RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR [2015-18]

B.A./B.Sc. FIRST SEMESTER (July – December) 2015

Mid-Semester Examination, September 2015

Date : 17/09/2015 **MATH FOR ECO (General)**

Time : 12 noon – 1 pm Paper : I Full Marks : 25

Group – A

Answer **any three** questions : [3 × 5]

1. a) Let A, B, C are subsets of a universal set U. If $A \cup B = A \cup C$ and $A \cap B = A \cap C$, prove that B = C. [3]

   b) Geometrically draw the figure of A × B, where $A = \{x \in \mathbb{R} : 2 \le x \le 3\}$ and $B = \{x \in \mathbb{R} : 4 \le x \le 5\}$. [2]

2. Show that the mapping $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = x^3$ is bijective. Find it's inverse mapping. [5]

3. Prove that finite intersection of open sets is open set. [3]
   Is the result true for arbitrary intersection? Justify your answer. [2]

4. a) Prove that the set $\mathbb{N}$ of natural numbers is a closed set in $\mathbb{R}$. [3]

   b) Give examples of a boundary point which is not a limit point and also give a limit point which is not a boundary point. [2]

5. Using the definition of convergence of a sequence, prove that sequence $\left\{\frac{n-1}{2n}\right\}$ converges to $\frac{1}{2}$. [5]

Group – B

6. Answer **any two** : [2 × 4]

   a) Solve, $x^7 + x^4 + x^3 + 1 = 0$.

   b) $\alpha^n + \beta^n = 2^{\frac{n}{2}+1} \cos\frac{n\pi}{4}$ where α, β are the roots of $x^2 - 2x + 2 = 0$ and n is a positive integer.

   c) Let $G = \mathbb{R} - \{1\}$. Determine whether or not (G, *) forms a group, where * is defined by $a * b = a + b - ab$ for $a, b \in G$.

7. Answer **any one** : [1 × 2]

   a) Prove that the set of cube roots of unity forms a group under multiplication.

   b) Find all the values of $(\sqrt{3} + i)^{1/6}$.

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