

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE, APRIL - 2024**

MATHEMATICS - II

[Maximum Marks : 75]

[Time : 3 hours]

PART-A

I. Answer **all** the following questions in one word or sentence. Each question carries 1 mark.

(9x1=9 marks)

		Module Outcome	Cognitive level
1	Evaluate $\begin{vmatrix} 4 & 1 \\ 2 & 3 \end{vmatrix}$.	M1.01	R
2	If $A = \begin{bmatrix} 2 & -1 \\ -3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} -3 & -1 \\ 3 & 2 \end{bmatrix}$, Find A+B	M1.03	U
3	Find the magnitude of the vector $\hat{i} - \hat{j} + 2\hat{k}$.	M2.02	R
4	Find dot product of $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$, $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$	M2.02	U
5	$\int \frac{1}{x} dx = \underline{\hspace{2cm}}$.	M3.01	R
6	Find $\int (\sin x + \cos x) dx$	M3.01	U
7	Find $\int 3 dx$.	M3.01	R
8	Find order and degree of the differential equation. $\left(\frac{d^2y}{dx^2}\right) + 3\left(\frac{dy}{dx}\right)^3 = 5$	M4.02	A
9	Solve $\frac{dy}{dx} = x$.	M4.02	U

PART B

II. Answer **any Eight** questions from the following. Each question carries 3 marks.

(8x3=24 marks)

		Module Outcome	Cognitive level
1	Find value of x for which $\begin{vmatrix} 2 & 3 & 5 \\ 2 & x & 5 \\ 3 & -1 & 2 \end{vmatrix} = 0$	M1.01	R
2	If $A = \begin{bmatrix} 3 & 2 & -1 \\ 4 & 5 & -3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 0 & 3 \\ -1 & 4 \end{bmatrix}$ Find AB.	M1.03	U
3	If $A = \begin{bmatrix} 4 & 1 \\ 3 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$. Show that $(A + B)^T = A^T + B^T$.	M1.03	U
4	Find dot product and angle between the vectors. $\vec{a} = 6\hat{i} - 3\hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} + 2\hat{j} - \hat{k}$	M2.02	R
5	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 and displaces from the position $4\hat{i} - 3\hat{j} - 2\hat{k}$ to $6\hat{i} + \hat{j} - 3\hat{k}$. Find the total work done.	M2.03	U
6	Evaluate $\int \frac{4 \cos x + 5}{\sin^2 x} dx$	M3.02	R

7	Evaluate $\int \frac{1+\cos x}{(x+\sin x)^2} dx$	M3.02	U
8	Evaluate $\int x \cdot \sin x \cdot dx$	M3.02	U
9	Find the area under the straight line $y = 2x + 3$, bounded by X-axis and the ordinates at $x=1$ and $x=3$.	M4.01	A
10	Solve $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$	M4.02	A

PART C

Answer **all** questions from the following. Each question carries 7 marks.

(6x7=42marks)

		Module Outcome	Cognitive level
III	Solve the following system of equation using Cramer's rule $x + 2y - z = -3$, $3x + y + z = 4$ $x - y + 2z = 6$	M1.02	U
OR			
IV	Solve the following system of equation using inverse of coefficient matrix. $5x + 2y = 12$ $3x - 8y = -2$	M1.03	U
V	(a) Find the moment about a point $\hat{i} + 2\hat{j} - \hat{k}$ of a force represented by $\hat{i} + 2\hat{j} + \hat{k}$ acting through the point $2\hat{i} + 3\hat{j} - 3\hat{k}$. (5 marks)	M2.03	A
	(b) Find unit vector in the direction of $\vec{a} = 2\hat{i} + 3\hat{j} + \hat{k}$. (2marks)	M2.02	R
OR			
VI	(a) If the position vectors of two points A and B are $A(3\hat{i} + \hat{j})$, $B(5\hat{i} + 2\hat{j} + \hat{k})$ respectively, Find length of the vector \overline{AB} . (3 marks)	M2.02	R
	(b) Find a unit vector perpendicular to both the vectors $\vec{a} = 4\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} - 2\hat{k}$. (4 marks)	M2.03	U
VII	(a) Find $(\vec{A} + \vec{B}) \times (\vec{A} - \vec{B})$ if $\vec{A} = (\hat{i} + 3\hat{j} + 2\hat{k})$, and $\vec{B} = (2\hat{i} - \hat{j} + \hat{k})$ (4 marks)	M2.03	U
	(b) Find value of p for which $2\hat{i} - 5\hat{j} + 3\hat{k}$ and $3\hat{i} + \hat{j} + p\hat{k}$ are perpendicular. (3 marks)	M2.03	U
OR			
VIII	(a) The position vectors of three points A,B,C are given by $4\hat{i} + 5\hat{j} + 6\hat{k}$, $5\hat{i} + 6\hat{j} + 4\hat{k}$ and $6\hat{i} + 4\hat{j} + 5\hat{k}$ respectively. Find the vectors \overline{AB} , \overline{BC} and \overline{AC} . (4 marks)	M2.02	R
	(b) Prove that $6\hat{i} + 2\hat{j} + 3\hat{k}$ and $\hat{i} + 3\hat{j} - 4\hat{k}$ are perpendicular. (3 marks)	M2.03	R

IX	(a) Find $\int \sin 4x \cdot \cos 2x \cdot dx$	(3 marks)	M3.01	R
	(b) Find $\int \frac{\sec^2 x}{1+\tan x} dx$	(4 marks)	M3.02	U
OR				
X	(a) Find $\int \sec x \cdot dx$	(4 marks)	M3.02	U
	(b) Find $\int_0^1 (x^2 + 2x - 3) dx$	(3 marks)	M3.03	U
XI	(a) Find $\int x^2 \log x \cdot dx$	(4 marks)	M3.02	U
	(b) Find $\int \tan^5 x \cdot \sec^2 x \cdot dx$	(3 marks)	M3.02	U
OR				
XII	(a) Find $\int_0^{\frac{\pi}{2}} \sin^2 x \cdot dx$	(4 marks)	M3.03	U
	(b) Find $\int_0^{\frac{1}{2}} \frac{1}{\sqrt{1-x^2}} dx$	(3 marks)	M3.03	R
XIII	(a) Find area bounded by the curve $y = x^2 - x - 2$ with X-axis.	(4 marks)	M4.01	A
	(b) Solve $\frac{dy}{dx} + 5y = 0$	(3 marks)	M4.02	A
OR				
XIV	(a) Solve $\frac{dy}{dx} + y \cot x = \operatorname{cosec} x$	(5 marks)	M4.02	A
	(b) Solve $dx(1+y^2) = dy(1+x^2)$	(2 marks)	M4.02	A
