General Instructions:

Read the following instructions very carefully and strictly follow them:

   (i)   This Question paper contains **38 questions**. All questions are **compulsory**.
   (ii)   Question paper is divided into **FIVE** Sections – Section **A, B, C, D** and **E**.
   (iii)   In Section **A**–Question Number **1** to **18** are Multiple Choice Questions (MCQs) and Question Number **19 & 20** are Assertion-Reason based questions of **1 mark** each.
   (iv)   In Section **B**–Question Number **21** to **25** are Very Short Answer (VSA) type questions, carrying **2 marks** each.
   (v)   In Section **C**–Question Number **26** to **31** are Short Answer (SA) type questions, carrying **3 marks** each.
   (vi)   In Section **D**–Question Number **32** to **35** are Long Answer (LA) type questions, carrying **5 marks** each.
   (vii)   In Section **E**–Question Number **36** to **38** are case study-based questions, carrying **4 marks** each.
   (viii) There is no overall choice. However, an internal choice has been provided in **2** questions in Section–**B**, **3** questions in Section–**C**, **2** questions in Section–**D** and **2** questions in Section–**E**.
   (ix)   Use of calculator is **NOT** allowed.

SECTION-A   **[1 × 20]**

This section comprises of Multiple-Choice Questions (**MCQ**s) of **1** mark each.

Select the correct option (Question **1** to Question **18**):

1. If X and Y are two sets and X^C denotes the complement of X, then $X \cap (X \cup Y)^C$ is equal to   [1]
   (a) X   (b) Y   (c) ϕ (d) X∩Y

2. The range of the function $|x|$ is   [1]
   (a) $(0, \infty)$ (b) $[0, \infty)$ (c) $\mathbb{R}$ (d) $\mathbb{R} \setminus \{0\}$

3. The greatest value of $\sin x \cos x$ is   [1]
   (a) 1   (b) 2   (c) $\sqrt{2}$ (d) $\frac{1}{2}$

4. Let $x, y \in \mathbf{R}$, then $x + iy$ is a non-real complex number if: [1]
   (a) $x = 0$ (b) $y = 0$ (c) $x \neq 0$ (d) $y \neq 0$

5. If x is a real number and $|x| < 3$, then   [1]
   (a) $x \geq 3$ (b) $-3 < x < 3$ (c) $x \leq -3$ (d) $-3 \leq x \leq 3$

6. The total number of terms in the expansion of $(x + a)^{51} - (x - a)^{51}$ after simplification is   [1]
   (a) 102   (b) 25   (c) 26   (d) NOT

7. The common ration of $1, -\frac{1}{2}, \left(\frac{1}{2}\right)^2, -\left(\frac{1}{2}\right)^3, \dots$ [1]
   (a) $\frac{1}{2}$ (b) 2   (c) $-\frac{1}{2}$ (d) -2

8. The inclination of the line $x - y + 3 = 0$ with the positive direction of x-axis is   [1]
   (a) 45^0 (b) 135^0 (c) -45^0 (d) -135^0

9. The distance of the point P $(1, -3)$ from the line $2y - 3x = 4$ is   [1]
   (a) 13   (b) $\frac{7}{13}\sqrt{13}$ (c) $\sqrt{13}$ (d) NOT

10. The eccentricity of an ellipse is   [1]
   (a) 0   (b) 1   (c) $0 < e < 1$ (d) $e > 1$

11. The length of latus rectum of a parabola is   [1]
   (a) $2a$ (b) $4a$ (c) $2\frac{b^2}{a}$ (d) $-\frac{a^2}{b}$

12. The length of the foot of perpendicular drawn from the point P (3, 4, 5) on y-axis is [1]

    (a) 10   (b) $\sqrt{34}$ (c) $\sqrt{113}$ (d) $5\sqrt{2}$

13. $\lim\limits_{x\to 0} x \sin\dfrac{1}{x}$ is equal to [1]

    (a) 0   (b) 1   (c) $\dfrac{1}{2}$ (d) doesn't exist

14. Number of arrangements can be done for 5 persons in a row? [1]

    (a) 60   (b) 120   (c) 240   (d) 5

15. $\lim\limits_{x\to 0}[x]$ [1]

    (a) -1   (b) 1   (c) 0   (d) doesn't exist

16. Derivative of $tanx$ is [1]

    (a) $sec^2 x$ (b) $-sec^2 x$ (c) $secx \times tanx$ (d) $tan^2 x$

17. The mean deviation of the data 3, 10, 10, 4, 7, 10, 5 from the mean is [1]

    (a) 2   (b) 2.57   (c) 3   (d) 3.75

18. In a leap year the probability of having 53 Sundays [1]

    (a) $\dfrac{1}{7}$ (b) $\dfrac{2}{7}$ (c) $\dfrac{53}{365}$ (d) $\dfrac{53}{366}$

Assertion-Reason Based Questions

DIRECTIONS: In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option:

(A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(B) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

(C) Assertion (A) is true but reason (R) is false.

