Sanjay Ghodawat University, Kolhapur

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

Year and Program: 2020-21 B.Sc.I | **School of Science** | **Department of Mathematics**

Course Code: MTS 101 | **Course Title: Mathematics I** | **Semester – I**

Day and Date: | **End Semester Examination (ESE)** | **Time:** **Max Marks: 50**

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.

			Marks	Bloom's Level	CO
Q.1		**Solve any Two.**			
	a)	If f and g are continuous functions at $x=c$ and if k is any real number then prove that $f+g$ and kf are continuous at $x=c$.	08	L_2	CO1
	b)	State Rolle's theorem and verify it for the function $f(x)=x^3-4x$ on $[-2,2]$.	08	L_2	CO2
	c)	If the function $f(x)$ is continuous in $[a,b]$ and differentiable in (a,b), then there exist point $c\in(a,b)$ such that $f'(c)=\dfrac{f(b)-f(a)}{b-a}$.	08	L_2	CO2
Q.2		**Solve any Two.**			
	a)	i) Find the nth derivative of the function $y=\dfrac{1}{ax+b}$. ii)Find the nth derivative of the function $y=\cos(ax+b)$.	08	L_2	CO3
	b)	If $\cos^{-1}\left(\dfrac{y}{b}\right)=\log\left(\dfrac{x}{n}\right)^n$ then prove that $x^2y_{n+2}+(2n+1)xy_{n+1}+2n^2y_n=0$.	08	L_4	CO3
	c)	i) Find the series expansion for $e^x.\sec x$. ii) Find the series expansion for $\log(1+\sin x)$.	08	L_3	CO4
Q.3		**Solve any Three**.			

a)	Evaluate $\lim_{x\to 0}\frac{\log\left(1-x^2\right)}{\log\left(\cos x\right)}$.	06	L_3	CO5
b)	Evaluate $\lim_{x\to 1}\frac{x^x-x}{x-1-\log x}$.	06	L_3	CO5
c)	Prove that $\sinh^{-1} z=\log(z+\sqrt{z^2+1})$.	06	L_3	CO6
d)	Find all the values of $(-i)^{\frac{1}{6}}$.	06	L_3	CO6

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