{x^2+3x-2}{x}\, dx$ (3 + 2 = 5)

(b) Evaluate (i) $\int x^2 e^{x^3}\, dx$, (ii) $\int \cot x\, dx$ (3 + 2 = 5)

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

OR



Marks

VIII (a) Evaluate $\int \tan^{-1}x\, dx$. 5

(b) Evaluate $\int_0^{\pi/2} \sin x\, e^{\cos x} dx$. 5

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

### UNIT — IV

IX (a) Find the area bounded by the curve $y = x + \sin x$, the X- axis and the ordinates at $x = 0$ and $x = \frac{\pi}{2}$. 5

(b) Obtain the volume of the solid obtained by rotating one arch of the curve $y = 2\sin 3x$ about the X- axis. 5

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

OR

X (a) Show that the volume of the solid generated when the area bounded by the parabola $y = x^2$, the $x$-axis and the ordinates at $x = 0$ and $x = 2$ is revolved about the $x$-axis is $\frac{32}{5}\pi$ cubic units. 5

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

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