

D 70942

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Name..... 36

Reg. No.....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2014

(UG—CCSS)

Core Course—Mathematics

MM 5B 07—BASIC MATHEMATICAL ANALYSIS

Time : Three Hours

Maximum : 30 Weightage

Part A

Answer all questions.

1. Give an example of a function.
2. State Cantor's theorem.
3. What is the absolute value of -10 ?
4. State the completeness property of R.
5. Give Euler number as the limit of a sequence.
6. Show that $(1/n)$ is a Cauchy sequence.
7. State Cauchy convergence criterion.
8. If $c > 1$, find $\lim c^n$.
9. Show that $[0, 1]$ is not open.
10. If a set is not open will it imply that the set is closed ?
11. State de Moivre's formula.
12. Find $\text{Arg}(-i)$.

(12 × ¼ = 3 weightage)

Part B

Answer all questions.

13. For any three sets A, B and C prove that $A - (B \cup C) = (A - B) \cap (A - C)$.
14. Define sequence. Give an example of a sequence.
15. Find $\lim \frac{1}{n^2 + 1}$.
16. Show that the sequence $(0, 2, 0, 2, \dots, 0, 2, \dots)$ does not converge to 0.
17. Find $\lim b^n, 0 < b < 1$.
18. Define Cantor set.

Turn over

19. Show that $\operatorname{Re}(iz) = -\operatorname{Im}(z)$.
20. Show that $|e^{i\theta}| = 1$.
21. Prove that $\sin 2\theta = 2 \sin\theta \cos\theta$.

(9 × 1 = 9 weights)

Part CAnswer any **five** questions.

22. Prove that the set \mathbb{Q} of rational numbers is denumerable.
23. Find infimum and supremum of $\left\{1 - \frac{(-1)^n}{n} : n \in \mathbb{N}\right\}$.
24. Prove that the set of real numbers is not countable.
25. Show that the intersection of any finite collection of open sets in \mathbb{R} is open.
26. Show that $\frac{5i}{2+i} = 1 + 2i$.
27. Show that $(\sqrt{3} + i)^7 = -64(\sqrt{3} + i)$.
28. If (X_n) is a convergent sequence and if $a \leq x_n \leq b, n \in \mathbb{N}$ then show that $a \leq \lim x_n \leq b$.

(5 × 2 = 10 weights)

Part DAnswer any **two** questions.

29. Find the rational number equivalent to 7.31414....14...
30. Prove that (i) $\lim_{n \rightarrow \infty} \frac{2n+1}{n} = 2$, (ii) $\lim_{n \rightarrow \infty} (\sin n/n) = 0$.
31. Find all the values of $(-8i)^{1/3}$.

(2 × 4 = 8 weights)