

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [2017-20]

B.A./B.Sc. FIRST SEMESTER (July – December) 2017

Mid-Semester Examination, September 2017

MATH FOR ECONOMICS (General)

Date : 15/09/2017

Time : 12 noon – 1 pm

Paper : I

Full Marks : 25

[Use a separate Answer Book for each group]

Group – A

Answer **any two** from **Question No. 1 to 4** :

[2×4]

- Find all the values of $(1+i)^{\frac{1}{5}}$.
- Prove that a group with three element is necessarily commutative.
- Prove that the set of all 2×2 real matrices of the form $\begin{bmatrix} x & y \\ -y & x \end{bmatrix}$ forms a field with respect to matrix addition and multiplication.
- Show that $\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix} = 0$ if $A + B + C = \pi$.

Answer **any one** from **Question No. 5 & 6** :

[1×5]

- Solve : $\begin{vmatrix} x^3 - a^3 & x^2 & x \\ b^3 - a^3 & b^2 & b \\ c^3 - a^3 & c^2 & c \end{vmatrix} = 0$.
- If w be a root of $x^4 = 1$, then show that $(a + bw + cw^2 + dw^3)$ is a factor of the following determinant $\begin{vmatrix} a & b & c & d \\ b & c & d & a \\ c & d & a & b \\ d & a & b & c \end{vmatrix}$.

Group – B

(Answer **any three** of the following)

[3×4]

- Prove that :
a) $(A \cup B)^c = A^c \cap B^c$
b) $(A \cap B)^c = A^c \cup B^c$.
- Let $S = \{x \in \mathbb{R} : -1 < x < 1\}$ and $f : \mathbb{R} \rightarrow S$ be defined by $f(x) = \frac{x}{1 + |x|}$, $x \in \mathbb{R}$. Show that f is a bijection. Determine f^{-1} .
- Use the principle of mathematical induction to show that $1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$ for all $n \in \mathbb{N}$.

10. Prove that $\sqrt{2}$ is irrational.

11. Prove that arbitrary union of open sets in \mathbb{R} is also open in \mathbb{R} .

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