

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 $(m^2 - \frac{1}{m})^6$.
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 × 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 $(2x + \frac{3}{x})^9$.
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 × 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 projection of line joining (1,-2,-1) to (3,1,1) on the vector $4\hat{i} - 5\hat{j} + 12\hat{k}$ 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 $(x - \frac{1}{x})^6$ 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 $2\hat{i} + \hat{j}$ act on a particle from the position $4\hat{i} - 5\hat{j} - 2\hat{k}$ to $\hat{i} + \hat{j} - 3\hat{k}$. Find the total work done. 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 $(\frac{x^3}{3} - \frac{1}{2x})^8$. 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

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 $\frac{d^2 y}{dx^2} = \sec^2 x$. 5

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