DAA-Quiz#3-GreedyPart-1-7thOct2022

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Scheduled for 05:30 pm, 7th Oct 2022, Duration: Strictly 30 minutes.
1. The quiz must be attempted using your SVNIT email ID only. If attempted using any other email ID, it would NOT be considered. There will not be any exceptions to this.
2. Please attend the quiz that is assigned to you.
3. Total Questions: 30, Total Marks: 60. **There is negative marking. For every FOUR wrong answers, 1 mark would be deducted.**
4. Google classroom may not show the scores with negative marking. Please do not assume that is your real score.
5. Time: 30 minutes
6. Please, DO NOT continue attempting after the deadline - in order to ensure that your quiz is submitted and received in time. No excuses would be tolerated.

Consider the figure shown here for the Activity selection problem, with the aim to select the maximum possible number of mutually compatible activities. The figure shows two possible schedules returned by two different algorithms, with each rectangle representing a job. The figure is a counterexample to show that _____. 2 points

- earliest start time first approach does not work.
- fewest conflicts first approach does not work
- shortest interval first approach does not work.
- earliest finish time first approach does not work.

For the interval scheduling problem, if the set A=i1,i2,i3,...ik with |A|=k is the set of intervals returned by the algorithm designed as the answer and the set O=j1,j2,j3,...jm be the optimal set of intervals, then in order to prove that the algorithm works, one should prove that _____. 2 points

- k<=m, that is f(ik) <= f(jm)
- k=m, that is f(ik) >= f(jm)
- k=m, that is f(ik) <= f(jm)
- k=m, that is f(jm) <= f(ik)

You are given a sequence of n songs where the ith song is l_i minutes long. You want to place all of the songs on an ordered series of CDs (e.g. CD 1, CD 2, CD 3, ...CD k) where each CD can hold m minutes. Furthermore, (1) The songs must be recorded in the given order, song 1, song 2, ..., song n. (2) All songs must be included. (3) No song may be split across CDs. Your goal is to determine how to place them on the CDs as to minimize the number of CDs needed. A greedy algorithm to solve this problem _____. 2 points

- will have complexity of the order of O(n)
- will have complexity of the order of O(lg n)
- a greedy algorithm can not be designed to solve this problem
- will have complexity of the order of O(n lg n)

Consider a variation of the Earliest Deadline First scheduling algorithm studied in class. Now, assume that we are given a set of n jobs. Associated with job i is an integer (not timing) deadline di > 0 and a profit pi > 0. For any job i the profit pi is earned iff the job i is completed by its deadline. To complete a job, one has to process the job on a machine for one unit of time. Only one machine is available for processing jobs. A feasible solution for this problem is a subset J of jobs such that each job in this subset can be completed by its deadline. The value of a feasible solution J is the sum of the profits of the jobs in J. An optimal solution is a feasible solution with maximum value. Assume that given the job mix as shown in the figure, one of the schedule that gives the optimal solution has _____ total profit value. Hint: In this job mix, the job schedule < j2 j4 > is not feasible but < j1 j3 > is - amongst others.

2 points

Job	j_1	j_2	j_3	j_4
Profit P	100	10	15	27
Deadline D	2	1	2	1

- ○ 110
- ○ 42
- ○ 115
- ○ 127

Consider the figure shown here for the Activity selection problem, with the aim to select the maximum possible number of mutually compatible activities. The figure shows two possible schedules returned by two different algorithms, with each rectangle representing a job. The figure is a counterexample to show that _____. 2 points

- shortest interval first approach does not work.
- earliest start time first approach does not work.
- earliest finish time first approach does not work.
- fewest conflicts first approach does not work

The activities as shown in the A1, A2,...,A12 need to use the same resource. Their start and finish times are as shown. Then, _____ is the maximum number of activities that can be completed without having conflicts in this schedule. 2 points

Activity	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}
Start T	1	3	2	6	6	8	4	4	9	10	2	7
Finish T	6	5	7	8	9	9	7	7	12	14	5	10

- 4
- 2
- 5
- 3

For the problem classroom scheduling in which given that a lecture j starts at sj and finishes at fj, with the objective function to find minimum number of classrooms to schedule all lectures so that no two occur at the same time in the same room, the depth of the schedule is defined as _____.

