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

Date : 15/09/2016

MATHEMATICS GENERAL FOR IND. CHEMISTRY

Time : 12 noon – 1 pm

Paper : I

Full Marks : 25

Group – A

(*Answer __any three__ questions*) [3×5]

1. State De Moiver's theorem. Use it to solve the equation : $x^3 + 8 = 0$. [2+3]

2. a) Show that the roots of the equation $\dfrac{1}{x-a} + \dfrac{1}{x-b} + \dfrac{1}{x-c} = \dfrac{1}{x} (a > b > c > 0$ are all real. [3]

   b) Find the quotient and remainder when $x^4 + 3x^3 + 2x^2 - 6$ is divided by $2x - 1$. [2]

3. Investigate the consistency of the system

   $x + y + z = 4$

   $2x - y + 3z = 1$

   $3x + 2y - z = 1$

   and if consistence then solve it. [5]

4. If ω be a cube root of unity, then prove that $(a + b\omega + c\omega^2)$ is a factor of the determinant

   $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$. Find also the other factor. [5]

5. Solve the following system of linear equations by Cramer's rule

   $x + 2y + z = 4$

   $x - y + z = 5$. [5]

   $2x + 3y - z = 1$

Group – B

(*Answer __any two__ questions*) [2×5]

6. If $\begin{array}{l} A = \{x : x \in \mathbb{R} \text{ and } 1 \le x \le 3\} \\ B = \{x : x \in \mathbb{R} \text{ and } 2 \le x \le 6\} \end{array}$ Find $A \cup B$, $A \cap B$, $A - B$ and $A \Delta B$. [5]

7. State the De Morgan's law. Verify any one of them for the set $A = \{1,5,6\}$, $B = \{5,6,7\}$ and $U = \{1,2,3,4,5,6,7\}$. [2+3]

8. a) If $A \cup B = A \cup C$ and $A \cap B = A \cap C$, prove that $B = C$. [2]

   b) Verify that $A - (B \cup C) = (A - B) \cap (A - C)$ where $A = \{1,2,5\}$, $B = \{2,4,6\}$, $C = \{5,7\}$. [3]

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