Class: F.Y.BSc IT

[Time:$2\frac{1}{2}$ Hours]

Subject: Discrete Mathematics

[Marks:75]

NOTE:

➢ **All questions are compulsory.**
➢ **Figures to the right indicate marks.**
➢ **Use of calculator is allowed.**

Q.1. Attempt any three from the following: [5X3=15]

1. Let U= {1,2,3,4,5,6,7,8,9}. If A ={1,2,3,4}, B={3,4,5,6}, C={1,3,5,7,9} then compute (A-B)UC, A∩ B', (A∩B)' and A symmetric B.

2. Explain method of writing sets with an example.

3. Draw Venn diagram for the following
   i.   A' U B'
   ii.   A symmetric B
   iii.   A UB

4. If A, B,C and D are any four sets then show that (A -B)XC=(AXC)-(BXC).

5. Explain conditional and disjunction logical operator and also give its truth table.

6. Let p: It rains; q: It is cloudy. Write following statements symbolically:
   i.   It rains and it is not cloudy.
   ii.   If it is cloudy then it will rain.
   iii.   If it is not cloudy then it does not rain.
   iv.   It will rain if and only if it is cloudy.
   v.   It is not true that it will rain or it is cloudy.

Q.2. Attempt any three from the following: [5X3=15]

1. Let a, b and c are integers. If a|b and a|c then show that a|b+c.

2. Write the following statements using variables and quantifiers
   i.   All quadrilaterals have four sides.
   ii.   Sum of all angles of a triangle is 180.
   iii.   No snakes have hands.
   iv.   Some numbers are perfect numbers.

3. Convert the following arguments using quantifiers and also check its validity using diagram.
   i. All your friends are perfect
   ii. Not everyone is perfect.

4. For any given integers x, y and z if x-y is even and y-z is even then show that 2x-(y+z) is also

even.

5. Negate each of the following statements:

    i.   Some girls are sincere.

    ii.   I will have tea or coffee.

    iii.   You will be smart if and only if you are healthy.

    iv.   All men are animals.

    v.   The weather is bad and I will not go to work.

6. Prove that square root of 2 is irrational.

Q.3. Attempt any three from the following: **[5X3=15]**

1. What is sequence. And also write first 7 terms of $a_n = 3n^2 + 2n - 6$

2. Prove by mathematical induction

$1^2 + 2^2 + 3^2 + \ldots\ldots\ldots + n^2 = n(n+1)(2n+1)/6$,   for all n>=1.

3. Prove by mathematical induction that $3|(n^3 - n)$ for every positive integer n.

4. Solve the recurrence relation $a_n = 3a_{n-1} + 7$, n>=2, and $a_1 = 5$ by using backtracking method.

5. Solve the recurrence relation $a_n = 2a_{n-1} - 2a_{n-2}$, $a_1 = 1$, $a_2 = 4$.

6. If f:R-{7/3} to R-{4/3} be a function defined as f(x)= (4x-5)/(3x-7) then show that f is bijective function.

Q.4. Attempt any three from the following: **[5X3=15]**

1. Explain matrix of a relation R.

2. If A ={1,2,3,4,5} and following be the matrix representation of relation om A then find that relation and also write its inverse relation.

    i.
$$M = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

    ii.
$$M = \begin{bmatrix} 1 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

3. What is reflexive, irreflexive and transitive relations.

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