~~Python~~ U-1 (DAA)

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Q1: need of correctness of algorithm.

- ensure → algo developed → satisfy the functional requirements.
- ensure → soln for problem → valid.
- duke → given problem → finite or infinite soln.
- efficient execution of tasks in comp.
- all cases of problem → covered
- appln correctness of algo → safety of human life or costly equip.

To confirm correctness –

steps followed are

- Identify properties of input data → preconditions
- Identify properties which must be satisfied by output data → postconditions.

The algorithm is correct if it can be proved that if pre-condition is true, the post condn must be true.

Pre- condn ⇒ Post -condn

If example is asked → Travelling Salesman Problem.
- travels diff cities
- each city one & only once.
- total tour → minimum cost.

- every tour is examined & cost is computed
- Tour with minimum cost is examined & retained.

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Q2- Issues in designing iterative algorithm-

- Iterative algo → recursive in nature
- In these types of algorithm → function doesn't call themselves.

Reasons-

- Iterations using loop control structures → eg → for, while, repeat-until-
  i) Intial condn ii) Terminating condn iii) Invariant condn.

- Improving efficiency of algo -
  - eliminate redundant computation → loop
  - Reducing reference to array → in loop
  - Avoiding last termination of a loop
  - early detection of expected output condn.

- estimation of Space & time requirements-
  ↳ amt of computer time requ to run algo.

- Expressing complexities using order notations-

- Applying different algorithmic strategies-
  - ↳ Brute Force
  - ↳ Divide & Conquer
  - ↳ Dynamic Programming
  - ↳ Greedy Technique
  - ↳ Backtracking.

Q3- Algorithm & characteristics

Q4-

→ step by step procedure which defines a set of instructions to be executed in certain order to get desired output.

characteristics –

1) Input – algo → zero or more inputs.
each oper^n → fundamental operator

2) Output – algo → atleast one output.
each oper^n → fundamental operate → zero or more inputs

3) Definiteness – all instr^n → algo → unambiguous, precise & easy to interpret

4) Finiteness – algo → must terminate after a finite no. of steps in all test cases.

5) effectiveness – develop algo → very basic, simple & feasible operations so that it can be traced.

- good algo → precise & unambiguous → every step
- same problem → diff algo strategies
- same algo → multiple ways.
- legitimate inputs → algo → well specified.

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Q4 Algo as Technology.

- algo → tool to utilize reasonable amount of exec" time & memory space.
- diff algo → (help) diff places
- every algo → own space & time complexity
- Fundamental concept → cs & plays crucial role in various field such as ai, cryptography, etc.

execution of algo → 1) selection of efficient algo

2) Fast hardware upon which algorith is executed.

eg → GPS navigator system in smartphone.

- Two algo Insertion sort (less efficient)
  Merge sort (more efficient)

Comp A.
Comp B → Mergesort → execution efficient.
↙ hardware plays imp role.

eg → AI, embedded system, robotics, Networking, web designing, etc.

Q5 & Q6 -

Problem Solving Strategies -

- different algorithms solve diff problems

1) Divide & Conquer - breaks down a large problem into smaller, more manageable subproblems
   - Top down approach
   - combine soln of subproblem to whole original problem.

2) Brute Force -
   - Technique with naive approach.
   - finds all possible solutions to find satisfactory soln
   - wide range of domains.

3) Dynamic Programming -
   - bottom up approach.
   - results of smaller reoccuring instances used to solve.

4) Trial & error - diff soln & observing outcomes until right one is found repeated attempts
   example - arranging a puzzle.

5) Greedy Technique
   - locally optimized decisions.
   - looks best at moment (decision)
   - no guarantee of optimal soln.
   - close to optimal value.