Q. Code:924832

Reg. No. | | | | | | | | | | | | | |

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2024

First Semester

MA22151 – APPLIED MATHEMATICS-I

(Common to all branches except Marine Engineering)

(Regulation2022)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Solve eigen value problems in matrices.	**3**
CO 2	Apply the basic notion of calculus in Engineering problems and to tackle different geometries.	**3**
CO 3	Perform calculus for more than one variable and its applications in Engineering problems.	**3**
CO 4	Apply definite integrals for design of three-dimensional components.	**3**
CO 5	Evaluate multiple integrals in cartesian and polar coordinates.	**3**

PART- A(20x2=40Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Write down the quadratic form corresponding to the matrix $\begin{pmatrix} 0 & 5 & -1 \\ 5 & 1 & 6 \\ -1 & 6 & 2 \end{pmatrix}$.	**1**	**2**
2.	Find the index and signature of the quadratic form $x_1^2+2x_2^2-3x_3^2$.	**1**	**2**
3.	If the sum of two Eigen values and trace of a 3×3 matrix A are equal, find the value of | A|.	**1**	**2**
4.	Find the Eigen values of $A-5I$ *if* $A=\begin{pmatrix} 1 & 7 & 5 \\ 0 & 2 & 9 \\ 0 & 0 & 5 \end{pmatrix}$.	**1**	**2**
5.	Find the radius of curvature of a curve $y=\log(\sec x)$ at any point (x,y).	**2**	**3**
6.	If $\bar{x}=\frac{c}{a}\cos^3 t, \bar{y}=\frac{-c}{b}\sin^3 t$ is the centre of curvature of a curve, find its evolute.	**2**	**2**
7.	Find the curvature of the straight line at any point on it.	**2**	**2**
8.	Find the envelope of $\frac{x}{a}\cos\theta+\frac{y}{a}\sin\theta=1$, θ *being the parameter*.	**2**	**3**
9.	If x = rcosθ, y = rsinθ, then prove that JJ′ = 1.	**3**	**2**
10.	If $u=f(x-y, y-z, z-x)$, find $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}$.	**3**	**2**

11.	Expand $xy+2x-3y+2$ in powers of $(x-1)$ and $(y+2)$ using Taylor's theorem up to first degree terms.	**3**	**2**	
12.	If u, v, w are functions of x, y, z and $\frac{\partial(u,v,w)}{\partial(x,y,z)}=4$, find the value of $\frac{\partial(2u,2v,2w)}{\partial(x,y,z)}$.	**3**	**2**	
13.	Evaluate: $\int x e^x dx$.	**4**	**2**	
14.	Evaluate: $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} x^2 \sin x dx$.	**4**	**2**	
15.	Evaluate: $\int_0^1 x^2 e^{5x} dx$.	**4**	**2**	
16.	Evaluate: $\int \log x dx$	**4**	**2**	
17.	Evaluate: $\int_2^a \int_2^b \frac{dxdy}{xy}$	**5**	**2**	
18.	Change the order of integration in $\int_0^1 \int_y^{2-y} xy\, dxdy$.	**5**	**2**	
19.	Find the area of a circle of radius 'a' by double integration in polar coordinates.	**5**	**3**	
20.	Evaluate $\int_0^1 \int_0^2 \int_0^3 xyz\, dxdydz$.	**5**	**2**	

PART- B (5x 10=50Marks)

		Marks	CO	RBT LEVEL
21. (a)	Verify Cayley Hamilton Theorem and hence find A^4 if $A=\begin{pmatrix}1&0&0\\1&0&1\\0&1&0\end{pmatrix}$.	**(10)**	**1**	**3**
	(OR)			
(b)	Reduce the quadratic form $x_1^2+2x_2^2+x_3^2-2x_1x_2+2x_2x_3$ into canonical form using orthogonal transformation.	**(10)**	**1**	**3**
22. (a)	Find the center of curvature of the curve $y=x^3-6x^2+3x+1$ at the point (1,-1)	**(10)**	**2**	**3**
	(OR)			

(b)	Find the envelope of the family of straight lines $\frac{x}{a}+\frac{y}{b}=1$ where the parameters a and b are connected by the relation $(i)\,ab=c^2 (ii)\,a+b=c$.	**(10)**	**2**	**3**
23. (a)	Find the Maximum Value of $x^m y^n z^p$ when x +y +z = a.	**(10)**	**3**	**3**
	(OR)			
(b)	**(i)** If $z=f(x+ct)+\varphi(x-ct)$, prove that $\frac{\partial^2 z}{\partial t^2}=c^2\frac{\partial^2 z}{\partial x^2}$.	**(5)**	**3**	**3**
	(ii) If $u=\frac{x}{y}+\frac{y}{z}+\frac{z}{x}$ Find $xu_x+yu_y+zu_z$	**(5)**	**3**	**3**
24. (a)	Using Disk method find the volume of the solid generated by revolving the region between the y-axis and the curve $x=\frac{2}{y},\ 1\le y\le 4$ about the y-axis. Also draw the region and solid of revolution.	**(10)**	**4**	**3**
	(OR)			
(b)	Using Washer method find the volume of the solid generated by revolving the region bounded by $y=\sqrt{x}$ *and* $y=x^2$ about the x-axis. Also draw the region and solid of revolution.	**(10)**	**4**	**3**
25. (a)	Change the order of the integration and hence evaluate $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dydx$.	**(10)**	**5**	**3**
	(OR)			
(b)	By converting into polar coordinates, evaluate $\int_0^a\int_y^a \frac{x}{x^2+y^2}\,dxdy$.	**(10)**	**5**	**3**

PART- C (1x 10=10Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Find the Eigen values and Eigen vectors of $\begin{pmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{pmatrix}$.	**(10)**	**1**	**3**

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