School of Basic and Applied Sciences

Mathematics

ETE - Jun 2023

Time : 3 Hours **Marks : 100**

Sem IV - C1UC402T - Real Analysis

Your answer should be specific to the question asked

Draw neat labeled diagrams wherever necessary

1. Define the following with example: K1 CO3 (5)
a. Bounded Set
b. Least Upper Bound
c. Completeness Property of Real number

2. State and Prove Rolle's Theorem. Give an example for the verification of the theorem. K1 CO2 (5)

3. Give the examle of a divergent and a convergent series. Discuss the convergence of auxiliary Series K2 CO3 (5)

$$\Sigma \frac{1}{n^p}$$

4. Cauchy's definition of continuity. Prove that a polynomial function is always a continuous function. K3 CO3 (10)

OR

Define the sequences and series. K3 CO1 (10)

Prove that the series $\Sigma \frac{1}{4^n}$ *converges to* $\frac{1}{3}$.

5. Explain the Absolute Convergence and Conditional Convergence. Check the absolute and conditionally convergence of the series K4 CO4 (10)

$$1 - \frac{1}{2} + \frac{1}{2^2} - \frac{1}{2^3} + \ldots$$

6. State and prove darboux theorem. K2 CO4 (10)

7. Every bounded sequence of real number contains a convergent sub-sequence. K3 CO4 (10)

8. Prove (E ∩ F)o=E o ∩ Fo and give the example for the same. K3 CO2 (15)

9. State and prove Bolzano-Weierstrass theorem for sequences. K4 CO6 (15)

OR

What is finite and arbitrary interection of the sets. Prove intersection of a finite number of open sets is open. Is it true for arbitrary collection. K4 CO5 (15)

10. Test for convergence the series whose nth terms is K4 CO2 (15)

i. $\frac{n^p}{(1+n)^q}$

ii. $\sin \frac{1}{n}$