C 30801 (Pages : 2) Name..................................

Reg. No..............................

FIFTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION NOVEMBER 2017

(UG—CCSS)

MM 5B 07—BASIC MATHEMATICAL ANALYSIS

Time : Three Hours Maximum : 30 Weightage

Part A

Answer **all** *questions.*

1. Define bijection.
2. Give an example of a denumerable set.
3. Give an example of a bounded below set which is not bounded above.
4. State nested interval property.
5. Is the sequence (n) convergent ?
6. Give an example of an unbounded sequence that has a convergent subsequence.
7. If (x_n) is an unbounded increasing sequence find $\lim x_n$.
8. Given an example of an open set which is not an interval.
9. Define Cantor set.
10. State Cauchy convergence criterion.
11. If z is real show that $z = \bar{z}$.
12. State de Moivres formula.

(12 × ¼ = 3 weightage)

Part B

Answer **all** *questions.*

13. By Mathematical Induction, prove that $1+2+3+\ldots\ldots+n=\dfrac{n(n+1)}{2}$.
14. Determine the set $A=\{x \in R / |2x+3|<7\}$.
15. Show that $\lim (1/n)=0$.

Turn over

16. Prove that a convergent sequence of real numbers is bounded.

17. Give an example of a bounded sequence that is not a Cauchy sequence.

18. Show that the set of Natural numbers is a closed set.

19. Show that $\overline{iz} = -i\overline{z}$.

20. Find $(\text{Arg } z_1 z_2)$.

21. If $z_1 = 2i$, $z_2 = \frac{2}{3} - i$, find $z_1 + z_2$.

(9 × 1 = 9 weightage)

Part C

Answer any **five** *questions.*

22. Determine the set of all real numbers x such that $2x + 3 < 6$.

23. Find the infimum and supremum of $\left\{\frac{1}{n} - \frac{1}{m} ; n, m \in \mathrm{N}\right\}$.

24. Find $\lim n^{1/n}$.

25. Is a Cauchy sequence of real numbers bounded ?

26. Show that a convergent sequence of real numbers is Cauchy.

27. Sketch the set of points determined by $|z + i| \leq 3$.

28. Prove that $\cos 3\theta = \cos^3\theta - 3\cos\theta\sin^2\theta$.

(5 × 2 = 10 weightage)

Part D

Answer any **two** *questions.*

29. Prove that there exists a positive real number x such that $x^2 = 2$.

30. State and prove Bolzano Weierstrass Theorem.

31. Find the exponential form of the complex number $-1 - i, \frac{-1 + \sqrt{3}i}{2}$.

(2 × 4 = 8 weightage)