





16.  $(4 \cos^3 15^\circ - 3 \cos 15^\circ) = ?$  [1]  
 a) 0 b) 1  
 c) -1 d)  $\frac{1}{\sqrt{2}}$
17. If  $f(x) = x^{100} + x^{99} \dots + x + 1$ , then  $f'(1)$  is equal to: [1]  
 a) 5049 b) 50051  
 c) 5050 d) 5051
18. How many 3-digit even numbers can be formed with no digit repeated by using the digits 0, 1, 2, 3, 4 and 5? [1]  
 a) 56 b) 52  
 c) 50 d) 54
19. **Assertion (A):** Let  $A = \{a, b\}$  and  $B = \{a, b, c\}$ . Then,  $A \not\subset B$ . [1]  
**Reason (R):** If  $A \subset B$ , then  $A \cup B = B$ .  
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.  
 c) A is true but R is false. d) A is false but R is true.
20. **Assertion (A):** If the numbers  $\frac{-2}{7}$ ,  $K$ ,  $\frac{-7}{2}$  are in GP, then  $k = \pm 1$ . [1]  
**Reason (R):** If  $a_1, a_2, a_3$  are in GP, then  $\frac{a_2}{a_1} = \frac{a_3}{a_2}$ .  
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.  
 c) A is true but R is false. d) A is false but R is true.

### Section B

21. Let  $R$  be a relation from  $N$  to  $N$  defined by  $R = \{(a, b) : a, b \in N \text{ and } a = b^2\}$ . Are the following true? [2]  
 (i)  $(a, a) \in R$  for all  $a \in N$   
 (ii)  $(a, b) \in R$  implies  $(b, a) \in R$   
 (iii)  $(a, b) \in R, (b, c) \in R$  implies  $(a, c) \in R$   
 Justify your answer in each case.

OR

Find the range of the function given by  $f(x) = \frac{3}{2-x^2}$ .

22. Evaluate:  $\lim_{x \rightarrow 0} \frac{\sec 5x - \sec 3x}{\sec 3x - \sec x}$ . [2]
23. If  $A$  and  $B$  are two events associated with a random experiment such that  $P(A) = 0.3$ ,  $P(B) = 0.4$  and  $P(A \cup B) = 0.5$ , find  $P(A \cap B)$ . [2]

OR

A die is tossed once. What is the probability of getting an even number?

24. Using properties of set, show that:  $A \cup (A \cap B) = A$  [2]
25. Find the locus of a point, so that the join of  $(-5, 1)$  and  $(3, 2)$  subtends a right angle at the moving point. [2]

### Section C

26. Determine  $n$  if  ${}^{2n}C_3 : {}^nC_2 = 12 : 1$  [3]
27. Show that the points  $A(4, 6, -3)$ ,  $B(0, 2, 3)$  and  $C(-4, -4, -1)$  form the vertices of an isosceles triangle. [3]
28. Find an approximation of  $(0.99)^5$  using the first three terms of its expansion. [3]

OR

Using binomial theorem, expand:  $(x^2 - \frac{2}{x})^7$ .

29. Evaluate  $\lim_{x \rightarrow -2} \frac{\frac{1}{x} + \frac{1}{2}}{x+2}$  [3]

OR

If  $f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & \text{when } x \neq \frac{\pi}{2}, \\ \text{and if } \lim_{x \rightarrow \frac{\pi}{2}} f(x) = 3 \end{cases}$

Find the value of k.

30. Each side of an equilateral triangle is 18 cm. The midpoints of its sides are joined to form another triangle whose midpoints, in turn, are joined to form still another triangle. The process is continued indefinitely. Find the sum of the areas of all the triangles. [3]

OR

If a, b, c are the pth, qth and rth terms of a GP, show that  $(q - r)\log a + (r - p)\log b + (p - q)\log c = 0$ .

