

JAMIA HAMDARD
Department of Computer Science & Engineering
School of Engineering Sciences & Technology
Odd Semester Examination-2024

Paper Name: Mathematics-I
 Paper Code: BTCSE-102/BTCSEAI-102/BTECE-102

Maximum Marks: 60
 Time: 2.5 Hour

NOTE: Programmable calculator is not allowed.

PART -A

(All questions are compulsory)

(4 X 5 = 20)

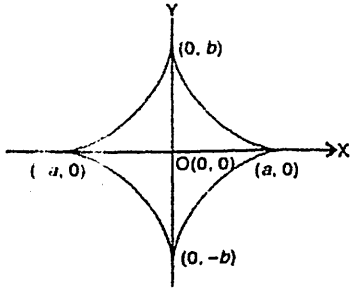
S.No	Questions	Marks	CO	BL
Q.1	Find the rank of the matrix $A = \begin{bmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{bmatrix}$ by reducing it into Echelon form.	5	CO1	L3
Q.2	Find the directional derivative of the function $f(x, y, z) = 2xy + z^2$ at the point $P_0 = (1, -1, 3)$ in the direction of the vector $V = i + 2j + 2k$.	5	CO5	L4
Q.3	Verify the Mean Value Theorem for the function $f(x) = (x-1)(x-2)(x-3)$ on $[0, 4]$.	5	CO3	L3
Q.4	Show that $\int_0^{\frac{\pi}{2}} \sqrt{\cot(\theta)} d\theta = \frac{\pi}{\sqrt{2}}$.	5	CO4	L4

PART - B

(Attempt any Four Questions out of Six)

(4 X 10 = 40)

S. No	Questions	Marks	CO	BL
Q.1	Test the consistency of the following system of linear equations. If the system is consistent then find its (general) solution. $\begin{aligned} 3x - 3y + 6z &= 6 \\ 5x - 8y + 13z &= 7 \\ x + 2y - z &= 5. \end{aligned}$	10	CO1	L4
Q.2	Diagonalize the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$.	10	CO2	L3
Q.3	(i) If $u = \log\left(\frac{x^4 + y^4}{x + y}\right)$ then show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$. (ii) Find the equation of tangent plane and normal line to the surface $f(x, y, z) = x^2 + y^2 + z - 9$ at the point $P_0 = (1, 2, 4)$.	10	CO5	L3
Q.4	Using Lagrange's Method of Multipliers, minimize the function $f(x, y, z) = xy + 2yz + 2zx$ subject to $xyz = 32$.	10	CO5	L4

Q.5	Determine the volume of the solid of revolution generated by revolving the hypocycloid $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = 1$ about the x-axis. 	10	CO4	L5
Q.6	(i) Show that $\lim_{x \rightarrow 0} \left(\frac{a^x + b^x + c^x}{3} \right)^{\frac{1}{x}} = (abc)^{\frac{1}{3}}$. (ii) Expand the function $f(x) = e^x \cos(x)$ about $a=0$ using Macluarin's series.	10	CO3	L4

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3- Applying, 4- Analyzing, 5- Evaluating, 6- Creating)

CO-Course Outcomes

*****End of Paper*****