TED (21) – 2002 REVISION 2021

FIRST SEMESTER DIPLOMA EXAMINATION IN
ENGINEERING AND TECHNOLOGY
(Common to all Diploma Programmes)

MATHEMATICS II

MODEL QUESTION PAPER – SET-1

Time: 3 hours Maximum Marks: 75

PART A

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

(9 x 1 = 9 Marks)

1	Evaluate $\begin{vmatrix} \sin x & \cos x \\ -\cos x & \sin x \end{vmatrix}$	M1.01	U
2	Find A-B , if $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 0 & -2 \\ -3 & -3 \end{bmatrix}$	M1.03	U
3	If $\vec{a} = i + j + k$, $\vec{b} = 2i - j + 3k$. Find $\vec{a}.\vec{b}$	M2.02	U
4	Find unit vector in the direction of $\vec{a} = 2i + 3j + 4k$.	M2.02	R
5	Evaluate $\int (2x + 3)\, dx$	M3.01	R
6	Evaluate $\int Sec\, x(\sec x + \tan x) dx$	M3.01	R
7	Evaluate $\int_0^1 x\, dx$	M3.03	U
8	Find order and degree of $\left(\frac{d^2y}{dx^2}\right)^3 + \frac{d^3y}{dx^3} + 5\frac{dy}{dx} = y$	M4.02	R
9	Solve $\frac{dy}{dx} = \frac{x}{y}$	M4.02	U

PART B

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

(8 x 3 = 24 Marks)

1	If $\begin{vmatrix} x & 1 & 3 \\ 4 & 1 & -1 \\ 2 & 0 & 3 \end{vmatrix} = \begin{vmatrix} 2 & -1 & 1 \\ 3 & 0 & 1 \\ -1 & 0 & 2 \end{vmatrix}$, Find x.	M1.01	U

2	Find inverse of $\begin{bmatrix} 4 & 1 \\ 6 & 5 \end{bmatrix}$	M1.03	U
3	Find a vector perpendicular to the vectors $\vec{a} = 2i + 3j + 4k$ and $\vec{b} = i + j + k$	M2.02	U
4	Find the angle between the vectors $6i - 3j + 2k$ and $2i + 2j - k$.	M2.02	U
5	Find the work done by a force $\vec{F} = i + 2j + k$ acting on a particle which is displaced from a point with position vector $2i + j + k$ to the point with position vector $3i + 2j + 4k$.	M2.03	U
6	Evaluate $\int \frac{sin^{-1}2x}{\sqrt{1-4x^2}} dx$	M3.02	U
7	Evaluate $\int x.\sin x \ dx$	M3.02	U
8	$\int_0^{\pi/2} \cos 4x . \cos x \, dx$	M3.03	U
9	Obtain the area enclosed between the parabola $y = x^2 - x - 2$ and the X-axis.	M4.01	U
10	Solve $\frac{dy}{dx} = \frac{xy^2+x}{yx^2+y}$	M4.02	A

PART C

Answer all questions. Each question carries seven marks

(6 x 7 = 42 Marks)

III	(a) Solve for 'x' if $\begin{vmatrix} 2 & 1 & x \\ 3 & -1 & 2 \\ 1 & 1 & 6 \end{vmatrix} = \begin{vmatrix} 4 & x \\ 3 & 2 \end{vmatrix}$	M1.01	R
	(b) Find the inverse of the matrix A = $\begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$	M1.03	R
	OR		
IV	.(a) If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{bmatrix}$; $B = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$ Compute AB and BA	M1.03	R
	(b) Find the values of a ,b, c that satisfy the matrix relation $\begin{bmatrix} a+3 & 3a-2b \\ 3a-c & a+b+c \end{bmatrix} = \begin{bmatrix} 2 & -7+2b \\ b+4 & 8a \end{bmatrix}$.		

