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(Revision- 2021)

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

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 $\begin{vmatrix} \sin x & \cos x \\ -\cos x & \sin x \end{vmatrix}$	M 1.01	U
2	*If* $A = \begin{bmatrix} 0 & 0 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 7 \\ 4 & 8 \end{bmatrix}$, find A + B	M 1.02	U
3	*If* $A = \begin{bmatrix} 1 & 4 & 3 \\ 2 & 1 & 6 \\ -1 & 2 & 0 \end{bmatrix}$, find 3A	M1.02	R
4	Find the vector $\overrightarrow{PQ}$ where P is the point (1,2,3) and Q is the point (3,5,6).	M2.02	U
5	Find the length of the vector $\vec{a} = 2\hat{\imath} - 3\hat{\jmath} + \hat{k}$	M2.02	R
6	Evaluate $\int \sec x \tan x \, dx$	M3.01	R
7	Evaluate $\int e^{2x} dx$	M3.02	U
8	Find the order and degree of the differential equation. $5\frac{d^3y}{dx^3} - 6\left(\frac{dy}{dx}\right)^2 + 4y = 0$	M4.02	R
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	Solve for ‘x’ if $\begin{vmatrix} x & 3 \\ 12 & x \end{vmatrix} = \begin{vmatrix} 4 & 3 \\ 1 & 4 \end{vmatrix}$	M 1.01	U
2	If $A = \begin{bmatrix} 1 & 4 & 3 \\ 2 & 1 & 6 \\ -1 & 2 & 0 \end{bmatrix}$ compute $A + A^T$ and $A - A^T$	M 1.03	R
3	Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$	M1.03	R

4	If $\vec{a} = 2\vec{i} + 2\vec{j} - \vec{k}$ and $\vec{b} = 6\vec{i} - 3\vec{j} + 2\vec{k}$ find $\vec{a}$x$\vec{b}$	M2.02	U
5	Find the values of x, y and z so that $2\hat{i} + 4\hat{j} - z\hat{k} = x\hat{i} + y\hat{j} + 3\hat{k}$	M2.02	R
6	Evaluate $\int \frac{2x}{x^2+1}$ dx	M2.02	U
7	Integrate x e^x with respect to x	M3.02	U
8	Find $\int_0^1 \frac{1}{\sqrt{1-x^2}}dx$	M3.03	R
9	Find the area under the straight line y = 2x + 3 bounded by the X axis and the ordinates at x = 1 and x =3	M4.01	U
10	Solve dx(1+ y^2) = dy (1 + x^2)	M4.02	A

PART C

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

(6x7=42marks)

		Module Outcome	Cognitive level
1	Solve the following system of equations using Cramer's rule x + 2y – z = -3, 3x + y + z = 4, x – y + 2z = 6 **OR**	M 1.02	U
2	Solve 5x + 2y = 4, 2x – y = 7 by finding the inverse of the coefficient matrix.	M1.03	U
3	The constant forces $2\vec{i} - 5\vec{j} + 6\vec{k}$, $-\vec{i} + 2\vec{j} - \vec{k}$ and $2\vec{i} + 7\vec{j}$ act on a particle from the position $4\vec{i} - 3\vec{j} - 2\vec{k}$ to $6\vec{i} + \vec{j} - 3\vec{k}$. Find the total work done. **OR**	M2.03	U
4	If $\vec{a} = 2\vec{i} + 3\vec{j} + 4\vec{k}$, $\vec{b} = -\vec{i} + 3\vec{j} + 2\vec{k}$ find the unit vector in the direction of the vector $3\vec{a}+4\vec{b}$	M2.02	U
5	(i) If $\vec{a} = 2\vec{i} + 3\vec{j} - \vec{k}$, and $\vec{b} = 3\vec{i} - \vec{j} + \vec{k}$ find $\vec{a}.\vec{b}$ (2 marks)	M2.02	R
	(ii) Find the moment about the point $\hat{i} + 2\hat{j} - \hat{k}$ of the force represented by $\hat{i} + 2\hat{j} + \hat{k}$ acting through the point $2\hat{i} + 3\hat{j} + \hat{k}$ (5 marks) **OR**	M2.03	R

6	(i) If $\lvert\vec{a}\rvert = 5$, $\lvert\vec{b}\rvert = 4$, $\vec{a}.\vec{b} = 10$, find the acute angle between $\vec{a}$ and $\vec{b}$ (2 marks) (ii) Find a unit vector perpendicular to the vectors $\hat{\imath} + \hat{\jmath} + \hat{k}$ and $\hat{\imath} + 3\hat{\jmath} - \hat{k}$ (5 marks)	M2.02 M2.02	A A
7 8	(i) Integrate $3x^2 - 4x + 6$ with respect x. (3 marks) (ii) Evaluate $\int x \log x \, dx$ (4 marks) **OR** (i) Find $\int_0^1 \frac{1}{1+x^2} dx$ (3 marks) (ii) Evaluate $\int x \sec(x^2)\tan(x^2) dx$ (4 marks)	M3.01 M3.03 M3.03 M3.02	R R U U
9 10	Evaluate $\int_0^{\pi/2} \frac{\cos x}{1+\sin x} dx$ **OR** Find (i) $\int e^{\tan x} \sec^2 x dx$ (3 marks) (ii) $\int_0^{\pi} cos^2 x \, dx$ (4 marks)	M3.03 M3.02 M3.03	U R R
11 12	Find the area bounded by the curve $y = x^2 + x$ and the x-axis **OR** Solve $\frac{dy}{dx} + y \cot x = 2 \cos x$	M4.01 M4.02	A A

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