

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [2016-19]

B.A./B.Sc. FIRST SEMESTER (July – December) 2016

Mid-Semester Examination, September 2016

MATHEMATICS GENERAL FOR ECONOMICS

Date : 15/09/2016

Time : 12 noon – 1 pm

Paper : I

Full Marks : 25

[Use a separate Answer Book for each group]

Group – A

(Answer any three questions)

[3×5]

1. Show that the product of all the values of $(\sqrt{3}+i)^{3/5}$ is $8i$. [5]
2. a) If $A = \begin{pmatrix} 1 & 0 \\ -1 & 1 \end{pmatrix}$, show that $A^{50} = \begin{pmatrix} 1 & 0 \\ -50 & 1 \end{pmatrix}$. [3]
b) Show that $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ b+c & c+a & a+b \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$. [2]
3. Find the rank of the matrix $\begin{pmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{pmatrix}$ by reducing it to the normal form. [5]
4. Prove that the set $Q(\sqrt{2}) = \{a + b\sqrt{2} : a, b \in \mathbb{R}\}$ forms a field with respect to usual addition and multiplication. [5]
5. Prove that a monotone increasing and bounded above sequence is convergent and converges to its supremum. [5]

Group – B

(Answer any two questions)

[2×5]

6. Let $A = \{x \in \mathbb{Z} \mid 0 \leq x \leq 10\}$, $B = \{x \in \mathbb{Z} \mid 5 \leq x \leq 15\}$ Find—
a) $A \cup B$ b) $A \setminus B$.
Now let $C = \{x \in \mathbb{Z} \mid x \geq 5\}$ and verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$. [(2×1·5)+2]
7. Define a bijective function with an example and verify why the function is bijective. [2+3]
8. a) If $f : A \rightarrow B$ & $g : B \rightarrow C$ be both injective mapping then prove that the composition of f and g i.e $g \circ f : A \rightarrow C$ is injective. [3]
b) $f : \mathbb{R} \rightarrow \mathbb{R}$ defined as $f(x) = e^x \forall x \in \mathbb{R}$, $g : \mathbb{R} \rightarrow \mathbb{R}$ defined as $g(x) = 2x \forall x \in \mathbb{R}$
check whether $g \circ f$ is injective or not. [2]