Sanjay Ghodawat University, Kolhapur

2020-21

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

EXM/P/09/00

Year and Program :F.Y.B.Sc | **School of Science** | **Department: Mathematics**

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

Day and Date: | **End Semester Examination** | **Time : 2 Hrs.**

Max Marks : 50

Instructions: 1) All Questions are compulsory.

2) Use of non-programmable calculator is allowed.

		Marks	Bloom's Level	CO
Q.1	**Solve the following (any two)**			
a)	If $\lim_{x\to a} f(x)=l$ and $\lim_{x\to a} g(x)=m$ then prove that $\lim_{x\to a}\left[f(x)\cdot g(x)\right]=l\cdot m$.	8	L2	CO1
b)	Discuss the continuity of the function $f(x)=\dfrac{e^{1/x}}{1+e^{1/x}}$ for $x\neq 0$, $=0$ for $x=0$ at the point $x=0$.	8	L2	CO1
b)	If a function $f(x)$ is continuous in the closed interval $[a, b]$ and differential in the open interval (a, b) then prove that there exists at least one point $c\in(a, b)$ such that $f'(c)=\dfrac{f(b)-f(a)}{b-a}$.	8	L2	CO2
Q.2	**Solve the following (any two)**			
a)	If $y=\sin^{-1}x$ then use Leibnit'z theorem to prove that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-n^2y_n=0$.	8	L3	CO3

b) Apply Taylor's theorem to express $7+(x+2)+3(x+2)^3+(x+2)^4$ in ascending power of x. | 8 | L3 | CO4

c) Apply Maclaurin's theorem to expand $\tan^{-1}x$ up to the term of x^7. | 8 | L3 | CO4

Q.3 Solve the following (any two)

a) Find the values of a and b, if $\lim_{x\to 0}\frac{x(1+a\cos x)-b\sin x}{x^3}=1$. | 9 | L1 | CO5

b) If n is any positive integer, then prove that | 9 | L1 | CO6

$$(1+i)^n+(1-i)^n=2^{\left(\frac{n}{2}+1\right)}\cos\left(\frac{n\pi}{4}\right).$$

c) If $\sin(\alpha+i\beta)=x+iy$ then prove that | 9 | L1 | CO6

i) $$\frac{x^2}{\cosh^2\beta}+\frac{y^2}{\sinh^2\beta}=1,$$

ii) $$\frac{x^2}{\sin^2\alpha}-\frac{y^2}{\cos^2\alpha}=1.$$

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