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iii) If A and B are two disjoint sets then

- a) $\{A \cap B\} = \{A\}$ b) $\{A \cap B\} = \{B\}$
c) $\{A \cap B\} = \{U\}$ d) $\{A \cap B\} = \{\phi\}$

iv) $y = x$ denotes a graph of

- a) a circle b) a straight line
c) a particular point d) none of these.

v) The points $(1, 2)$, $(2, 4)$ and $(x, 6)$ are collinear.

Then, $x =$

- a) 3 b) 4
c) 0 d) -3.

vi) The value of $\left(\frac{1}{81}\right)^{-3/4}$ is equal to

- a) 3 b) 21
c) 27 d) 9.

vii) If $a + \sqrt{b} = x + \sqrt{y}$, which of the following is true ?

- a) $a = x$ or $b = y$ b) $a = y$ and $b = x$
c) $a = x$ and $b = y$ d) $a = y$ or $b = x$.

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GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Find the square root of $(28 - 6\sqrt{3})$.
3. If three successive coefficients in the expansion of $(1 + x)^n$ be 252, 210 and 120 respectively, find the value of n .
4. Find the 9th term of the G.P. of which the 4th and 11th terms are 2 and $1/64$ respectively.
5. Find the equation of the straight line that passes through the origin and the point of intersection between the two straight lines $x - y - 4 = 0$ and $7x + y + 20 = 0$.
6. If $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y = \frac{\sqrt{3}-1}{\sqrt{3}+1}$, find the value of $(x^2 + xy + y^2) / (x^2 - xy + y^2)$.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) If x, y, z are in G.P., prove that $\log x, \log y$ and $\log z$ are in A.P.

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b) The price of a diamond weighing 10 carats is Rs. 12,000. The diamond is broken into 2 pieces weighing 8 carats and 2 carats. If the price of the diamond is proportional to the square of its weight, find the amount of loss due to breakage.

c) Rohan purchased a mobile phone paying Rs. 5,000 down and promising to pay Rs. 200 quarterly for the next 4 years. The seller charges 8% per annum compounded quarterly. Find the extra amount of money Rohan will pay due to his hire-purchase. 4 + 4 + 7

8. a) Divide 21 into three parts, which will be in A.P., such that the product of the first and second parts is 28.

b) If $f(x) = \frac{1-x}{1+x}$ find $f\left\{f\left(\frac{1}{x}\right)\right\}$.

c) Show that $2+\sqrt{17}$ is not a rational number.

5 + 5 + 5

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9. a) If $(x^2 + y^2 + z^2)(a^2 + b^2 + c^2) = (ax + by + cz)^2$ then show that $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$.

b) An urn contains 12 lamps of which 5 are defectives. In how many ways 6 lamps can be selected from the urn so as to include at most 3 defective lamps.

c) If the sum of the roots of a quadratic equation is 2 and the sum of their cubes is 27, then find the corresponding equation.

10. a) Find the value of m if $x^2 - 2(5 + 2m)x + 3(7 + 10m) = 0$ has equal roots.

b) Which term in the expansion of $\left(x^2 + \frac{1}{x}\right)^{12}$ is independent of x ? Write the value of that term.

c) A student counsellor is planning schedules for 30 students to train them on foreign languages. Sixteen students say they want to take French, 16 want to take Spanish, and 11 want to take German. Five say they want to take both French and German and of these, 3 wanted to take Spanish as well. Five want only German, and 8 want only Spanish. How many students want French only?

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11. a) Find the locus of the point, the ratio of whose distances from the line $x = 2$ and from the point $(5, -1)$ is $3 : 2$.

b) State De Morgan's laws.

If $U = (-1, -2, 0, 3, 5, 10, 12, 13, 16)$,

$P = \{-2, 3, 5, 12\}$, $Q = \{-1, -2, 0, 5, 12, 13\}$,

then verify De Morgan's laws.

c) Find the equation of the circle through the points $(4, 3)$ and $(-2, 5)$ and having its centre on the line $2x - 3y = 4$.

Or

Apply the principle of mathematical induction to prove

$$\frac{1}{4 \cdot 7} + \frac{1}{7 \cdot 10} + \frac{1}{10 \cdot 13} + \dots + \frac{1}{(3n+1) \cdot (3n+4)} = \frac{n}{4(3n+4)}$$
