## QUESTION 2013

Group-A

(Multiple Choice Type Questions) . Choose the correct alternatives for the following:

in The roots of the quadratic equation  $x^2-4x-5=0$  are

VO) -1.5

a The value of logs 2 is

10 1

f(x+1) = 2x + 3, then f(-3) is

a) 5

c) 7

w y = x denotes a graph of

a) a circle

c) a point

d) none of these

a) if a finite set has 5 elements, then the no. of elements of its power set is

d) none of these

vi) The equation to the locus of the moving point (3t, t) where t is parameter, is

b) 
$$x = 3t$$

$$0) x = 3y$$

vi) The co-ordinates of the centroid of the triangle whose vertices are (2,0), (1,-3) and (-3,3)

c) 
$$(-1, 3)$$

will Which of the following is a null set?

a) [0]

b) 
$$\{\phi\}$$
  $\{x: x \text{ is an integer and } 1 < x < 2\}$ 

d) none of these

ii) The centre and radius of the circle  $x^2 + y^2 - 4x + 6y - 12 = 0$  are respectively

a) (2,3) and  $\sqrt{5}$  units

√b) (2, -3) and 5 units

c) (4, 6) and 10 units

d) none of these

 $n) \text{ if } A \subset B \text{. then } A \cup B =$ 

Fa) A

b) A \cap B

c) B

d) none of these

Group - B (Short Answer Type Questions)

 $2 \cdot \log \left(\frac{a-b}{3}\right) = \frac{1}{2} (\log a + \log b), \text{ then show that } a^2 + b^2 = 11ab.$ 

San Topic: BASIC ALGEBRA, Short Answer Type Question No. 2.

3. Find the angle between the straight lines x-2y+1=0 and x+3y=2. See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Short Answer Type Question No. 12.

4. If the coefficient of  $x^3$  in the expansion of  $\left(x^3 + \frac{k}{x}\right)^5$  be 160, find the value of k.

See Topic: MATHEMATICAL INDUCTION & BINOMIAL THEOREM, Short Answer Type Question No. 5.

- 5. In a cricket team of 14 players there are 6 bowlers. How many different teams of 11 players can be formed taking at least 4 bowlers in the team?

  See Topic: PERMUTATIONS AND COMBINATIONS, Short Answer Type Question No. 7.
- 8. Without using Venn diagram, prove that  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ . See Topic: SETS, Short Answer Type Question No. 4.

## Group - C (Long Answer Type Questions)

7. a) If  $\alpha$  and  $\beta$  are the roots of the equation  $2x^2-4x+1=0$ , then form such an equation whose roots are  $\alpha^2+\beta$  and  $\beta^2+\alpha$ .

b) If 
$$\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$$
, then prove that  $xyz = 1$ .

- c) Find the sum of 6+66+666+... upto n terms.
- a) See Topic: THEORY OF QUADRATIC EQUATION, Short Answer Type Question No. 3.
- b) See Topic: BASIC ALGEBRA, Short Answer Type Question No. 4.
- c) See Topic: SEQUENCES & SERIES, Long Answer Type Question No. 5.
- 8. 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) If  $\frac{1}{a}$ ,  $\frac{1}{b}$ ,  $\frac{1}{c}$  are in A.P. and  $(a+b+c\neq 0)$ , then show that  $\frac{b+c}{a}$ ,  $\frac{c+a}{b}$ ,  $\frac{a+b}{c}$  are also in A.P.
- 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.
- 3) See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 11.
- b) See Topic: SEQUENCES & SERIES, Long Answer Type Question No. 7.
- c) See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 12.
- 9. a) If x is real, find the maximum value of  $\frac{x+2}{2x^2+3x+6}$ .
- b) Apply the principle of mathematical induction to prove,

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$$\frac{1}{4.7} + \frac{1}{7.10} + \frac{1}{10.13} + \dots + \frac{1}{(3n+1).(3n+4)} = \frac{n}{4(3n+4)}.$$

- c) Solve the equation  $2^{x+2} + 2^{x-1} = 9$
- a) See Topic: THEORY OF QUADRATIC EQUATION, Long Answer Type Question No. 14.
- b) See Topic: MATHEMATICAL INDUCTION & BINOMIAL THEOREM, Long Answer Type **Ouestion No. 4.**
- c) See Topic: BASIC ALGEBRA, Long Answer Type Question No. 17.
- 10. a) Examine whether the function  $f:z\to z$  defined by f(x)=x+2 is one-one onto. If inverse exists, find its inverse.
- b) Prove that  $C_0^2 + C_1^2 + C_2^2 + \dots + C_n^2 = \frac{(2n)!}{(n!)^2}$
- c) Show that the straight line  $y = x + c\sqrt{2}$  touches the circle  $x^2 + y^2 = c^2$ , where c is a constant. Also find the point of contact.
- a) See Topic: FUNCTIONS, Long Answer Type Question No. 1.
- b) See Topic: MATHEMATICAL INDUCTION & BINOMIAL THEOREM, Long Answer Type Question No. 2.
- c) See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 17.
- 11. a) What is the present value of Rs. 1,000 due in 2 years at 5% compound interest according to the interest is paid i) yearly, ii) half-yearly?
- b) Find the total number of arrangements of the letters of the world 'STATISTICS' when
- i) there is no restriction
- ii) the vowels remain together
- iii) order of the vowels remain unchanged.
- c) 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.
- a) See Topic: COMPOUND INTEREST AND ANNUITY, Long Answer Type Question No. 2.
- b) See Topic: PERMUTATIONS AND COMBINATIONS, Long Answer Type Question No. 5. c) See Topic: SETS, Long Answer Type Question No. 11.