Practical No. 2

Title:

Implement Job Sequencing with Deadlines Using a Greedy Method

Aim:

To implement the Job Sequencing problem using the Greedy algorithm and determine the maximum profit that can be earned by completing jobs within their deadlines.

Objective:

To apply the greedy approach to solve the Job Sequencing with Deadlines problem and analyze how it helps in obtaining an optimal job schedule for maximum profit.

Hardware Requirements:

- Processor: Intel Core i3 or higher
- RAM: Minimum 2 GB
- Storage: Minimum 100 MB free space
- Input Devices: Keyboard and Mouse
- Output Device: Monitor

Software Requirements:

- Operating System: Ubantu
- Programming Language: Python 3.x (or C/C++/Java)
- IDE/Text Editor: VS Code / PyCharm / Notepad++
- Terminal

Theory:

The Job Sequencing with Deadlines problem is a classic greedy algorithm problem in which:

- Each job has a deadline and a profit.
- A job takes one unit of time and only one job can be scheduled at a time.
- The goal is to schedule jobs such that total profit is maximized while no job misses its deadline.

Approach (Greedy Strategy):

1. Sort all jobs in decreasing order of profit.
2. For each job:
    - Find the latest available slot before or on its deadline.
    - If a slot is found, assign the job to that slot.
3. Return the scheduled jobs and total profit.

This greedy approach ensures that we are always choosing the most profitable job first, and assigning it to the latest possible slot to leave earlier slots available for other jobs.

Algorithm:

1. Sort jobs in descending order of profit.
2. Initialize an array result[] to keep track of free time slots.
3. For each job in the sorted list:
   a. Check from the job's deadline down to 1.
   b. If a free slot is found, assign the job and mark the slot as occupied.
4. Calculate and return total profit and scheduled job sequence.

Conclusion:

The Greedy Algorithm efficiently solves the Job Sequencing problem by always selecting the most profitable job first and scheduling it in the latest possible free slot. This approach ensures that more jobs can be accommodated while maximizing total profit.