Assignment - 1
Basics of Algorithms & Mathematics

Q.1) Define algorithm. Discuss various properties of algorithm. Enlist steps for designing an algorithm.

A.1)

- **Algorithm**

→ Algorithm is a process or set of rules to be followed to achieve desired output, especially by a computer.

→ Hence, it is any well-defined computational procedure that some value, or set of values as input & produces some value, or set of values as output.

- **Properties of Algorithm**

→ Precision: Each step of an algorithm must be precisely defined.

→ Input: An algorithm accepts zero or more inputs

→ Output: An algorithm must generate atleast one desirable output.

→ Finiteness: An algorithm must always terminate after finite no. of steps.

→ Effectiveness: All operations to be performed in algorithm must be essential & basic.

→ Generality: Algorithm should be expressed in generic form & must be applicable to a set of all possible inputs.

- Steps to design algorithm

→ Obtain description of the problem.
→ Analyze the problem.
→ Develop high-level algorithm
→ Refine algorithm by adding more detail.
→ Review the algorithm.

Q.2) Define algorithmic strategies. Mention any 5 algorithm design techniques.

A.2)

- Algorithm Strategies

→ Algorithm strategy is defined as an approach to solve a problem & it can combine several approaches.

- Types of algorithm design techniques

→ Simple recursive algorithms
→ Backtracking algorithms
→ Divide & conquer algorithms
→ Greedy algorithms
→ Brute force algorithms

Q.3) What are three ways for representing a set?

A.3) • Roster Notation (Tabular Form)

→ Listing all elements of set, separated by commas & enclosed within curly brackets {}.

→ Eg: A = {1,2,3,4,5}

• Set Builder Form

→ Writing in symbolic form the common characteri-stics shared by all elements of set.

→ Eg: A = {x : x ∈ N ∧ x ≤ 5}, N = Natural numbers

• Descriptive Form.

→ State in words the elements of set.

→ Eg: A = Set of first five natural numbers.

Q.4) Determine whether R is equivalence relation or not where A = {0,1,2} & R = {(0,0), (1,0), (1,1), (2,2), (2,1)}.

A.4) Given, A = {0,1,2}

Relation R over A = {(0,0), (1,0), (1,1), (2,2), (2,1)}

Here, as ∀x ∈ A, (x,x) ∈ R, the given relation R is reflexive over A.

Also, as ∀x,y ∈ A, (x,y) & (y,x) ∉ R, given relation R is not symmetric over A.

Hence, R is not an equivalence relation over A.

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Q.5.) Provide an example of solution to linear in-equality.

A.5.) → The term inequality is applied to any statement involving one of the symbols $<, >, \leq, \geq$.

Ex: $+3x + 5 \leq +16$

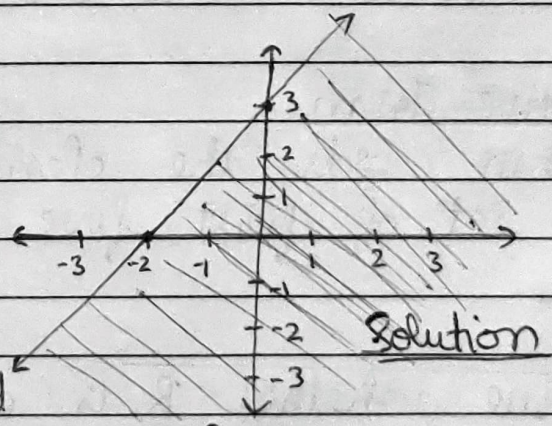
$\Rightarrow +3x \leq +16 - 5$

$\Rightarrow +3x \leq +21$

$\Rightarrow x \leq 7 \rightarrow$ ∴ Solution.

Ex: $2y \leq 3x + 6$

$\Rightarrow y \leq \frac{3}{2}x + 3$



Solution

Hence, the shaded graph is the solution for linear inequality $2y \leq 3x + 6$