Reg. No.		a

B.Tech. DEGREE EXAMINATION, NOVEMBER 2023

Third Semester

18MAB205T - MATHEMATICS (LE)

(For the candidates admitted from the academic year 2018-2019 to 2021-2022)

Note:								1000		1 1	1 1 1
(i)		Part -	• A should be answered in OMR sh	eet w	ithin first 4	10 m	ıınu	tes and OMR she	eet shoul	d be	handed
410		over to	o hall invigilator at the end of 40 th n	nınute		_					
(ii)		Part -	B & Part - C should be answered	ın ans	wer bookie	ι.					
Time:	3]	hours							Max. N	/Iarl	cs: 100
			$PART - A (20 \times 1 =$	= 20 N	Jarks)				Marks	BL	CO
			Answer ALL Qu								
						Γ2	1	17	1	1	1
	1	 1.	he sum and product of the eiger	1		1	2	1			
	٠.	Find t	he sum and product of the eiger	ı valu	les of $A =$	1	2	1 -			Ŧ
						$\lfloor 0$	0	1			
		(A) :	5, 3	(B)	3, 5						
		(C)		(D)	0, 1						
	2.		rank and index of the QF whose	cano	nical form	ı is	y_1^2	$-2y_2^2$	1	1	1
		(A) Z		(B)			•	-			
		(C) (0, 2						
		(-)		` /							
	3.	The n	number of positive terms in the c	anon	ical form	is c	alle	d	1	1	1
			Signature		Index						
		(C)	Quadratic form	(D)	Positive	defi	nite	e			
					**						1
	4.	Two	of the eigen values of the 3×3	time	s matrix A	A ar	e -	1, 2 and $ A = 4$	4. ¹	1	1
		Find 1	the third eigen value.								
		(A)		(B)	1		- 1				
		(C)	1	0							
									1	1	2
	5.		curvature of the straight line is	(D)	2				1	1	-
		(A)		(B)					16		
		(C)	-1	(D)	U				*	Ta .	
	_	T1		lo ia	ogual to			of its radius	1	1	2
	0.		curvature at any point of the circ		Same			OI Its Tacitus			
			Square Paginragal	` '	Constant	ŀ					
		(C)	Reciprocal	(D)	Constant	L					
	7	The 1	ocus of center of curvature is ca	lled					1	1	2

(B) Evolute

8. A curve which touches each member of a family of the curve is called

(D) Envelope

(B) Envelope

(D) Radius of curvature

(A) Involute

(A) Evolute

(C) Radius of curvature

(C) Circle of curvature

of that family

9.	If rt - s ² >0 and r < 0 at (a, b) then the point is (A) Maximum point (B) minimum point (C) saddle point (D) none of these	1	1	3
10.	If $u = x + y$, where $x = t$, $y = e^t$, then du/dt is (A) e^t (B) t (C) $t + e^t$ (D) $1 + e^t$	1	1	3
11.	The stationary points of $2x^2 - 4x - y^2$ is (A) $(1, 0)$ (B) $(0, 1)$ (C) $(0, -1)$ (D) $(-1, 0)$	1	1	3
12.	If $f(x, y) = e^{xy}$ then $f_{xx}(1, 1)$ is (A) -e (B) -1/e (C) e (D) 1/e	1	1	3
13.	A surface generated by a line which passes through a fixed point and makes a constant angle with a fixed line through the fixed point. (A) Cone (B) Right Circular Cone (C) Cylinder (D) Right Circular Cylinder	1	1	4
14.	A surface generated by a line which intersects a fixed circle and is perpendicular to the plane of the circle is (A) Cone (B) Right Circular Cone (C) Cylinder (D) Right Circular Cylinder	1	1	4
	The centre of the sphere $x^2 + y^2 + z^2 - 2x + 4y - 4z = 0$ (A) (-1, 2, -2) (B) (-2, 4, -4) (C) (2, -4, 4) (D) (1, -2, 2)	1	1	4
16.	The distance between the parallel planes $2x - 2y + z + 3 = 0$ and $4x + 4y + 2z + 5 = 0$ (A) $1/6$ (B) $1/5$ (C) $1/3$ (D) $1/2$	1	1	4
17.	Changing the order of integration in the double integral based on (A) limits (B) function (C) region (D) order	1	1	5
18.	The value of $\int_0^1 \int_0^2 \int_0^3 dx dy dz$ is (A) 2 (B) 4 (C) 6 (D) 0	1	1	5
19.	The curve y²=4x is a (A) Straight line (B) Parabola (C) Ellipse (D) Hyperbola	1	1	5
20.	Evaluation of $\int_0^1 \int_0^1 dx dy$ (A) 1 (B) 2 (C) 3	1	1	5

PART - B (5 × 4 = 20 Marks) Answer ANY FIVE Questions

Marks BL CO

- 21. If 3 and 2 are the eigen values of the matrix $A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$ find the eigen values of A^{-1} and A^{3} .
- 22. Determine the nature of the quadratic form $x_1^2 + 3x_2^2 + 6x_3^2 + 2x_1x_2 + 2x_2x_3 + 4x_1x_3$ without reducing them to canonical form.
- 23. Find the envelop of the family of straight lines $y = mx + \sqrt{a^2m^2 + b^2}$, where m is the parameter.
- 24. Find $\frac{dy}{dx}$, if $3x^2 + xy y^2 + 4x 2y + 1 = 0$.
- 25. Find the Taylor series expansion of e^x cos y at the point (0, 0) up to second degree terms.
- 26. Find the equation of the right circular cone with origin as vertex and the axes of coordinates as its three generators.
- 27. Evaluate $\int_0^{\pi} \int_0^{a \sin \theta} r \, dr \, d\theta$.

PART – C $(5 \times 12 = 60 \text{ Marks})$ Answer ALL Questions

Marks BL CO

- 28. a. Verify the Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence find A^4 .
 - b. Reduce the quadratic form $2x_1^2 + 6x_2^2 + 2x_3^2 + 8x_1x_3$ to canonical form by orthogonal reduction. Find also the nature of the quadratic form.
- 29. a. Find the evolutes of the parabola $y^2 = 4ax$.
 - b. Find the circle of curvature of the curve $\sqrt{x} + \sqrt{y} = 1$ at the point of $\left(\frac{1}{4}, \frac{1}{4}\right)$

30. a. A rectangular box open at the top, is to have a volume of 32 cc. Find the dimensions of the box, that requires the least material for its construction.

(OR)

- b. Find the Taylor series expansion of $x^2 + y^2 + 2x^2y + 3xy^2$ at the point (-2,1) upto second degree terms.
- 31. a. Find the equation of the sphere passing through the points (1,1,-1), (-5,4,2), (0,2,3) and having its centre on the plane 3x+4y+2z=6.

(OR)

- b. Find the equation of the right circular cylinder whose axis is $\frac{12}{3} = \frac{x-1}{2} = \frac{y-3}{2} = \frac{z-5}{-1}$ and radius 3.
- 32. a. Evaluate $\int_0^2 \int_1^3 \int_1^2 xy^2 z \, dz \, dy \, dx$.

(OR)

b. Change the order of integration in the integral $\int_0^4 \int_{\frac{x^2}{4}}^{2\sqrt{x}} dy \, dx$.
