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Roll. No.:....60..... Name:.....Sanjeeb J.....

GOVERNMENT COLLEGE OF ENGINEERING, KANNUR

S1: FIRST SEMESTER B-TECH DEGREE (2024 Admns)

Time: 1.5 hrs **FIRST SERIES TEST : NOV 2024** Max. Marks: 30

BRANCH: CS

GAMAT 101: MATHEMATICS FOR INFORMATION SCIENCE - 1

Course Outcome. Student will be able to:
CO2: Calculate the limits for functions of two variables and partial derivatives of multivariable functions

PART A

Answer ALL Questions (Each question carries 3 marks: **4 x 3 = 12 marks)**

1	Find the slope of the surface $z = x^2y + 5y^3$ in the x direction at (1, -2)	[CO 2]
2	Find the first and second order partial derivatives of $z = x^3 + y^3 - 3xy$	[CO 2]
3	If $z = e^x \sin y$, prove that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$	[CO 2]
4	Find $\frac{dz}{dt}$ using chain rule when $z = xy$ with $x = \cos t$ and $y = \sin t$	[CO 2]

PART B

Answer any ONE Full question from each module
(Each question carries **9** marks: **2 x 9 = 18marks)**

Module II

5	a)	If $z = \log(x^2 + y^2)$, prove that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$	[CO 2] 5 marks
	b)	Find $\frac{dw}{dt}$ if $w = xy + z$, $x = \cos t$, $y = \sin t$, $z = t$. Also find $\frac{dw}{dt}$ at $t = \frac{\pi}{2}$	[CO 2] 4 marks
		OR	
6	a)	Find the slopes of the sphere $x^2 + y^2 + z^2 = 14$ in the y direction at the points (1,2,3) and (1,2,-3)	[CO 2] 4 marks
	b)	Suppose that $w = \sqrt{x^2 + y^2 + z^2}$, $x = \cos\theta$, $y = \sin\theta$, $z = \tan\theta$. Use chain rule to find $\frac{dw}{d\theta}$ at $\theta = \frac{\pi}{4}$	[CO 2] 5 marks
		Module II	
7	a)	Find the rate of change of $z = \frac{1}{x+y}$ with respect to x at the point (-1,4) with y held fixed.	[CO2] 4 marks

	b)	If $u = x^2 + y^2$, $x = r - s$, $y = r + s$, find $\frac{\partial u}{\partial r}$ and $\frac{\partial u}{\partial s}$	[CO2] 5 marks
		OR	
8	**a)**	If $z = \text{Log}(x^2 + xy + y^2)$, prove that $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = 2$	[CO2] 5 marks
	b)	Find the rate of change of $z = \sin(y^2 - 4x)$ with respect to y at the point (3,1) with x held fixed.	[CO2] 4 marks

7	a)	Find the relative minima of $f(x,y) = 3x^2 - 2xy + y^2 - 8y$	[CO3] 5marks
	b)	Find $\frac{dy}{dx}$ from $y = \sqrt{3x^2 + 4x + 5}$ at $x = 1$	[CO1] 4 marks
		OR	
8	a)	If $u = f(y-z, z-x, x-y)$, show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.	[CO3] 5 marks
	b)	At what points the function $f(x) = \frac{x+1}{x^2-4x+3}$ is continuous	[CO1] 4 marks

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GOVERNMENT COLLEGE OF ENGINEERING, KANNUR

S1: FIRST SEMESTER B-TECH DEGREE (2024 Admns)

Time: 1.5 hrs **SECOND SERIES TEST : DEC 2024** Max. Marks: 30

BRANCH: CS

GAMAT 101: MATHEMATICS FOR INFORMATION SCIENCE - 1

Course Outcome: Student will be able to

CO1: Apply various concepts in calculus to linearize function and to analyze concavity

CO3: Interpret Directional derivative and solve maxima minima of multivariable functions

PART A

Answer ALL Questions (Each question carries 3 marks: **4 x 3 = 12 marks**)

1	Find the slope of the curve $y = x^2 + 5x + 7$ at the point $x = 3$	[CO 1]
2	Find $\lim_{x \to 5} \frac{x^2 - 25}{x - 5}$	[CO 1]
3	Find the critical points of $f(x,y) = x^2 - 2xy + 2y$	[CO 3]
4	Find the critical points of $f(x,y) = x^2 + y^2 - 2x - 6y + 14$	[CO 3]

PART B

Answer any ONE Full question from each module

(Each question carries 9 marks: **1 x 9 = 9marks**)

Module I

5	a)	Find the equation of the tangent and normal lines to the curve $y = x^2$ at the point (1,1).	[CO 1] 5 marks
	b)	Find the limit $\lim_{x \to \infty} \frac{4x^3+5x^2+6x+7}{7x^3+6x^2+5x+4}$	[CO 1] 4 marks
		OR	
6	a)	Find the instantaneous rate of change of $f(x) = 5x^3 + 7x^2 + 9x + 11$ at $x = 1$	[CO 1] 4 marks
	b)	Linearize $f(x) = \sin x$ at $x = \frac{\pi}{4}$	[CO 1] 5 marks

Module III