

Lavanya Roll No - 04

General Instructions:

All questions are compulsory.

This question paper contains 38 questions .

Questions 1 to 20 in section A are multiple choice questions carrying 1 mark each .

Questions 21 to 25 in section B are very short answer type questions carrying 2 marks each

Questions 26 to 31 in section C are short answer type questions carrying 3 marks each .

Questions 32 to 35 in section D are long answer type questions carrying 5 marks each .

Questions 36 to 38 in section E are case based questions carrying 4 marks each.

[SECTION - A]

Q1. If A and B be any two sets, then $A \cap (A \cup B)^c$ is equal to :

- (a) A (b) B (c) Φ (d) None of these

Q2. The value of $\sin(\pi - \theta) \sin(\pi + \theta) \operatorname{cosec}^2 \theta =$

- (a) 0 (b) 1 (c) -1 (d) $1/2$

Q3. The number of the proper subset of {a, b, c} is :

- (a) 3 (b) 8 (c) 6 (d) 7

Q4. Set $A = \{0, 7, 26, 63\}$ in set-builder form is :

- (a) $\{x : x \in \mathbb{N}, x = n^3 - 1 \text{ and } n \leq 7\}$ (b) $\{x : x \in \mathbb{N}, x = n^2 - 1 \text{ and } n \leq 5\}$
(c) $\{x : x \in \mathbb{N}, x = n^2 + 1 \text{ and } n \leq 4\}$ (d) $\{x : x \in \mathbb{N}, x = n^3 - 1 \text{ and } n \leq 4\}$

Q5. Value of $\sin 10^\circ + \sin 20^\circ + \sin 30^\circ + \dots + \sin 360^\circ$ is :

- (a) 1 (b) 0 (c) 2 (d) $1/2$

- Q6. If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$ and $D = \{15, 17\}$, Then $(A \cup B) \cap C$ is :
 (a) $\{11, 13, 15\}$ (b) $\{9, 11, 13, 15\}$ (c) $\{9, 11, 13\}$ (d) $\{11, 13\}$
- Q7. If $\tan A = 1/2$ and $\tan B = 1/3$, then the value of $\tan(A + B) =$
 (a) 1 (b) 0 (c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$
- Q8. If $i^{103} = a + ib$ then $a + b$ is equal to :
 (a) 1 (b) -1 (c) 0 (d) 2
- Q9. The variance of the data is 121, then the standard deviation of the data is :
 (a) 11 (b) 12 (c) 13 (d) 1331
- Q10. The value of $\sin\left(\frac{-11\pi}{3}\right)$ is $\frac{\sqrt{3}}{m}$. Value of 'm' is :
 (a) 1 (b) 2 (c) 3 (d) 5
- Q11. The real part of $\frac{(1+i)^2}{3-i}$:
 (a) $\frac{1}{3}$ (b) $-\frac{1}{5}$ (c) $-\frac{1}{3}$ (d) None of these
- Q12. The solution of the $0 < \frac{3(x-2)}{5} < 15$ is :
 (a) $2 < x < 27$ (b) $27 < x < -2$ (c) $-27 < x < 2$ (d) $-27 < x < -2$
- Q13. The conjugate of complex number $5i - 4$ is :
 a) $-5i - 4$ b) $5 - 4i$ c) $-5i + 4$ d) $5i + 4$
- Q14. If $\tan A = 3$ and A lies in IIIrd quadrant, then the value of $\sin A$ is :
 a) $\frac{1}{\sqrt{10}}$ b) $\frac{2}{\sqrt{10}}$ c) $-\frac{3}{\sqrt{10}}$ d) $-\frac{5}{\sqrt{10}}$
- Q15. If $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$, x belongs to :
 a) $[1, \infty)$ b) $(1, \infty)$ c) $(-5, 5)$ d) $[-5, 5]$

Q16. There are three relations R_1 , R_2 and R_3 such that $R_1 = \{(2, 1), (3, 1), (4, 2)\}$,
 $R_2 = \{(2, 2), (2, 4), (3, 3), (4, 4)\}$ and $R_3 = \{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6), (6, 7)\}$ Then :

- a) R_1 and R_2 are function b) R_2 and R_3 are functions
 c) R_1 and R_3 are function d) Only R_1 is a function

Q17. The mean deviation from the mean for the set of observations $-1, 0, 4$ is :

- a) 3 b) 2 c) 1 d) none of these

Q18. The domain of relation $R = \{(x, y) : x^2 + y^2 = 16, x, y \in \mathbb{Z}\}$ is :

- (b) $\{0, 1, 2, 3, 4\}$ b) $\{-4, -3, -2, -1\}$
 (c) $\{-4, -3, -2, -1, 0, 1, 2, 3, 4\}$ d) None of the above

Assertion -Reason Based question :-

Question 19 and 20 contains Assertion and Reason and has four choices a), b), c) and d), only one of which is the correct answer. Mark the correct choice :

- a) Assertion and Reason are true and Reason is a correct explanation for Assertion.
 b) Assertion and Reason are true, Reason is not the correct explanation of assertion.
 c) Assertion is true but reason is false.
 d) Assertion is false but reason is true.

