**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE,APRIL - 2022**

ENGINEERING MATHEMATICS -II

[Maximum Marks:100]   [Time:3 hours]

PART - A
(Maximum marks : 10)

Marks

I.   Answer all the questions in one or two sentences. Each question carries 2 marks.

1.   Find p so that 2i + pj + k and 3i – 2j + 4k are perpendicular.

2.   Solve for x, if $\begin{vmatrix} x & 4 \\ 9 & x \end{vmatrix} = 0$

3.   If A = $\begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}$, B = $\begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$ Evaluate AB

4.   Evaluate $\int_0^1 \frac{1}{1+x^2} dx$

5.   Find integrating factor of $\frac{dy}{dx} + xy = 1$ (5 x 2 = 10)

PART - B
(Maximum Marks: 30)

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

1. Find the unit vector perpendicular to the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ where

    $\vec{a}$ = 2i + j – k, $\vec{b}$ = i – 2j + 2k.

2. Find the middle terms of $\left(x - \frac{3}{x^2} \right)^7$

3. Solve the system of equations by finding the inverse of the coefficient matrix

    3x-y+z = 4, 2x – 7 y +3z = -6, x + y –z = 4

4. Solve for x, if $\begin{vmatrix} 1-x & -1 \\ 2 & 3 & x \\ 0 & -1 & x \end{vmatrix} = 2$

5. Evaluate $\int x^2 \sin x \, dx$

6. Find the area enclosed between two parabolas $y^2 = 4x$ and $x^2 = 4y$

7. Solve x $\frac{dy}{dx}$ + y = x^2 + 1   (5 x 6 = 30)

PART – C
(Maximum marks:45)
(Answer ***one full*** question from each unit. Each full question carries 15 marks.)

UNIT - I

III (a) Find the area of triangle whose vertices are (2,1,-4), (1,-2,1), (3,2-3) (5)

   (b) Find the projection of the vector 2i +j-k on the vector 3i – 4j (5)

   (c) Expand binomially $(3x – 2y)^5$ (5)

OR

IV (a) Find angle between the vectors 2 i + j - 2k and 3i –j +3k. (5)

   (b) Find the moment of the forces 3 i + j and 2 i – 3k about the point whose

     position vector is i + 2j +k acted on a point whose position vector is

     3i – j + k (5)

   (3) Find the term independent of $(5x^2+ \frac{2}{x})^{12}$ (5)

UNIT –II

V (a) Express the matrix $\begin{bmatrix} 2 & -6 & 4 \\ -2 & 1 & 3 \\ 0 & 5 & 4 \end{bmatrix}$ as a sum of symmetric and Skew –

     Symmetric Matrices (5)

   (b) If A +B $=\begin{bmatrix} 2 & 1 \\ -3 & 0 \end{bmatrix}$, A-B $=\begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$ then find A and B (5)

   (c) Solve by Cramer's rule 3x + y – z = 8, 2x +y+4z = 1 , x – y+3 z = -2 (5)

OR

VI (a) If A $=\begin{bmatrix} 2 & 1 \\ 3 & 5 \end{bmatrix}$, B $=\begin{bmatrix} 1 & -2 \\ 2 & 3 \end{bmatrix}$ then verify *(AB)⁻¹ = B⁻¹A⁻¹* . (5)

   (b) If 3 $\begin{bmatrix} a+b & 5 \\ b & 2 \end{bmatrix}+\begin{bmatrix} 1 & -1 \\ -2 & c \end{bmatrix}$ $=\begin{bmatrix} 1 & 14 \\ 4 & 8 \end{bmatrix}$ then find the value of a,b and c (5)

   (c) If A $=\begin{bmatrix} 2 & 1 \\ 3 & -1 \end{bmatrix}$ then prove that $A^2- A – 5I = 0$ (5)

UNIT – III

VII (a) Find $\int \frac{1}{1+sinx}dx$ (5)

   (b) Evaluate $\int_0^{\pi/2} \sqrt{1+ Sin2x}\, dx$ (5)

   (c) Find $\int \frac{2x^2}{1+4x^3}\, dx$ (5)

OR

VIII (a) Find $\int_0^{\frac{\pi}{2}} sinx \sqrt{1 + cosx}\, dx$ (5)

(b) Find $\int cos^3x\, dx$ (5)

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

UNIT –IV

IX (a) Find the volume of the solid generated by revolving one arch of the curve

y = sin3x about the X-axis (5)

(b) Solve $\dfrac{dy}{dx} = \dfrac{xy^2+x}{yx^2+y}$ (5)

(c) Solve $\dfrac{d^2y}{dx^2} = sec^2 x$ (5)

OR

X (a) Find the area bounded by $y^2 = x$ and x =0, x =4, and X -axis (5)

(b) Solve $\dfrac{dy}{dx} + ycotx = 1$ (5)

(c) Solve dy = e^{3x-2y} dx (5)