(NO. OF PAGES: 2)

(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2021 ONLY)

21UMS510

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : NOVEMBER-2023

COURSE NAME: B.Sc.- MATHEMATICS | **MAXIMUM MARKS: 70**

SEMESTER: V | **TIME : 3 HOURS**

PART - III

REAL ANALYSIS-I

SECTION - A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. **(K1)**

1. A set with no _______ bound is said to be unbounded above.
   a) lowest b) upper c) lower d) greatest
2. Any set of ordered pairs is called a_______.
   a) real b) subset c) variable d) relation
3. The set of all adherent points of a set S is called the_______ of S.
   a) sets b) adherent c) closure d) sequence
4. A subset T of S is called complete if the _______ is complete.
   a) metric subspace b) metric space c) sequence d) metric
5. f(c+)-f(c) is called the _______ of f at c.
   a) lefthand jump b) jump c) righthand jump d) closed

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES **(K2)**

6. What is interval?
7. What does the new relation $\tilde{S}$ mean?
8. Write the formula of norm.
9. Write the triangle inequality.
10. Define continuous function.

SECTION – B (5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Prove that every integer n>1 is either a prime or a product of primes.

(OR)

b) If $a \geq 0$, then prove that we have the inequality $|x| \leq a$ if, and only if $-a \leq x \leq a$.

12.a) Define composite functions and similar sets.

(OR)

b) i) Prove that the set Q of all rational numbers is a countable set.

ii) Prove that the set S of intervals with rational end points is a countable set.

(CONTD…..2)

13.a) Prove that the union of any collection of open sets is an open set.

(OR)

b) Prove that the set S in R^n is closed if, and only if, it contains all its adherent points.

14.a) If X is a closed subset of a compact metric space M, then prove that X is compact.

(OR)

b) Prove that sequence $\{x_n\}$ in a metric space (S, d) can converge to at most one point in S.

15.a) Prove that a metric space S is connected if, and only if, every two-valued function on S is constant.

(OR)

b) If f is a strictly increasing on a set S in R, then prove that f^{-1} exists and is strictly increasing on f(S).

SECTION - C (4 X 10 = 40 MARKS)

ANSWER ANY FOUR OUT OF SIX QUESTIONS
(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS
(FROM Qn. No : 17 to 21) (K4 (Or) K5)

16. State and prove representation theorem for open sets on the real line..

17. If n is a positive integer which is not a perfect square, then Prove that $\sqrt{n}$ is irrational..

18. Prove that every subset of a countable set is countable.

19. State and prove Heine-Borel theorem.

20. Prove that In Euclidean space R^k every Cauchy sequence is convergent.

21. State and prove Heine theorem.

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ETHICAL PAPER