

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 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)

I

1. Find the third term in the expansion of $(3x + \frac{1}{x^2})^{15}$
2. Find the inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$
3. Evaluate $\int x^3(x^3 + 1)dx$
4. Find the area under the straight line $y = 2x - 3$ bounded by the X-axis and Solve the ordinates $x = 1$ and $x = 2$
5. Solve $\frac{dy}{dx} = e^{x+y}$

(3 x 2 = 6)

PART-B

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

II

1. Find the area of the parallelogram whose adjacent sides are determined by the vectors $\hat{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\hat{b} = 2\hat{i} - 7\hat{j} + \hat{k}$.
2. Find the moment about the point $\hat{i} + 2\hat{j} - \hat{k}$ of a force represented by $\hat{i} + 2\hat{j} + \hat{k}$ acting through the point $2\hat{i} + 3\hat{j} + \hat{k}$
3. Solve $2x + 3y + z = 11, 2x - y + 4z = 13, 3x + 4y - 5z = 3,$
by Cramer's rule (Method of determinants)
4. Evaluate $\int_0^\infty \frac{(\tan^{-1} 5x)^2}{1+25x^2} dx$

5. Evaluate $\int x^2 e^{-x} dx$

6. Find the volume of the ellipsoid when the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, rotated about X-axis.

7. Solve the differential equation $\frac{dy}{dx} + 2y \cot x = 3x^2 \operatorname{cosec} x$

(4 x 6 = 24)

PART-C

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

UNIT – I

III.

1. If $\hat{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\hat{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, show that $\hat{a} + \hat{b}$ and $\hat{a} - \hat{b}$ are perpendicular to each other (8 Marks)

2. Find the projection of $\hat{i} - \hat{j}$ on the vector $\hat{i} + \hat{j}$ (7 Marks)

Or

IV

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

(8 Marks)

2. Expand $(x^3 - \frac{1}{x^2})^5$ binomially (7 Marks)

UNIT – II

V

1. If $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & 0 & 3 \\ 3 & -1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 2 & 3 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 2 & 3 & -4 \\ 2 & 0 & -2 & -1 \end{bmatrix}$, show that

$A(BC) = (AB)C$ (8 Marks)

2. Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, find $A^3 - 3A^2 + 2I$, where I is the identity matrix.

(7 Marks)

Or

VI

1. Solve $2x + y + z = 1, x - 2y - z = \frac{3}{2}, 3y - 5z = 9$ by finding the inverse of the coefficient matrix. (8 Marks)

2. If $A = \begin{bmatrix} 3 & 4 \\ 8 & 5 \end{bmatrix}, B = \begin{bmatrix} 0 & 8 \\ 8 & 5 \end{bmatrix}$, show that $(AB)^{-1} = B^{-1}A^{-1}$. (7 Marks)

UNIT- III

VII

1. (a.) Integrate $\int \frac{x^2}{x^2+1} dx$

(b.) $\int \frac{x}{x+1} dx$

(4+4=8 Marks)

2. Integrate $\int \frac{e^x(x+1)}{\sin(xe^x)} dx$

(7 Marks)

Or

VIII

1. Integrate $\int \frac{1}{1+\cos x} dx$

(8 Marks)

2. Integrate $\int_0^{\frac{\pi}{2}} \sin^3 x dx$

(7 Marks)

UNIT - IV

IX.

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

(8 Marks)

2. Solve $\frac{d^2y}{dx^2} = \sin^2 x + xe^x$

(7 Marks)

Or

X.

1. Solve $\frac{dy}{dx} = \frac{xy^2+x}{xy^2+y}$

(8Marks)

2. Solve $(1+x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$

(7 Marks)