

## SECTION 'B' (Short-Answer Questions) (40)

**NOTE:** Attempt any TEN part questions in all. All questions carry equal marks. (i.e. 4 marks of each part).

2. i) Find the real and imaginary parts of the  $\left(\frac{1-i}{2-i}\right)^{-1}$
- ii) Show that the  $A = \begin{bmatrix} -5 & -8 & 0 \\ 3 & 5 & 0 \\ 1 & 2 & -1 \end{bmatrix}$  is an involutory matrix.:
- iii) Without expanding show that  $\begin{vmatrix} x+1 & x+3 & x+5 \\ x+4 & x+6 & x+8 \\ x+7 & x+9 & x+11 \end{vmatrix} = 0$
- iv) If  $\alpha, \beta, \gamma$  are the direction angles of a vector then show  $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 2$ .
- v) Find three consecutive numbers in G.P whose sum is 39 and their product is 729.
- vi) Sum the series  $1 + 2.5 + 3.5^2 + 4.5^3 + \dots$  to 30 terms.
- vii) How many distinct permutations of letters of the word 'ESSENTIAL' are possible?
- viii) Prove the proposition by mathematical induction for every positive integer  $n$ .

$$1 + 4 + 7 + \dots + (3n-2) = \frac{n(3n-1)}{2}$$

- ix) Find the middle term in the expansion of  $\left(\frac{a}{b} - \frac{b}{a}\right)^{18}$ .

OR

Use binomial theorem to find the value of  $(19)^4$ .

- x) Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be the function defined by  $f(x) = -5x + 1$ , find the value of  $f^{-1}(0)$ .

- xi) The sides of a parallelogram are 25cm and 35cm long and one of its angle is  $36^\circ$ . Find the length of the diagonal(s).

- xii) Prove that:  $r = 4R \sin \frac{\alpha}{2} \sin \frac{\beta}{2} \sin \frac{\gamma}{2}$ .

- xiii) Draw the graph of  $y = -\sin \theta$ ; where  $0 \leq \theta \leq \pi$

OR

Show that  $\cos^{-1}(y) + \cos^{-1}(-y) = \pi$ .

- xiv) If  $\alpha + \beta + \gamma = 180^\circ$ , then show that  $\cos \left(\frac{\beta+\gamma}{2}\right) = \sin \frac{\alpha}{2}$ .

- xv) Find the equation of the graph of the function of the type  $y = ax^2 + bx + c$  which crosses the  $x$ -axis at the points  $(-4, 0)$  and  $(3, 0)$  and also passes through the point  $(2, -4)$ .

## SECTION "C" (Detailed Answer Questions)(40)

**NOTE:** Attempt any FIVE question from this section.

All questions carry equal marks.

3. Use Gauss, Jordan method to solve the system of linear equations:

$$2x + 2y - z = 4, \quad x - 2y + z = 2 \quad x + y = 0$$

4. If the  $p^{\text{th}}$  term of a H.P is  $q$ , the  $q^{\text{th}}$  term is  $p$ , then the  $(p+q)^{\text{th}}$  term is  $\frac{pq}{p+q}$ .

5. The king, the queen and the jack of clubs are removed from a deck of 52 playing cards and the shuffled. A card is drawn from the remaining cards. Find the probability of getting:

- (i) A heart (ii) A Queen (iii) A Club

6. Use Binomial Theorem to show that  $4x^2 - 2x - 1 = 0$  If

$$\frac{1}{x} = \frac{2}{5} + \frac{1.3}{2!} \left(\frac{2}{5}\right)^2 + \frac{1.3.5}{3!} \left(\frac{2}{5}\right)^3 + \dots$$

7. The points  $A(1, 1), B(5, 4), C(8, 9)$  and  $D(0, 3)$  represent the position vectors. Show that the  $ABCD$  is a Trapezium.

8. Solve the linear programming problem when  $x \geq 0$  and  $y \geq 0$ . Maximize  $Z(x, y) = 30x + 36y$ , subject to:  $4x + 2y \leq 12$ ;  $6x + 5y \leq 20$

9. If  $\cos \theta = \frac{3}{5}$ , where  $0 < \theta < \frac{\pi}{2}$ , then find the value of  $\tan 3\theta$ .

10. Find the general solution of the trigonometric equation  $4\cos^2 x - 8\sin x + 1 = 0$ . Also verify the solution.