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

CLASS: BSC (H) **SEMESTER : I**
BRANCH: MATHEMATICS AND COMPUTING **SESSION : MO/2025**

SUBJECT: MA25105 CALCULUS - I

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 n[th] derivative of $\frac{1}{x+1}$.	[2]	1	1,2
Q.1(b)	If $y=\cos(m\sin^{-1}x)$, prove that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}+(m^2-n^2)y_n=0$	[3]	1	2
Q.2(a)	State the generalized mean value theorem.	[2]	1	1
Q.2(b)	Expand $f(x)=\sin x$ about the point $x=0$.	[3]	1	2
Q.3(a)	Explain convexity and concavity of the function of single variable.	[2]	1	1
Q.3(b)	For what values of x, the following expression is maximum and minimum respectively. $2x^3-21x^2+36x-20$.	[3]	1	3
Q.4(a)	Define asymptote.	[2]	2	1
Q.4(b)	Find the asymptotes of the cubic equation $x^3-2y^3+xy(2x-y)+y(x-y)+1=0$.	[3]	2	3
Q.5(a)	Define radius and centre of curvature at a point.	[2]	2	2
Q.5(b)	Find the radius of curvature at the point (x,y) on the curve $y=a\log\sec\left(\frac{x}{a}\right)$.	[3]	2	3

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