31. In a class, 18 students took Physics, 23 students took Chemistry and 24 students took Mathematics of these 13 took both Chemistry and Mathematics, 12 took both Physics and Chemistry and 11 took both Physics and Mathematics. If 6 students offered all the three subjects, find: [3]
- The total number of students.
  - How many took Maths but not Chemistry.
  - How many took exactly one of the three subjects.

#### Section D

32. In a survey of 44 villages of a state, about the use of LPG as a cooking mode, the following information about the families using LPG was obtained. [5]

Number of families	0-10	10-20	20-30	30-40	40-50	50-60
Number of villages	6	8	16	8	4	2

- Find the mean deviation about median for the following data.
  - Do you think more awareness was needed for the villagers to use LPG as a mode of cooking?
33. Find the equation of the ellipse whose foci are (4, 0) and (-4, 0), eccentricity = 1/3. [5]

OR

Find the (i) lengths of major and minor axes, (ii) coordinates of the vertices, (iii) coordinates of the foci, (iv) eccentricity, and (v) length of the latus rectum of ellipses:  $\frac{x^2}{25} + \frac{y^2}{9} = 1$ .

34. Solve for x,  $|x + 1| + |x| > 3$  [5]
35. Prove that  $\cos 12^\circ + \cos 60^\circ + \cos 84^\circ = \cos 24^\circ + \cos 48^\circ$  [5]

OR

Prove that:  $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$ .

#### Section E

36. **Read the text carefully and answer the questions:** [4]

**Function as a Relation** A relation f from a non-empty set A to a non-empty set B is said to be a function, if every element of set A has one and only one image in set B.

In other words, we can say that a function f is a relation from a non-empty set A to a non-empty set B such that the domain of f is A and no two distinct ordered pairs in f have the same first element or component.

If f is a function from a set A to a set B, then we write

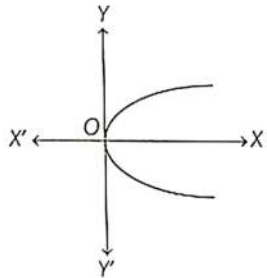
$$f : A \rightarrow B \text{ or } A \xrightarrow{f} B.$$

and it is read as  $f$  is a function from  $A$  to  $B$  or  $f$  maps  $A$  to  $B$ .

- (i) If  $f(x) = \frac{1}{2 - \sin 3x}$ , then find the range ( $f$ ).
- (ii) If  $f(1 + x) = x^2 + 1$ , then find the  $f(2 - h)$ .
- (iii) If  $f(x) = x^2 + 2x + 3$ , then find the value of among  $f(1)$ ,  $f(2)$  and  $f(3)$ .

**OR**

What is the equation of a given figure?



37. **Read the text carefully and answer the questions:**

[4]

In a hostel 60% of the students read Hindi newspapers, 40% read English newspapers and 20% read both Hindi and English newspapers.



- (i) A student is selected at random. She reads Hindi or English newspaper?
- (ii) A student is selected at random. Did she read neither Hindi nor English newspapers?
- (iii) A student is selected at random. She reads Hindi but not English Newspaper?

**OR**

A student is selected at random. She reads English but not Hindi Newspaper?

38. **Read the text carefully and answer the questions:**

[4]

The conjugate of a complex number  $z$ , is the complex number, obtained by changing the sign of imaginary part of  $z$ . It is denoted by  $\bar{z}$ .

The modulus (or absolute value) of a complex number,  $z = a + ib$  is defined as the non-negative real number  $\sqrt{a^2 + b^2}$ . It is denoted by  $|z|$ . i.e.

$$|z| = \sqrt{a^2 + b^2}$$

Multiplicative inverse of  $z$  is  $\frac{\bar{z}}{|z|^2}$ . It is also called reciprocal of  $z$ .

$$z\bar{z} = |z|^2$$

- (i) If  $f(z) = \frac{7-z}{1-z^2}$ , where  $z = 1 + 2i$ , then find  $|f(z)|$ .
- (ii) Find the value of  $(z + 3)(\bar{z} + 3)$ .