15U503 (Pages: 2) Name: …………………….

Reg. No : …………………

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, OCTOBER 2017

(CUCBCSS - UG)

CC15U MAT 5B 07 - BASIC MATHEMATICAL ANALYSIS

(Mathematics - Core Course)

(2015 – Admission Regular)

Time: Three Hours Maximum: 120 Marks

Section A

Answer ***all*** questions. Each question carries 1 mark.

1. Let be defined by and . Find and .
2. State Principle of Strong Induction.
3. Find all real numbers that satisfy the inequality.
4. If , then find and
5. State density theorem for rational numbers in .
6. Find the binary representation(s) of .
7. Find , where
8. Give an example of a bounded sequence which is not Cauchy.
9. If then .
10. Find all the limit points of the set .
11. Find the .
12. State de Moivre's theorem.

(12x1=12 Marks)

Section B

Answer ***any ten*** questions. Each question carries 4 marks.

13. Prove that divisible by for all.
14. State and prove Cantor's theorem.
15. Let be such that . Then prove that either & or & .
16. If then show that iff
17. For any positive real number prove that there exists such that
18. Prove that the set of all real numbers is uncountable.
19. Find the rational number represented by the periodic decimal .
20. Discuss the convergence of the sequence , .
21. If , , then prove that iff .
22. Let and be two convergent sequences of real numbers such that for all . Prove that .

23. Prove that the sequence defined by and converges to the positive square root of the equation .
24. Prove that the intersection of any finite collection of open sets in is open in .
25. Prove that , for all .
26. Sketch the region , .

(10x4=40 Marks)

Section C

Answer ***any six*** questions. Each question carries 7 marks.

27. Prove that the set of all rational numbers does not satisfy the completeness property.
28. If is a bounded set in and be a non empty subset of . Show that

    .
29. State and prove the nested intervals property.
30. If then show that the sequence converges to one.
31. Check the convergence of the sequence , where .
32. State and prove monotone convergence theorem
33. Prove that every contractive sequence is convergent.
34. Show that a subset of is closed iff it contains all of its limit points.
35. Find the cube roots of .

(6x7=42 Marks)

Section D

Answer ***any two*** questions. Each question carries 13 marks.

36. (a) Prove that infimum property can be deduced from supremum property.

    (b) Let be a non empty bounded subset of . Prove that
37. State and prove Cauchy convergence criterion for sequences of real numbers.
38. State and prove the characterization theorem for open sets.

(2x13=26 Marks)