TED (15) – 2002

(REVISION — 2015)

Reg. No. .....

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2017

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. If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$, find $\vec{a} \cdot \vec{b}$.
2. Obtain the third term in $\left(m^2 - \frac{1}{m^4}\right)^6$.
3. Solve for x if $\begin{vmatrix} x & 12 \\ 3 & x \end{vmatrix} = 0$.
4. Evaluate $\int_0^1 \frac{1}{\sqrt{1-x^2}}\, dx$.
5. Find the integrating factor of $\frac{dy}{dx} + y\tan x = \cos^2 x$. $(5 \times 2 = 10)$

PART — B

(Maximum marks : 30)

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

1. 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) $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b})$ and (ii) $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$
2. Find the middle terms in the expansion of $\left(2x + \frac{3}{x}\right)^9$.
3. Solve the following system of equations using determinants.
   $2x - 3y + z = -1$, $4x - y + 3z = 11$, $x + 4y - 2z = 3$.
4. If $A = \begin{bmatrix} 5 & 3 \\ 2 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 5 \\ 4 & 3 \end{bmatrix}$, show that $(AB)^{-1} = B^{-1} A^{-1}$
5. Evaluate $\int_0^2 x^2 e^x dx$.
6. Find the area enclosed by one arch of the curve $y = \sin 3x$ and the x-axis.
7. Solve $\frac{dy}{dx} + 2y\tan x = \sin x$. $(5 \times 6 = 30)$

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 projection of line joining (1,-2,-1) to (3,1,1) on the vector $4\hat{i}-3\hat{j}+12\hat{k}$. 5

(b) A force is represented in magnitude and direction by the line joining the point $A(1,-2,4)$ and $B(5,2,3)$, find the moment about the point (-2,3,5). 5

(c) Expand $\left(x-\frac{1}{x}\right)^6$ binomially. 5

OR

IV (a) The constant forces $2\hat{i}-5\hat{j}+6\hat{k}$, $-\hat{i}+2\hat{j}-\hat{k}$ and $2\hat{i}+7\hat{j}$ act on a particle from the position $4\hat{i}-3\hat{j}-2\hat{k}$ to $\hat{i}+\hat{j}-3\hat{k}$. Find the total workdone. 5

(b) Find the area of the parallelogram having adjacent sides $\vec{a}=3\hat{i}+\hat{j}-2\hat{k}$ and $\vec{b}=\hat{i}-3\hat{j}+4\hat{k}$. 5

(c) Find the constant term in the expansion of $\left(\frac{4x^3}{3}-\frac{3}{2x}\right)^8$. 5

UNIT — II

V (a) Find A and B if $2A+3B=\begin{bmatrix}1 & 2 & -1\\ 2 & 0 & 1\end{bmatrix}$, and $A+2B=\begin{bmatrix}2 & 1 & 0\\ 1 & -1 & 2\end{bmatrix}$. 5

(b) If $A=\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$, show that $A^2-4A-5I=0$ 5

(c) If $\begin{vmatrix}x & 1 & 3\\ 4 & 1 & -1\\ 2 & 0 & 3\end{vmatrix}=\begin{vmatrix}2 & -1 & 1\\ 3 & 0 & 1\\ -1 & 0 & 2\end{vmatrix}$, find x. 5

OR

VI (a) Solve $\frac{2}{x}+\frac{5}{y}=3$, $\frac{6}{x}+\frac{7}{y}=5$ using determinants. 5

(b) Solve the system of equations by finding the inverse of the coefficient matrix $3x+y-z=3$, $-x+y+z=1$, $x+y+z=3$. 5

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

UNIT — III

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

(b) Evaluate $\int \sin^{-1}x\,dx$. 5

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

OR

Marks

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

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

(c) Evaluate $\int \frac{\sin^{-1}2x}{\sqrt{1-4x^2}}\,dx$. 5

UNIT — IV

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

(b) Find the volume of the paraboloid got by rotating the portion of the parabola $y^2 = 4x$ between $x = 0$ and $x = 2$ about the x-axis. 5

(c) Solve $\frac{dy}{dx} + 2y\cot x = \operatorname{cosec} x$. 5

OR

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

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

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