(D) Assertion (A) is false but reason (R) is true.

19. Assertion (A): If A = {1, 2, 3, 4, 5} and B = {5, 6, 7, 8, 9, 10} then A and B are [1] mutually exclusive events.

    Reason (R): If A∩B= ∅ then A and B are mutually exclusive events.

20. Assertion (A): If A = $\{1, 2, 3\}$, then $|P(A)| = 8$ [1]

    Reason (R): If $|A| = n$, then $|P(A)| = 2^n$

SECTION-B   [2 × 5]

Questions Number **21** to **25** are Very Short Answer (VSA) type questions of **2** marks each.

21. Let A = {1,2,3}, B = {3,4} and C = {4,5,6}. Find $A \times (B \cap C)$

22. **(A)** Write the equation of the line through the points (1, –1) and (3, 5).

<div align="center">OR</div>

    (B) Find the equation of the line, which makes intercepts –3 and 2 on the x- and y-axes respectively.

23. Find the distance between the points $P(1, -3, 4)$ and $Q(-4, 1, 2)$.

24. Find $\lim\limits_{x\to 2} \dfrac{x^2 - 4}{x^3 - 4x^2 + 4x}$

25. **(A)** Find the mean deviation about the mean for the following data:

         6, 7, 10, 12, 13, 4, 8, 12

<div align="center">OR</div>

    (B) Find the mean deviation about the median for the following data:

         3, 9, 5, 3, 12, 10, 18, 4, 7, 19, 21

Questions Number **26** to **31** are Short Answer (SA) type questions of **3** marks each.

26. (A) Prove that $\frac{\sin\ (x+y)}{\sin\ (x-y)} = \frac{\tan x + \tan y}{\tan x - \tan y}$

OR

  (B) Prove that $\frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = \cot x$

27. Ravi obtained 70 and 75 marks in first two-unit test. Find the minimum marks he should get in the third test to have an average of at least 60 marks.

28. Compute $(98)^5$

29. Find $\lim\limits_{x\to 0} \frac{\sin ax}{\sin bx}$

OR

  Find $\lim\limits_{n\to\infty} \frac{1+2+\cdots+n}{n^2}$

30. Find the coordinates of the foci, the vertices, the lengths of major and minor axes and the eccentricity of the ellipse $9x^2 + 4y^2 = 36$.

31. A committee of two persons is selected from two men and two women. What is the probability that the committee will have
  (i)   No men
  (ii) One men

SECTION-D [5 × 4]

Questions number **32** to **35** are Long Answer (LA) type questions of **5** marks each.

32. Prove that $(A \cup B)' = A' \cap B'$ [5]

33. (A) Show that [5]

$$tan\ 3x \times tan\ 2x \times tan\ x = tan\ 3x - \tan 2x - tan\ x$$

OR

  (B) Prove that

$$cos\ \left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right) = \sqrt{2}\cos x$$

34. For any two complex numbers z_1 and z_2, prove that [5]
$$Re(z_1 z_2) = Re(z_1)Re(z_2) - Im(z_1)Im(z_2)$$

35. (A) In how many ways can a team of 3 boys and 3 girls be selected from 5 boys [5]
   and 4 girls?

OR

  (B) Find the number of 4-digit numbers that can be formed using the digits
    1, 2, 3, 4, 5 if no digit is repeated. How many of these will be even?

SECTION-E [4 × 3]

Questions number **36** to **38** are case-study based questions of **4** marks each.

