Reg. No............................ Name..................................... U504

B.SC DEGREE END SEMESTER EXAMINATION OCTOBER 2016

SEMESTER – 5: MATHEMATICS (CORE COURSE)

COURSE: U5CRMAT5, U5CRCMT5 – MATHEMATICAL ANALYSIS

(Common for B Sc Mathematics & B Sc Computer Application)

Time: Three Hours Max. Marks: 75

PART-A

(Answer **all** questions. Each question carriers 1 mark)

1. Find the Supremum of $\left\{1+\frac{(-1)^n}{n}\ ; n \in N\right\}$
2. State order completeness in R
3. Give an example of an open set which is not an interval
4. Obtain the derived set of $\{x:\ 1 < x < 2\}$
5. Define a perfect set & give an example
6. Give an example of a bounded sequence
7. Write the limit points of the sequence $\{1+(-1)^n\}$; n$\in N$
8. Give an example of a monotonic increasing sequence which is bounded above
9. Show that for any complex number z;Re (iz)= -Im z
10. Write $\frac{4+i}{2-3i}$ in the form a+ib

(1 x 10 = 10)

PART-B

(Answer **any eight** questions. Each question carriers 2 marks)

11. Prove that the greatest number of a set if it exists is the supremum of the set
12. State Dedekind's property of real numbers
13. If M &N are nbds of a point x then show that M∩N is also a nbd of x
14. If S&T are subsets of R show that S⊆T⟹S' ⊆T'
15. S is a set such that T=R-S is open ,show that S is closed
16. Prove that the set of all odd positive integers is countabily infinite
17. Show that every convergence sequence is bounded
18. Show that $\{S_n\}$ where $S_n=1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+$................cannot converge
19. Sketch the points determined by Re(z-i)=2
20. Find the principal argument of z = $\frac{-2}{1+i\sqrt{3}}$

(2 x 8 = 16)

PART-C

(Answer **any five** questions. Each question carriers 5 marks)

21. Prove that the order completeness property of real numbers implies Dedekind's property

22. Prove that the interior of a set S is the largest open sub set of S

23. Prove that the set of all rational numbers in $[0,1]$ is countable

24. Prove that every bounded sequence with a unique limit point is convergent

25. State & prove Sandwich theorem

26. Show that the sequence $\{S_n\}$ where $S_n = \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \cdots\cdots + \frac{1}{n!}$ is convergent

27. If c is any n^{th} root of unity other than unity itself ,then show that $1+c+c^2+c^3+\ldots.c^{n-1} = 0$

(5 x 5 = 25)

PART-D

(Answer **any two** questions. Each question carries 12marks)

28. Prove that the set of rational numbers is not order complete

29. State & prove Bolzano Weierstrass theorem (for sets)

30. Show that the sequence $\{r^n\}$ converges iff $-1 < r \leq 1$

31. (a) Show that $\lim_{n\to\infty}\left[\frac{1}{\sqrt{n^2+1}} + \frac{1}{\sqrt{n^2+2}} + \cdots \ldots\ldots\ldots. + \frac{1}{\sqrt{n^2+n}}\right] = 1$

(b) Show that the sequence $\left\{a_n^{\frac{1}{n}}\right\}$ where $a_n = \frac{(3n)!}{(n!)^3}$ converges

(12 x 2 = 24)

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