



Module-4

Greedy Algorithms

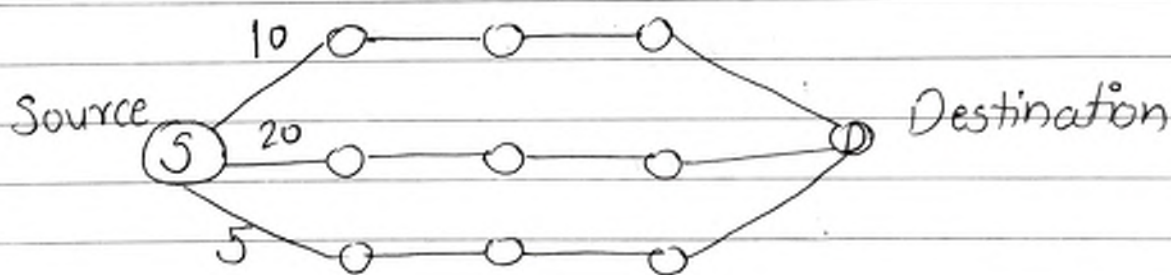
Introduction :-

Greedy algorithms are the algorithms that follow local optimal choice of each stage with intend of finding global optimum.

Which

It is we go to or we select best possible solution in every stage of solving a problem.

Example



So in this case where we need to find the minimum cost path from source to destination in first step from source we have three edges 10, 20 & 5 out of which 5 is selected in first step.

We are following local optimal choice of each stage.



And by finding local optimal choice at each stage finally we reach to Destination with minimum cost path. which is global optimum.

We have a solution space and we need to find out the feasible solution based on some selection criteria.

For example, a 12th passed student have multiple options career options like engineering, medical, banking sector, government sector, etc.

If the student has completed 11th & 12th in arts section engineering & medical is not an option.

So based on some selection criteria which is 11th & 12th is completed in arts we got a few options like banking sector, government sector, business, etc. These options are nothing but feasible solutions.

Now from the feasible solutions we need to find the optimal solution.

Greedy method is totally based on optimal solution.

Optimal solution focuses on minimal cost. Like in first step from source to destination we have selected edge with weight 5 as optimal



solution.

For a student in selecting career path, he will have optimal solution based on all feasible solutions with the criteria that college fees should be minimum.

The optimal solution focuses on maximizing the profit along with minimum cost.

For student, he needs to find out a career path with higher pay packages with minimum college fees.

This means we are greedy regarding profit.

During sale we go to the shop with the ~~minimum~~ maximum discount is an example of greedy method. Regardless of quality of product. So future we may feel that this is not the ~~local~~ best solution.

But locally at this stage we are getting the best solution.

Now the third criteria we have is minimum risk. while investing money we choose the option with minimum risk.



So at each stage greedy algorithm gives local optimum solution on the bases of

- If
- ① Minimum Cost (Travelling from Source to Destination problem)
 - ② Maximum profit (Buying a product with maximum discount problem)
 - ③ Minimum Risk (Investing money in market with minimum risk problem)

Regardless of final solution / global optimum.

Applications of greedy method :-

- 1) Knapsack problem
- 2) Job sequencing
- 3) Minimum spanning tree
- 4) Optimal merge pattern
- 5) Dijkstra's Algorithm.

We focus on the current stage to find the best result.