Sanjay Ghodawat University, Kolhapur

2020-21

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EXM/P/09/00

Year and Program: S.Y B.Sc.	**School of Science**	**Department: Mathematics**
Course Code: MTS 201A	**Course Title: Mathematics III (Real Analysis)**	**Semester : III**
Day : Friday **Date : 18.12.2020**	**End Semester Examination**	**Time : 2 Hrs.** **Max Marks : 50**

Instructions: 1) All Questions are compulsory.
2) Figures to the right indicate full marks.

		Marks	Bloom's Level	CO
Q.1	**Answer the following (Any Two)**–			
a)	i) Prove that every subset of a countable set is countable. ii) Prove that the countable union of a countable set is countable.	8	L2	CO1
b)	i) Prove that any open interval]a,b[is equivalent to any other open interval]c,d[. ii) Explain with suitable example. i) One-one function. ii) Onto function. iii) Identity function. iv) Constant function.	8	L2	CO1
c)	i) State and prove Bernoulli's inequality. ii) If $a, b \in \mathbb{R}$ then prove that $\|\,\|a\| - \|b\|\,\| \leq \|a - b\|$	8	L2	CO2
Q.2	**Answer the following (Any two)** –			
a)	State and prove nested interval property.	8	L3	CO2
b)	If c>0 then prove that $\lim\left(c^{\frac{1}{n}}\right) = 1$	8	L3	CO3
c)	State and prove Cauchy Convergence Criterion	8	L2	CO3

Q.3 **Answer the following (Any two) –**

a)	i) Show that the geometric series $\sum_{n=0}^{\infty} r^n = 1 + r + r^2 + \cdots + r^n$ converges to $\frac{1}{1-r}$ for $\lvert r \rvert < 1$ ii) Show that the harmonic series $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges.	9	L2	CO4
b)	i) State and prove Rearrangement Theorem. ii) If $f \in R[a,b]$ then show that the value of the integral is uniquely determined.	9	L2 L3	CO4 CO5
c)	State and prove Cauchy Criterion for Riemann integral functions.	9	L2	CO5

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