Note: Sections 'B' and 'C' comprise pages 1-2 and questions therein are to be answered on the separately provided Answer Book. Use supplementary answer sheet i.e., sheet B if required. Write your answers neatly and legibly.

SECTION – B (Marks 48)

Q.2   Attempt any TWELVE parts. All parts carry equal marks. $(12 \times 4 = 48)$

i.   If $Z_1 = 2 + i$, $Z_2 = 3 + 2i$, $Z_3 = 1 + 3i$ then express $\dfrac{Z_1 \, Z_3}{Z_2}$ in the form $a + ib$.

ii.   Convert the following to logical form and prove it by constructing truth table: $(A \cap B)' = A' \cup B'$

iii.   Without expansion verify that
$$\begin{vmatrix} -a & 0 & c \\ 0 & a & -b \\ b & -c & 0 \end{vmatrix} = 0.$$

v.   Resolve $\dfrac{x^2 + 1}{x^3 - 1}$ into Partial Fractions.

viii.   A die is rolled twice. Event E_1 is the appearance of even number of dots and Event E_2 is the appearance of more than 4 dots. Prove that:
$$P(E_1 \cap E_2) = P(E_1) . P(E_2)$$

ix.   Find the numbers greater than 23000 that can be formed from digits 1, 2, 3, 5, 6 without repeating any digit.

xii.   If α, β, γ are the angles of a triangle ABC, show that:
$$\cot \frac{\alpha}{2} + \cot \frac{\beta}{2} + \cot \frac{\gamma}{2} = \cot \frac{\alpha}{2} \cot \frac{\beta}{2} \cot \frac{\gamma}{2}.$$

xiv.   Prove that $r_1 r_2 + r_2 r_3 + r_3 r_1 = s^2$.

xv.   Prove that $\tan^{-1} \dfrac{120}{119} = 2 \cos^{-1} \dfrac{12}{13}$.

SECTION – C (Marks 32)

Note: Attempt any FOUR questions. All questions carry equal marks. $(4 \times 8 = 32)$

Q.6   If $2y = \dfrac{1}{2^2} + \dfrac{1.3}{2!} \cdot \dfrac{1}{2^4} + \dfrac{1.3.5}{3!} \cdot \dfrac{1}{2^6} + \cdots$, then prove that $4y^2 + 4y - 1 = 0$.