

The Project Report is submitted to
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution Affiliated to
Rashtrasant Tukadoji Maharaj Nagpur University)

Design Analysis of Algorithms-Lab

On Topic

Job Sequencing with Deadlines using Greedy Algorithm

by

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Aim: -

To implement the Job Sequencing with Deadlines problem using the Greedy Algorithm approach in C++ to maximize the total profit by scheduling jobs within their deadlines.

Problem Statement: -

Given a set of jobs with deadlines and profits design an algorithm to maximize the total profit by scheduling the jobs in such a way that the jobs are completed before their deadlines. The jobs should be processed in order of their profits.

Introduction: -

The Job Sequencing with Deadlines problem is an optimization problem that aims to schedule a set of jobs within their given deadlines to maximize total profit.

Each job takes one unit of time, and only one job can be executed at a time. By applying the Greedy approach, the algorithm prioritizes jobs with higher profits and allocates them to the latest possible available slot before their deadline.

Theory: -

The Job Sequencing with Deadlines problem uses a greedy approach to schedule jobs for maximum profit.

It sorts all jobs in descending order of profit and assigns each to the latest available slot before its deadline.

This ensures that the most profitable jobs are prioritized while meeting all deadline constraints. Working Steps:

1. The Job Sequencing with Deadlines problem uses a greedy approach to schedule jobs for maximum profit.
 - a. It sorts all jobs in descending order of profit and assigns each to the latest available slot before its deadline.
 - b. This ensures that the most profitable jobs are prioritized while meeting all deadline constraints.

Complexity: -

Time Complexity: $O(n^2)$ (due to nested loops for scheduling). Space

Complexity: $O(n)$ (for maintaining the job slots array).

Algorithm of the Code: -

Step 1: Start the program.

Step 2: Input the number of jobs and their details — Job ID, Deadline, and

Profit.

Step 3: Sort all jobs in descending order of profit.

Step 4: Find the maximum deadline among all jobs to determine time slots.

Step 5: For each job, starting from the most profitable one:

Check for the latest available time slot before its deadline.

If a slot is free, assign the job to that slot.

Step 6: After all jobs are processed, display the job sequence and the total profit.

Step 7: Stop the program

INPUT:

Job Sequencing Problem

Enter Job ID, Deadline, Profit (comma separated):

A,2,80
E,3,30
C,1,32
B,2,15
D,1,30

Run Algorithm

OUTPUT:

Run Algorithm

Scheduled Jobs:

Job	Deadline	Profit
C	1	32
A	2	80
E	3	30

Total Profit: 142

C A E

Result: -

The program successfully schedules jobs in such a way that the total profit is maximized while meeting all deadlines.

It selects the most profitable jobs first and arranges them in available time slots using the Greedy Algorithm.

For the given input, the optimal job sequence is $C \rightarrow A \rightarrow E$, achieving a maximum profit of 142.

Conclusion: -

The Job Sequencing with Deadlines problem demonstrates how the Greedy Algorithm can be effectively used to achieve optimal profit scheduling. By prioritizing jobs with higher profits and placing them within their deadlines, the algorithm provides an efficient and optimal solution.