BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2024)

CLASS: IMSc **SEMESTER : II**
BRANCH: MATHEMATICS AND COMPUTING **SESSION : SP/2024**

SUBJECT: MA105R1 CALCULUS II

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Find the center and radius of the circle $x^2 + y^2 + z^2 - 8x + 4y + 8z - 45 = 0,\ x - 2y + 2z - 3 = 0.$	[5]	CO1	
Q.2(a)	Prove that the points $(1, 2, 3), (-2, 3, 4)$ and $(7, 0, 1)$ are collinear.	[2]	CO1	
Q.2(b)	If the angle θ between the line $\frac{x+1}{1} = \frac{y-1}{2} = \frac{z-2}{2}$ and the plane $2x - y + \sqrt{\lambda}\, x + 4 = 0$ is such that $sin\,\theta = \frac{1}{3}$, find the value of λ.	[3]	CO1	
Q.3(a)	Find the equation of the right circular cylinder with radius 5 and axis as $\frac{x-4}{2} = \frac{y-3}{-1} = \frac{z-2}{2}$	[2]	CO1	
Q.3(b)	Find the equation of the tangent plane to the sphere $x^2 + y^2 + z^2 - 4x + 2y - 6z + 5 = 0$, which is parallel to the plane $3x + 2y - 2z = 0$.	[3]	CO1	
Q.4(a)	Use a double integral to determine the area of the region bounded by $y = 1 - x^2$ and $y = x^2 - 3$.	[2]	CO2	
Q.4(b)	Use a triple integral to determine the volume of the region below $z = 5 - xy$ and above the region in the xy-plane defined by $0 \le x \le 3$, $0 \le y \le 2$.	[3]	CO2	
Q.5(a)	Evaluate by changing the order of integration of the double integral $\int_0^1 \int_x^1 e^{y^2} dy\, dx$	[5]	CO2	

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