DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL - 2025

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 $\begin{vmatrix} sec\theta & tan\theta \\ tan\theta & sec\theta \end{vmatrix}$	M1.01	U
2	Find A + B if $A = \begin{bmatrix} 0 & -2 \\ -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$	M1.03	R
3	Find the difference of the vectors $2\hat{i} + 3\hat{j} + 5\hat{k}$ and $\hat{i} + \hat{j} + \hat{k}$	M2.02	U
4	Evaluate the length of the vector $2\hat{i} - \hat{j} + 2\hat{k}$	M2.02	R
5	Find $\int sinx \, dx$	M3.01	R
6	Find $\int (x^2 + 3) \, dx$	M3.01	R
7	Evaluate $\int_0^1 3x \, dx$	M3.03	U
8	Find the order and degree of $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + 1 = 0$	M4.02	U
9	Solve the differential equation $\frac{dy}{dx} = x^2$	M4.02	A

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 $\begin{vmatrix} x & 12 \\ 3 & x \end{vmatrix} = 0$	M1.01	U
2	If $A = \begin{bmatrix} 3 & 1 & -1 \\ 0 & 1 & 2 \end{bmatrix}$ compute AA^T	M1.02	R
3	Find the inverse of $\begin{bmatrix} 3 & 3 \\ -1 & 2 \end{bmatrix}$	M1.03	U
4	Find $\bar{a} \times \bar{b}$ if $\bar{a} = 2\hat{i} + 2\hat{j} - \hat{k}$ and $\bar{b} = 6\hat{i} - 3\hat{j} + 2\hat{k}$	M2.02	U
5	Find the work done by the force $\bar{F} = \hat{i} + 2\hat{j} + \hat{k}$ acting on a particle which is displaced from the point with position vector $2\hat{i} + \hat{j} + \hat{k}$ to the point with position vector $3\hat{i} + 2\hat{j} + 4\hat{k}$	M2.03	A

6	Find the vector $\overline{PQ}$ and length of $\overline{PQ}$ if P is the point (1,2,3) and Q is the point (3,5,6)	M2.01	U
7	Find $\int \cos^2 x\, dx$	M3.02	U
8	Find $\int x \sin x\, dx$	M3.02	U
9	Evaluate $\int_0^1 \frac{1}{1+x^2} dx$	M3.03	R
10	Solve the differential equation $\frac{dy}{dx} = e^{3x+y}$	M4.02	A

PART C
Answer all questions. Each question carries seven marks

(6 x 7 = 42 Marks)

		Module outcome	Cognitive level
III	Solve the following system of equations by Cramer's rule $x + 2y - z = -3, \quad 3x + y + z = 4, \quad x - y + 2z = 6$ (7 marks)	M1.02	U
	OR		
IV	(a) Find a, b, c if $\begin{bmatrix} a & a+b \\ 2a-c & b+c \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 7 & -2 \end{bmatrix}$ (4 marks)	M1.03	R
	(b) Find $A + A^T$ if $A = \begin{bmatrix} 1 & -1 \\ 2 & -3 \end{bmatrix}$ (3 marks)	M1.03	U
V	(a) Find the dot product of the vectors $2\hat{i} + \hat{j} + \hat{k}$ and $-2\hat{i} + 2\hat{j} - 3\hat{k}$ (2 marks)	M2.02	R
	(b) A force $\overline{F} = 4\hat{i} - 3\hat{k}$ passes through the point A whose position vector is $2\hat{i} - 2\hat{j} + 5\hat{k}$. Find the moment of the force about the point B whose position vector is $\hat{i} - 3\hat{j} + \hat{k}$ (5 marks)	M2.03	A
	OR		
VI	(a) Find a unit vector in the direction of $\overline{a} + \overline{b}$ where $\overline{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\overline{b} = \hat{i} - \hat{j} - 2\hat{k}$ (4 marks)	M2.02	R
	(b) Find $(\overline{a} + \overline{b}) \cdot (\overline{a} - \overline{b})$ if $\overline{a} = \hat{i} + \hat{j} + \hat{k}$ and $\overline{b} = 2\hat{i} - \hat{j} - \hat{k}$ (3 marks)	M2.02	U
VII	(a) Find the value of 'p' if the vectors $2\hat{i} - \hat{j} - \hat{k}$ and $4\hat{i} - p\hat{j} - 2\hat{k}$ are perpendicular. (3 marks)	M2.02	U
	(b) Find a unit vector perpendicular to both the vectors $\overline{a} = \hat{i} - \hat{j} + 2\hat{k}$ and $\overline{b} = -\hat{i} + \hat{j} - \hat{k}$ (4 marks)	M2.02	U
	OR		

VIII	(a) Find $2\bar{a}.\,3\bar{b}$ if $\bar{a} = \hat{\imath} + \hat{\jmath} + \hat{k}$ and $\bar{b} = 2\hat{\imath} - \hat{\jmath} - \hat{k}$. (3 marks)	M2.03	R
	(b) Find the area of the triangle formed by the points A, B, C $\overline{AB} = \hat{\imath} + 2\,\hat{\jmath} + 3\hat{k}$ and $\overline{BC} = -3\hat{\imath} - 2\hat{\jmath} + \hat{k}$. (4 marks)	M2.02	A
IX	(a) Find $\int \frac{1-sinx}{x+cosx}\,dx$. (4 marks)	M3.02	U
	(b) Evaluate $\int_0^{\pi/2} sin2x\,dx$. (3 marks)	M3.03	U
	OR		
X	(a) Find $\int x^2 logx\,dx$. (3 marks)	M3.02	U
	(b) Prove that $\int secx\,dx = log(secx + tanx) + c$. (4 marks)	M3.02	R
XI	(a) Find $\int \frac{3cosx+4}{sin^2x}\,dx$. (4 marks)	M3.02	U
	(b) Evaluate $\int_0^{\pi/2} sinx\,dx$. (3 marks)	M3.03	U
	OR		
XII	(a) Find $\int sin^3 x\, cosx\,dx$. (4 marks)	M3.02	R
	(b) Evaluate $\int_1^2 logx\,dx$. (3 marks)	M3.03	U
XIII	Find the area bounded by the parabola $y = x^2 - x - 2$ and the X – axis. (7 marks)	M4.01	A
	OR		
XIV	Solve $\frac{dy}{dx} + y\,tanx = cos^2x$. (7 marks)	M4.02	A

****