BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

CLASS: IMSc **SEMESTER : II**
BRANCH: MATHEMATICS AND COMPUTING **SESSION : SP/2025**

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 equation of the sphere whose centre is $(1,1,1)$ and which passes through the point $(2,0,3)$.	[2]	CO1	
Q.1(b)	Let the line passing through the points $(-1,2,1)$ and parallel to the line $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z}{4}$ intersect the line $\frac{x+2}{3}=\frac{y-3}{2}=\frac{z-4}{1}$ at the point P. Then find the distance of P from the point $Q(4,-5,1)$.	[3]	CO1	
Q.2(a)	Find the equation of the right circular cylinder with radius 4 and axis as $\frac{x-4}{2}=\frac{y-3}{-1}=\frac{z-2}{2}$.	[2]	CO1	
Q.2(b)	If the image of the point $P(1,-2,3)$ in the plane $2x+3y-4z+22=0$, measured parallel to the plane $\frac{x}{1}=\frac{y}{4}=\frac{z}{5}$ *is* Q. Then find the length of PQ.	[3]	CO1	
Q.3	Evaluate $\iint 5x^3\cos(y^3)dxdy$, where D is the region bounded by $y=2$, $y=\frac{x^2}{4}$ and the y-axis.	[5]	CO2	
Q.4(a)	Evaluate by changing the order of integration of the double integral $\int_0^a\int_x^a(x^2+y^2)dy\,dx$.	[2]	CO2	
Q.4(b)	Find the volume of the region below $z=4-xy$ and above the region in the xy-plane defined by $0\le x\le 2,\ 0\le y\le 1$.	[3]	CO2	
Q.5(a)	Find a unit normal to the surface $x^2y+2xz=4$ at $(2,-2,3)$.	[2]	CO3	
Q.5(b)	Given $\phi=2x^3y^2z^4$. Find $div\ (grad\ \phi)$ and show that $div\ (grad\ \phi)=\nabla^2\phi$.	[3]	CO3	

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