2 points

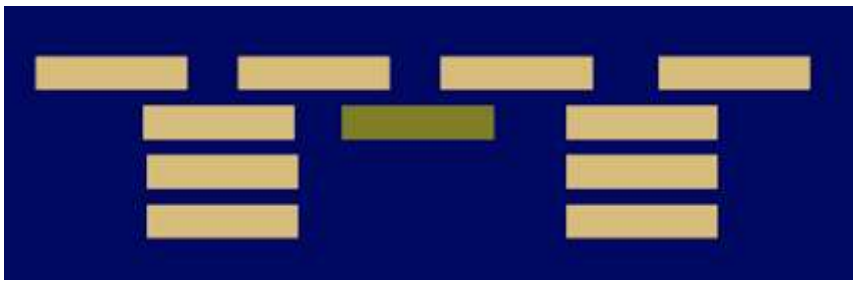
- ○ the minimum number of the intervals contained, at a unique time
- ○ none of these
- ○ the maximum number of the intervals contained, at a unique time

Given as the goal to maximize the number of mutually compatible activities selected out of a given number of activities as shown in the job mix in the figure here, with their start and finish times, one selects first, the last activity to start, that is compatible to all the previous activities. Then, the number of activities selected is _____ and is _____.

2 points

- ○ 5, optimal
- ○ 4, suboptimal
- ○ 4, optimal
- ○ 3, suboptimal

Consider the figure shown here for the Activity selection problem, with the aim to select the maximum possible number of mutually compatible activities. The figure shows two possible schedules returned by two different algorithms, with each rectangle representing a job. The figure is a counterexample to show that _____. 2 points

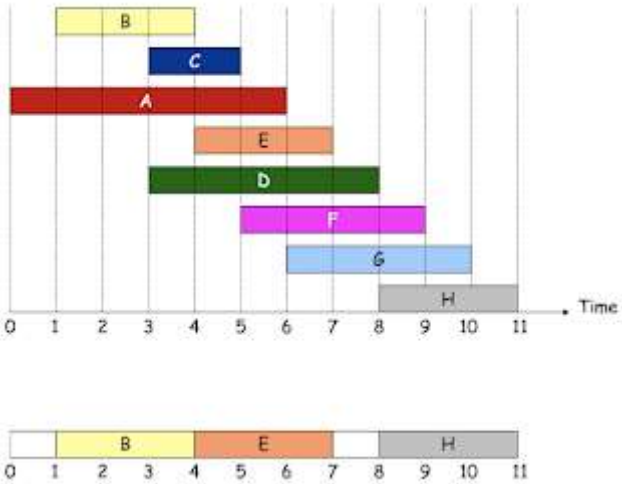


- fewest conflicts first approach does not work
- shortest interval first approach does not work.
- earliest start time first approach does not work.
- earliest finish time first approach does not work.

This question pertains to proving that the SJF scheduling algorithm is the optimal scheduling algorithm with respect to minimizing the average completion time of the jobs to be scheduled for execution. Consider that the execution time of the jobs is t1, t2, t3, t4, ...tn for each of the jobs t_i, i from 1 to n. The if the jobs are scheduled in the same order i.e. job1 is scheduled first, job 2 is scheduled second, job 3 is scheduled third and job n is scheduled nth; then the total completion time is given by the expression _____. 2 points

- none of these options
- \sum_{i=1}^{n} [(n-i-1) * ti]
- \sum_{i=1}^{n} [(n+i-1) * t_i]
- \sum_{i=1}^{n} [((n+1)*t_i) - (i*t_i)]

Consider the figure shown here for the Activity selection problem, with the aim to select the maximum possible number of mutually compatible activities. The figure shows a schedule returned by an algorithm, the bottom figure showing the selected activities by the algorithm. The figure is a counterexample to show that _____. 2 points



- fewest conflicts first approach does not work
- none of these options
- shortest interval first approach does not work.
- earliest finish time first approach does not work.

Consider the last scheduling algorithm studied i.e. scheduling to minimize the lateness. Consider only two jobs with their execution times tj and their deadlines dj, as shown in the diagram below. Then, if scheduled in this order only the one shown in the diagram, the maximum lateness of the schedule is _____. 2 points

	1	2
tj	1	10
dj	100	10

counter-example

- 2
- 11
- 100
- 1

Consider an instance of the input job schedule as well as the algorithm run, as shown in the figure. This is for the problem in which, under the constraint that the each of the given job j that starts at time sj and finishes at time fj, is to be scheduled on machines, such that no two jobs occur at the same time on the same machine; the goal is to minimize the number of machines used. Here the last job to be scheduled on the machine M2 is _____. 2 points

task	start_ time	finish_ time	time required	availability time now on respective classroom
A	0	2	2	2(M1)
B	3	7	4	7(M1)
C	4	7	3	7(M3)
D	9	11	2	11(M3)
E	7	10	3	10(M1)
F	1	5	4	5(M2)
G	6	8	2	8(M2)

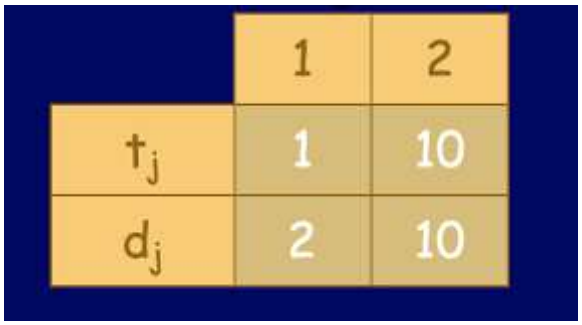
- C
- E
- G
- F

The time complexity of the optimal algorithm used to schedule n compatible lectures in classrooms t ensure that the number of classrooms used is minimal is _____. 2 points

- O(n^2)
- O(lg n)
- O(n lg n)
- O(n)

Consider the last scheduling algorithm studied i.e. scheduling to minimize the lateness. Consider only two jobs with their execution times tj and their deadlines dj, as shown in the diagram below. Then, to minimize the maximum lateness, job _____ should be scheduled first and then the job _____.