36. A class XI teacher, after teaching the topic of 'Relations; tries to assess the performance of her students over this topic. The figure shows a relation between the sets P and Q.
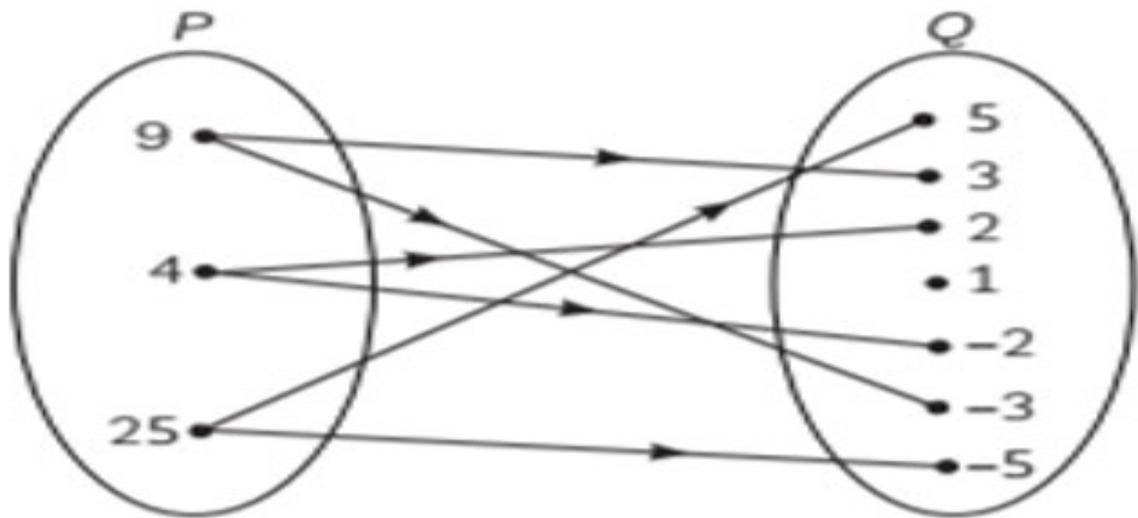
(i)   Find the relation in set builder form   [1]
(ii) What is the domain of the relation?   [1]
(iii) Find the range of the relation?   [1]
(iv) Find total no. of relation from P to Q.   [1]

37. Aditya's mother gave him Rs. 200 to buy some packets of rice and maggie from the market. The cost of one packet of rice is Rs. 30 and that of one packet of maggie is Rs. 20. Let x denotes the number of packet of rice and y denotes the number of packets of maggie.

(i) Find the inequality that represents the given situation.   [1]
(ii) If he buys 4 packets of rice and spends entire amount of Rs. 200, then find the
    maximum number of packets of maggie that he can buy.   [2]
(iii) Solve the following inequality for real x: $4x + 3 < 5x + 7$ [1]

38. One card is drawn from a well shuffled deck of 52 cards. Each outcome is equally likely.
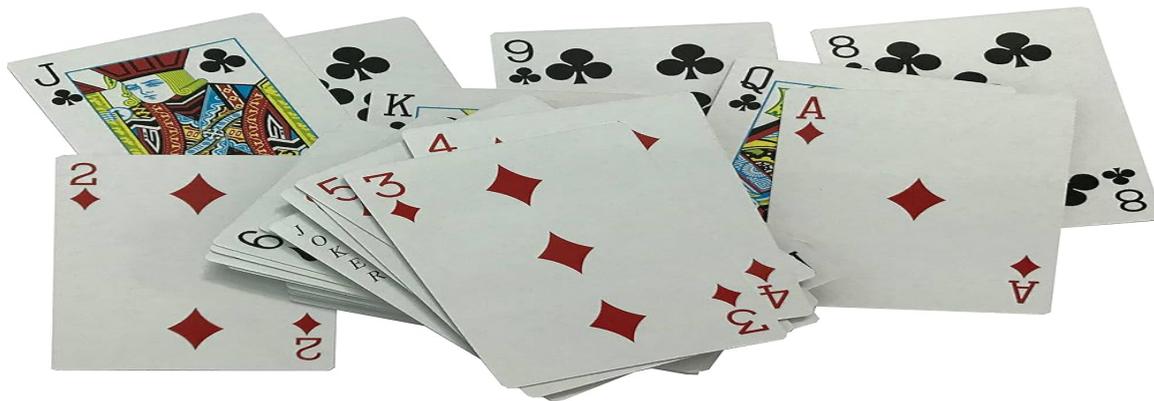
(i) What is the probability that the card will be a heart.   [1]
(ii) What is the probability that the card will be a black card.   [1]
(iii) What is the probability that the card will be an ace of spade.   [1]
(iv) What is the probability that the card will be a king of red color.   [1]