V	(a) A force $\vec{F} = 4i - 3k$ passes through the point A whose position vector is $2i - 2j + 5k$. Find the moment of the force about the point B whose position vector is $i - 3j + k$. (b). Find area of the triangle formed by O,A,and B when $\overrightarrow{OA} = i + 2j + 3k \; and \; \overrightarrow{OB} = -3i - 2j + k$	M2.03 M2.02	A
	OR		
VI	(a) The constant forces $2i - 5j + 6k, -i + 2j - k \; and \; 2i + 7j$ act on a particle from the position $4i - 3j - 2k \; to \; 6i + j - 3k$. Find the total workdone. (b) Find a unit vector perpendicular to the vectors $i - j + k \; and \; 2i + j - k$.	M2.03 M2.02	
VII	(a) Find angle between $7i - j + 11k \; and \; i + j + k$. (b) Find the value of 'p' so that two vectors $2i - 3j - k \; and \; 4i - pj - 2k$ are perpendicular to each other.	M2.02	R
	OR		
VIII	(a) Find area of a parallelogram whose adjacent sides are determined by the vectors $\vec{a} = i - j + 3k \; and \; \vec{b} = 2i - 7j + k$. (b) Find the dot product of 2i+3j-k and i-2j+4k	M2.02	R
IX	(a) Evaluate $\int_0^{\pi} \frac{1-\sin x}{x+\cos x} dx$. (b) Evaluate $\int_0^{\pi/2} \cos^3 x \; dx$.	M3.03 M3.02	U
	OR		
X	(a) Evaluate $\int \frac{(\tan^{-1} 5x)^2}{1+25x^2} dx$. (b). Evaluate $\int_0^{\pi/2} \sin 2x . \cos x \, dx$.	M3.03	U
XI	(a). Evaluate $\int_0^{3\pi/2} x . \cos 3x \; dx$ (b) Evaluate $\int x^2 \log x \, dx$	M3.03 M3.02	U
	OR		
XII	(a). Prove that $\int \sec x \; dx = \log(\sec x + \tan x) + c$ (b). Evaluate $\int \frac{2x^4}{1+x^{10}} dx$.	M3.02	U

XIII	(a). Find area bounded by the curve $x = y^2 - 2y$, the Y-axis and the abscissae at $y = 1 \ and \ y = 2$	M4.01	A
	(b) Solve $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$	M4.02	
	OR		
XIV	(a). Find the area under the straight line $y = 2x + 3$ bounded by the X-axis and the ordinates $= 1 \ and \ x = 3$.	M4.01	
	(b). Solve $\frac{dy}{dx} + y \cot x = cosec \ x$.	M4.02	A

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MATHEMATICS II

MODEL QUESTION PAPER – SET-2

Time: 3 hours Maximum Marks: 75

PART A

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

(9 x 1 = 9 Marks)

1	Evaluate $\begin{vmatrix} sin\theta & -cos\theta \\ cos\theta & sin\theta \end{vmatrix}$	M1.01	U
2	Subtract $\begin{bmatrix} 5 & 6 \\ -1 & 2 \end{bmatrix}$ from $\begin{bmatrix} 8 & -4 \\ -1 & 0 \end{bmatrix}$	M1.03	R
3	Find the sum of the vectors $\hat{\imath} - 2\hat{\jmath} + 3\hat{k},\ 2\hat{\imath} - 3\hat{\jmath} + \hat{k}\ and - \hat{\imath} + 2\hat{\jmath} - 3\hat{k}$	M2.02	R
4	Find the length of the vector $\hat{\imath} - 2\hat{\jmath} + 2\hat{k}$	M2.02	U
5	Find $\int_0^1 \frac{1}{1+x^2}dx$	M3.03	R
6	Find $\int cosx\ dx$.	M3.01	R
7	Evaluate $\int_0^{\frac{\pi}{2}} sinx\ dx$	M3.03	R
8	Find the order and degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 - 2y = 0$	M4.02	R
9	Find the integrating factor of $\frac{dy}{dx} + \frac{y}{x} = x^2$	M4.02	A

PART B

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

(8 x 3 = 24 Marks)

