

10. If $f(x) = (\sin x + \cos x)^2$, then $f(\pi)$ is :
 A) 0 B) 1 C) -1 D) 8
11. Let $A = \{0, 1, 9\}$, $B = \{2, 0, 5\}$ and $C = \{0, -2, 6\}$, then the number of elements in $A \times (B - C)$ is:
 A) 5 B) 6 C) 12 D) 8
12. Multiplicative inverse of $4 - 3i$ is:
 A) $\frac{4}{5} - \frac{3}{5}i$ B) $\frac{4}{5} + \frac{3}{5}i$ C) $-\frac{4}{5} + \frac{3}{5}i$ D) $-\frac{4}{5} - \frac{3}{5}i$
13. Let $A = \{2, 3\}$, $B = \{3, 4, 5\}$ and $U = \{1, 2, 3, 4, 5, 6\}$ then $(A \cup B)'$ is:
 A) $\emptyset$ B) $\{1, 5\}$ C) $\{1, 6\}$ D) $\{6, 2\}$
14. Domain of the function $f(x) = \frac{x^2 + 3x + 5}{x^2 - 5x + 4}$ is :
 A) R B) $\emptyset$ C) $R - \{1, 4\}$ D) $\{1, 4\}$
15. A function $f(x) = \begin{cases} 2x - 3, & 0 \leq x < 4 \\ x^2 - 5, & x \geq 4 \end{cases}$, then $f(4)$ is :
 A) 5 B) 11 C) 12 D) 9
16. Let $A = \{-1, 0, 1, 2, \{3, 7\}, 4, 5, 6\}$ then which of the following statement is incorrect:
 A) $\{3, 7\} \in A$ B) $\{3, 7\} \subset A$ C) $\{1, 4\} \subset A$ D) $\{\{3, 7\}\} \subset A$
17. The degree measure corresponding to $-\frac{5\pi}{3}$ is :
 A) -270° B) -300° C) -120° D) -240°
18. The additive inverse of $\frac{5 + \sqrt{2}i}{1 - \sqrt{2}i}$ is:
 A) $1 - 2\sqrt{2}i$ B) $-1 - 2\sqrt{2}i$ C) $-1 + 2\sqrt{2}i$ D) $1 + 2\sqrt{2}i$

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (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.

19. Assertion (A): The maximum value of $3\sin x - 4\sin^3 x + 2$ is 4.
 Reason (R): For real x , $-1 \leq \sin x \leq 1$
20. Assertion (A): The number of non-empty subsets of the set containing letters of the word 'SECTION' is 127.
 Reason (R): The number of subsets of a set having n elements is 2^n .

SECTION-B (Each question carries two marks)

21. Find the value of n if ${}^nP_5 = 42 \cdot {}^nP_3, n > 4$.

OR

- How many numbers lying between 100 and 1000 can be formed with the digits 0, 1, 2, 3, 4, 5 if the repetition of digits is not allowed.
22. If all letters of the word "RANK" are arranged as in dictionary, what will be 21st word?
23. Let $R = \{(x, y) : y = x + 1 \text{ and } x, y \in \{0, 1, 2, 4, 5\}\}$. Write R in roster form. Write its domain and range.
24. Draw graph of the function : $f(x) = \begin{cases} -x, & x < 0 \\ x^2, & x \geq 0 \end{cases}$

OR

- Let $f = \{(1, 1), (2, 3)\}$ be a function from Z to Z defined by $f(x) = ax + b$. Find the function.
25. Find $x + y$, if x and y are real numbers and $(x - iy)(3 - 5i)$ is conjugate of $-3 + 4i$.

SECTION-C (Each question carry three marks)

26. IQ of a person is given by the formula $IQ = \frac{MA}{CA} \times 100$, where MA is the mental age and CA is the chronological age. If $60 \leq IQ \leq 100$ for a group of 10 year old children, find the range of their mental age. Taking MA as x , represent its value on number line.
27. Verify De Morgan's law, using Venn diagram.
28. Let A be set of all letters of the word "TAMILNADU",
 $X = \{x : x \text{ is a vowel and } x \in A\}$ and $Y = \{y : y \text{ is a consonant and } y \in A\}$
 Write X and Y in roster form and find the following:
 i) $A - X$ ii) $A - Y$ iii) $X \cup Y$ iv) $X \cap Y$

OR

- If $n(U) = 50, n(A) = 3x, n(B) = 2x$ and $n(A \cap B) = x = n(A \cup B)'$, find
 i) x ii) $n(A - B)$ iii) $n(A \cup B)$

29. Simplify : $\frac{\cos(\pi + x) \cos(-x)}{\sin(\pi - x) \cos(\frac{\pi}{2} + x)} - \frac{\tan(\pi - x) \tan(\frac{\pi}{2} + x)}{\cos(\frac{3\pi}{2} + x) \cos(\frac{5\pi}{2} + x)}$

OR

Prove that : $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2 \frac{x+y}{2}$

30. Find the range of the following functions:

i) $-|2x - 3| + 5$ ii) $2 - 3 \sin x$ iii) $\sqrt{25 - x^2}$

31. If $a + ib = \frac{c+i}{c-i}$, where a, b, c are real, prove that $\frac{b}{a} = \frac{2c}{c^2 - 1}$ and find $a^2 + b^2$.

OR

Express $\frac{3-4i}{(4-2i)(1+i)}$ in the standard form and find its modulus.

SECTION-D (Each question carry five marks)

32. How many words can be formed by taking four letters at a time from the letters of the word "MATHEMATICS".

OR

In how many ways can the letters of the word "SISTER" be arranged if:

- i) Words start with R and end with S.
- ii) All S's occur together
- iii) There are always 3 letters between S and E.

33. Find $(a+b)^4 - (a-b)^4$ and hence evaluate : $(\sqrt{5} + \sqrt{3})^4 - (\sqrt{5} - \sqrt{3})^4$.

34. The ratio of the A.M. and G.M. of two positive numbers a and b is m:n. Show that :

$$a:b = (m + \sqrt{m^2 - n^2}) : (m - \sqrt{m^2 - n^2})$$

OR

Find the sum to first n terms of the series: $0.7 + 0.77 + 0.777 + \dots$

35. Prove that : $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$.

SECTION-E CASE BASED QUESTIONS (Each question carry four marks)

36. Some students decided to save some portion of pocket money and their savings form a geometric progression. The savings of the 5th and 3rd students are Rs. 2025 and Rs.225 respectively.

Based on the above information, answer the following questions:

- i) Find the common ratio of the progression.
- ii) Find the amount saved by the first student.
- iii) Find the ratio of the savings of 4th student to 2nd student.

OR

Find the total saving of first 5 students.

37. In a competitive examination paper consists of 10 questions divided into two sections I and II, each containing 5 questions. A student is required to attempt 7 questions. In how many ways the student select the questions if :

- i) The student selects exactly 4 questions from the section I.
- ii) The student selects all questions from the section I.
- iii) The student selects at least 3 questions from the section I.

OR -

The student selects at most 4 questions from the section I.

38. During tree plantation drive, a rectangular park is used for planting saplings. Length of the park is three times its width. Width of the park is x metres.

Based on the above information, answer the following questions:

- i) Find the least value of x if the minimum perimeter of the park is 160m.
- ii) If the perimeter of the triangle is at most 200 m, then what is the maximum value of x ?