

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/  
COMMERCIAL PRACTICE, APRIL - 2023**

**MATHEMATICS - II**

[Maximum marks: 75]

(Time: 3 Hours)

**PART A**

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

**(9 x 1 = 9 Marks)**

		Module outcome	Cognitive level
1	Evaluate $\begin{vmatrix} 3 & 4 \\ -2 & 3 \end{vmatrix}$	M1.01	R
2	Find $A^T$ if $A = \begin{bmatrix} 1 & 3 & 5 \\ 3 & 4 & 2 \\ 2 & 1 & 3 \end{bmatrix}$	M1.03	R
3	Find $\vec{a} + \vec{b}$ if $\vec{a} = 3\hat{i} + 4\hat{j} - 2\hat{k}$ , $\vec{b} = 2\hat{i} - 3\hat{j} - 2\hat{k}$	M2.02	U
4	Find a vector joining (1,2,-3) and (3,1,1)	M2.01	R
5	$\int \sec^2 x \cdot dx = \text{-----}$	M3.01	R
6	Find $\int (2x + 3) dx$	M3.01	U
7	Find $\int x^5 \cdot dx$	M3.01	U
8	Find order and degree of the differential equation $\left(\frac{dy}{dx}\right)^3 + \frac{d^2y}{dx^2} = 1$	M4.02	A
9	Write the formula for finding area included between the curve $y = f(x)$ , X-axis, and the ordinates at $x = a$ and $x = b$	M4.01	R

**PART B**

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

**(8 x 3 = 24 Marks)**

		Module outcome	Cognitive level
1	Solve for x, if $\begin{vmatrix} 3x & 7 \\ 2 & 3 \end{vmatrix} = \begin{vmatrix} 4 & 2 \\ 2 & 2 \end{vmatrix}$	M1.01	U
2	If $A = \begin{bmatrix} 3 & -2 \\ -7 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 \\ 3 & 2 \end{bmatrix}$ , Compute $3A - 5B$ .	M1.03	U
3	If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ , $B = \begin{bmatrix} -1 & 2 \\ 2 & 1 \end{bmatrix}$ , $C = \begin{bmatrix} 3 & -2 \\ 1 & 3 \end{bmatrix}$ Compute $(A+B)C$ .	M1.03	R
4	Find dot product and angle between the vectors. $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + \hat{k}$	M2.02	R
5	Find $\vec{a} \times \vec{b}$ $\vec{a} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} + 4\hat{k}$	M2.02	U
6	Find $\int \sin 2x \cdot \cos 3x \cdot dx$	M3.01	R
7	Find $\int \tan x \cdot dx$	M3.02	U

8	Find $\int \frac{2+\sin x}{\cos^2 x} . dx$	M3.01	R
9	Find area bounded by the curve $y = x + \sin x$ , the X- axis and the ordinates at $x = 0$ and $x = \frac{\pi}{2}$	M4.01	A
10	Solve $\frac{dy}{dx} = 2y$	M4.02	A

### PART C

**Answer all questions. Each question carries seven marks**

**(6 x 7 = 42 Marks)**

		<b>Module outcome</b>	<b>Cognitive level</b>
III	Solve the following system of equation using Cramer's rule $x + y + z = 3, 2x + 3y + z = 6, x - y - z = -3$ (7)	M1.02	U
<b>OR</b>			
IV	Solve the following system of equation using inverse of coefficient matrix $5x - y = 3, 4x + 2y = -1$ (7)	M1.03	U
V	(a) If A,B,C are three points whose position vectors are given by $A(\hat{i} + 3\hat{j} + 2\hat{k}), B(2\hat{i} - \hat{j} + \hat{k})$ and $C(2\hat{i} - 3\hat{j} + 4\hat{k})$ , Find $\overrightarrow{AB} \times \overrightarrow{AC}$ (4)	M2.02	U
	(b) Find the work done in moving an object along the vector $3\hat{i} + 2\hat{j} - 5\hat{k}$ if the force applied is $5\hat{i} + 4\hat{j} + \hat{k}$ . (3)	M2.03	U
<b>OR</b>			
VI	(a) Find a unit vector perpendicular to both $\vec{a} = 2\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 6\hat{i} - 3\hat{j} + 2\hat{k}$ . (5)	M2.02	U
	(b) Prove that $\vec{a} = 3\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = 2\hat{i} + 2\hat{j} - 2\hat{k}$ are perpendicular. (2)	M2.02	U
VII	(a) Find the value of p so that $p\hat{i} + 2\hat{j} + 3\hat{k}$ and $-\hat{i} + 3\hat{j} - 4\hat{k}$ are Perpendicular. (3)	M2.02	R
	(b) Find unit vector in the direction of $\vec{a} + \vec{b}$ if $\vec{a} = 2\hat{i} + 2\hat{j} - 5\hat{k}$ , $\vec{b} = 2\hat{i} + \hat{j} + 3\hat{k}$ (4)	M2.01	R
<b>OR</b>			
VIII	(a) Find moment about the point $\hat{i} - 3\hat{j} + \hat{k}$ of a force $4\hat{i} - 3\hat{k}$ acting through the point $2\hat{i} - 2\hat{j} + 5\hat{k}$ . (5)	M2.03	A
	(b) If the position vector of A is $2\hat{i} - \hat{j} - \hat{k}$ and position vector of B is $-\hat{i} - 3\hat{j} + 3\hat{k}$ . Find $\overrightarrow{AB}$ . (2)	M2.01	R
IX	(a) Evaluate $\int \frac{\sec^2 x}{\sqrt{1-\tan^2 x}} . dx$ (4)	M3.02	U
	(b) Evaluate $\int (x + 1) . (x + 2) dx$ . (3)	M3.01	R
<b>OR</b>			
X	(a) Evaluate $\int_0^4 x\sqrt{x^2 + 9} . dx$ (4)	M3.03	U
	(b) Evaluate $\int x^2 . \log x . dx$ (3)	M3.02	U

XI	(a) Evaluate $\int_1^2 \log x \cdot dx$	(4)	M3.03	U
	(b) Evaluate $\int \cos 4x \cdot \sin 2x \cdot dx$	(3)	M3.02	R
<b>OR</b>				
XII	(a) Evaluate $\int \cos^2 2x \cdot dx$	(3)	M2.01	R
	(b) Evaluate $\int_1^2 \frac{2x+1}{x^2+x+1} dx$	(4)	M2.03	U
XIII	(a) Find the area bounded by the portion of the parabola $y^2 = 4x$ about the X- axis between the ordinates at $x = 0$ and $x = 4$ .	(3)	M4.01	A
	(b) Solve $dy = e^{3x+y} dx$	(4)	M4.02	A
<b>OR</b>				
XIV	(a) Solve $\frac{dy}{dx} + 2y \tan x = \sin x$	(5)	M4.02	A
	(b) Solve $\frac{dy}{dx} = 2$	(2)	M4.02	A

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