1	Solve by determinant method. x+2y-z=-3, 3x+y+z=4, x-y+2z=6 .	M1.02	A
2	If A = $\begin{bmatrix} 1 & 0 & 5 \\ -2 & 1 & 6 \\ 3 & 2 & 7 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & -2 & 2 \\ 4 & 0 & 3 \\ 2 & 1 & 1 \end{bmatrix}$ then find 3A +2 B	M1.03	U
3	If A = $\begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$ then show that $A A^{-1} = A^{-1} A = I$	M1.03	U
4	Find a unit vector perpendicular to the vectors $\hat{\imath} + \hat{\jmath} + \hat{k}$ and $\hat{\imath} + 3\hat{\jmath} - \hat{k}$	M2.02	U
5	Find the unit vector in the direction of $2\hat{\imath} + 3\hat{\jmath} - \hat{k}$	M2.02	R
6	If $\vec{a} = 5\hat{\imath} - \hat{\jmath} - 3\hat{k}$, $\vec{b} = \hat{\imath} + 3\hat{\jmath} - \hat{k}$ then show that the vectors $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$ are perpendicular.	M2.02	A
7	Evaluate $\int cos^3 x\, dx$	M3.02	U
8	Find $\int_0^{\frac{\pi}{4}} \frac{sec^2 x}{1+tan x} dx$	M3.03	U
9	Integrate $x^2 e^x$	M3.02	R
10	Solve $\frac{dy}{dx} = \frac{xy^2+x}{yx^2+y}$	M4.02	A

PART C

Answer all questions. Each question carries seven marks

(6 x 7 = 42 Marks)

III	Solve using Cramer's rule x+y-4z=-8, -4x+y+z=2, x-4y+z=-3	M1.02	U
	OR		
IV	**(i)** If $\begin{bmatrix} a & a+b \\ 2a-c & b+c \end{bmatrix} = \begin{bmatrix} 2 & 3 \\ 7 & -2 \end{bmatrix}$, find a,b and c.	M1.03	R
	(ii) Solve 5x+2y=4, 2x-y=7 by finding the inverse of the coefficient matrix	M1.03	U

V	**(i)** Find the values of x, y and z so that $2\,i + 4\,j - z\,k = x\,i + y\,j + 3\,k$	M2.01	R
	(ii) Find the dot product and the angle between the vectors $7\hat{i} - \hat{j} + 11\hat{k}$ and $\hat{\imath} + \hat{\jmath} + \hat{k}$	M2.02	U
	OR		
VI	**(i)** Find the work done by a force $\vec{F} = i + 2j + k$ acting on a particle which is displaced from a point with position vector $2i + j + k$ to the point with position vector $3i + 2j + 4k$	M2.03	U
	(ii) Find value of 'λ' so that $2i - 5j - k$ *and* $3i + \lambda j + k$ are perpendicular.	M2.02	R
VII	**(i)** If $\lvert\vec{a}\rvert = 5$, $\lvert\vec{b}\rvert = 4$, $\lvert\overline{a \times b}\rvert = 10$, find the acute angle between $\vec{a}$ and $\vec{b}$	M2.02	R
	(ii) 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
	OR		
VIII	**(i)** *If* $\vec{a} = 2\,i + 3j - k$ find the length of the vector $\overrightarrow{2a}$	M2.01	R
	(ii) Find the moment about the point $\hat{\imath} + 2\hat{\jmath} - \hat{k}$ of the force represented by $\hat{\imath} + 2\hat{\jmath} + \hat{k}$ acting through the point $2\hat{\imath} + 3\hat{\jmath} + \hat{k}$	M2.03	U
IX	Find **(i)** $\int_0^{\pi/2} (\sin x + \cos x)\; dx$	M3.03	R
	(ii) $\int x^2 \log x dx$	M3.02	R
	OR		
X	. Find **(i)** $\int_0^1 \frac{1}{\sqrt{1-x^2}}$ dx	M3.03	R
	(ii) $\int \frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x} dx$	M3.01	R

XI	**(i)** Find $\int x(x + 1)\, dx$ **(ii)** Evaluate $\int_0^{\frac{\pi}{2}} sin3x \cos x\, dx$ **OR**	M3.01 M3.03	U U
XII	Find **(i)** $\int e^{\tan x} \sec^2 x dx$ **(ii)** $\int \frac{2x+2}{x^2+2x+1} dx$	M3.02 M3.02	U U
XIII	Solve $\frac{dy}{dx} + ycotx = 2cosx$ **OR**	M4.02	A
XIV	Find the area bounded between one arch of the curve y = sinx and the x- axis.	M4.01	A