SHRI RAMSWAROOP MEMORIAL UNIVERSITY

End Semester Examination (2021-22)-Odd Semester

B. Sc. – I Year (I Sem)	
Course Name: Calculus-I	**Code: BMA1005**
Time: 02 Hours	**Max Marks: 60**

University Roll No.															
(To be filled by the Student)															

Note: Please read instructions carefully:

a) *The question paper has 03 sections and it is compulsory to attempt all sections.*

b) *All questions of Section A are compulsory; questions in Section B and C contain choice.*

Section A: Very Short Answer type Questions **Attempt all the questions.**		**BL**	**CLO**	**Marks (10)**
1.	Evaluate $\lim_{n\to\infty} \log \frac{2n}{2n+3}$.	BL5	CLO1	02
2.	State Taylor's theorems with Cauchy's forms of remainder.	BL1	CLO2	02
3.	Find the nth derivative of $y = \sin(2x+3)$.	BL3	CLO2	02
4.	Find the radius of curvature at any point of $s = 4a\sin\psi$ (cycloid).	BL3	CLO4	02
5.	Can the function $f(x) = \sqrt{x}$ be expanded in ascending powers of x by Maclaurin's theorem.	BL4	CLO2	02
Section B: Short Answer Type Questions. **Attempt any 03 out of 05 questions.**		**BL**	**CLO**	**Marks (30)**
1.	Verify Cauchy mean value theorem for the functions $f(x) = x^2$ and $g(x) = x^4$ in the interval [0,1].	BL4	CLO2	10
2.	If $u = u\left(e^{y-z}, e^{z-x}, e^{x-y}\right)$, prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0.$	BL5	CLO3	10
3.	If $u = \log\left(\frac{x^2+y^2}{x+y}\right)$, find the value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}.$	BL3	CLO3	10
4.	Discuss the applicability of Rolle's theorem to the function $f(x) = x^2 + 1, \quad when\ 0 \le x \le 1$ $= 3 - x, \quad when\ 1 < x \le 2$	BL4	CLO2	10
5.	Show that the chord of curvature through the pole of the equiangular spiral $r = ae^{\theta\cos\alpha}$ is $2r$.	BL3	CLO4	10

Section C: Long Answer Type Questions. **Attempt any 01 out of 04 questions.**		**BL**	**CLO**	**Marks (20)**
1.	Discuss the differentiability of the function $f(x)=\|x-1\|+\|x-2\|$ in the interval [0, 3].	BL4	CLO1	20
2.	Find the first four terms of the expansion of the function $e^x \log(1+y)$ in Taylor's series in the neighbourhood of the point (0, 0).	BL4	CLO3	20
3.	Evaluate the shortest distance from the point $(1,2,-1)$ to the sphere $x^2+y^2+z^2=24.$	BL5	CLO3	20
4.	If $y=\left[x+\sqrt{1+x^2}\right]^m$, prove that: $(1+x^2)y_{n+2}+(2n+1)xy_{n+1}+(n^2-m^2)y_n=0.$ Hence find (y_n) at $x=0.$	BL5	CLO2	20