Q19. Assertion : The subsets of the set $\{1, \{2\}\}$ are $\{\}$, $\{1\}$, $\{\{2\}\}$ and $\{1, \{2\}\}$.

Reason : The total number of proper subsets of a set containing n elements is $2^n - 1$.

Q20. Assertion: cosec x is negative in third and fourth quadrants.

Reason : cot x decreases from 0 to $-\infty$ in first quadrant & increases from 0 to ∞ in third quadrant.

[SECTION - B]

Q21. If the arcs of the same lengths in two circle subtend angles 65° and 110° at the centre, find the ratio of their radii.

Q22. i) Write the interval $[-23, 5)$ in the set-builder form.

ii) Write all the subsets of $\{a, b, c\}$.

Q23. Let $f(x) = \sqrt{x}$ and $g(x) = 2x$ be two real functions. Find $(f + g)(x)$, $(f - g)(x)$, $(fg)(x)$, $\left(\frac{f}{g}\right)(x)$

OR

Find the domain and range of the function $f(x) = \sqrt{9 - x^2}$.

Q24. The marks obtained by a student of class XI in first and second terminal examination are 62 and 48 respectively. Find the minimum marks he should get in the annual examination to have an average of at least 60 marks.

OR

Find all pairs of consecutive even positive integers, both of which are larger than 5 such that their sum is less than 23.

Q25. Find the value of $\tan \frac{\pi}{8}$.

[SECTION - C]

Q26. Let $A = \{1, 2, 3, \dots, 14\}$. Let R be the relation on A defined by $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$:

- i) Write R in roster form.
- ii) Find the domain of R .
- iii) Find the range and codomain of R .

OR

Q26. i) Let $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ be a function from Z to Z defined by $f(x) = ax + b$, for some integers a, b . Determine a, b .

ii) Define and draw the graph of modulus function. Write its domain and range.

Q27. Solve the inequalities $5(2x - 7) - 3(2x + 3) \leq 0$, $2x + 19 \leq 6x + 47$ and represent the solution graphically on the number line.

OR

The longest side of a triangle is three times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm, find the minimum length of the shortest side.

- Q28. i) Convert: -4 radian into degree measure.
 ii) The minute hand of a watch is 1.5 cm long. How far does it's tip move in 40 minutes?

Q29. Prove that : $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$

OR

Prove that : $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$

- Q30. i) If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$, $C = \{2, 4, 6, 8, 10, 12, 14, 16\}$ and $D = \{5, 10, 15, 20\}$. Find : a) $A - C$ b) $(A \cap C) \cap (B \cup C)$.
 ii) Draw venn diagram of $A' \cup B'$

Q31. Find the mean deviation about median for the following data :

x_i	15	21	27	30	35
f_i	3	5	6	7	8

[SECTION - D]

Q32. How many litres of water will have to be added to 1125 litres of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content ?

Q33. Calculate mean, variance and standard deviation for the following distribution.

Classes	0-30	30-60	60-90	90-120	120-150	150-180	180-210
Frequency	2	3	5	10	3	5	2

OR

- i) If the set A has 2 elements and set B has 3 elements and some of the elements of $A \times B$ are $(a, 1)$, $(b, 3)$ and $(b, 2)$. Then find A and B. Also find the remaining elements of $A \times B$. (1)
- ii) The cartesian product $P \times P$ has 16 elements among which are found $(a, 1)$ and $(b, 2)$. Then find set P. (1)
- iii) Express the function $f: A \rightarrow R$, $f(x) = x^2 - 1$, where $A = \{-4, 0, 1, 4\}$ as a set of ordered pairs. Find the range and codomain. (2)
38. Two complex numbers $z_1 = a + ib$ and $z_2 = c + id$ are said to be equal if $a = c$ and $b = d$
- i) If $(2a + 2b) + i(ba) = -4i$, then find the real values of a and b. Express the given expression $(1 + i)(1 + 2i)$ in the form $a + ib$. (2)
- ii) Find multiplicative inverse and conjugate of $2 - 4i$. (2)