2 points



- 1, 2
- 2, 1

Consider an instance of the input job schedule as well as the algorithm run, as shown in the figure. This is for the problem in which, under the constraint that the each of the given job j that starts at time sj and finishes at time fj, is to be scheduled on machines, such that no two jobs occur at the same time on the same machine; the goal is to minimize the number of machines used. Here the first job to be scheduled on the machine M3 is _____. 2 points

task	start_ time	finish_ time	time required	availability time now on respective classroom
A	0	2	2	2(M1)
B	3	7	4	7(M1)
C	4	7	3	7(M3)
D	9	11	2	11(M3)
E	7	10	3	10(M1)
F	1	5	4	5(M2)
G	6	8	2	8(M2)

- ○ D
- ○ F
- ○ C
- ○ E

Consider the figure shown here for the Activity selection problem, with the aim to select the maximum possible number of mutually compatible activities. The figure shows two possible schedules returned by two different algorithms, with each rectangle representing a job. The figure is a counterexample to show that _____. 2 points

- earliest finish time first does not work.
- earliest start time first approach does not work.
- shortest activity first approach does not work.
- fewest activity conflicts do not work.

Assume given a job mix to be scheduled on 2 machines m1, m2 such that no machine processes more than one process at a time, no process is executed by more than one machine, there is non-preemptive scheduling, with the objective to minimize the final completion time, the optimal solution will have _____ final completion time. 2 points

Job	j_1	j_2	j_3	j_3
Burst T	3	5	6	10

- 11
- 8
- 13
- 16

Consider the Interval scheduling problem studied in the chapter on Greedy design. In a variation of the same problem, consider the following: We have n requests labeled 1, . . . , n, with each request i specifying a start time si and a finish time fi. Each interval i now also has a value, or weight vi . Two intervals are compatible if they do not overlap. The goal of our current problem is to select a subset S ⊆ {1, . . . , n} of mutually compatible intervals, so as to maximize the sum of the values of the selected intervals, (Sigma(iεS) of vi). This problem be _____ solved using the greedy design technique. 2 points

- can
- cannot

Given the problem that Jobs j1,j2,j3...jn with running times t1, t2, t3,....tn are to be scheduled on multiprocessors such as to minimize the average completion time, the approach to be used is _____. 2 points

- shortest job first, with a new processor used if the next job is not compatible with the job already scheduled on existing processors.
- none of these.
- no approach solves the problem in polynomial time
- earliest finish time first

Consider the problem of scheduling the lectures in a classroom. Given that a lecture j starts at sj and finishes at fj, and the the goal is to find the minimum number of classrooms to schedule all lectures, so that no two occur at the same time in the same room. Given the job mix as shown below, the depth of this schedule is _____. 2 points

Lecture	j_1	j_2	j_3	j_4	j_5	j_6	j_7	j_8
Start T	0	3	4	9	7	1	6	11
Finish T	2	7	7	11	10	5	8	13

- 3
- 7
- 4
- 5

Formally, a combinatorial optimization problem is a quadruple viz. < I f m g >, where I is a set of problem instances, f (x) - is the set of feasible solutions, given a specific problem instance x ε I, then _____. 2 points

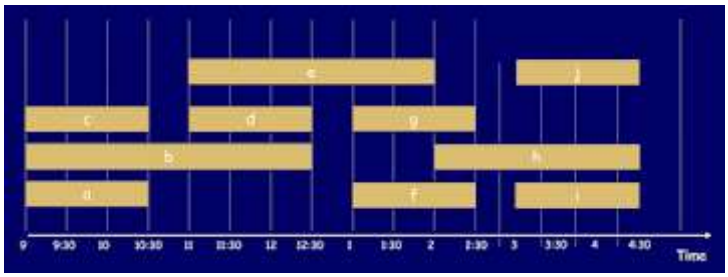
- m(x,y) - given an instance x and a feasible solution of x, m(x,y) denotes the measure of x, which is usually a positive real.
- m(x,y) - given an instance x and a feasible solution of x, m(x,y) denotes the measure of x, which is an integer.
- m(x,y) - given an instance x and a feasible solution of x, m(x,y) denotes the measure of y, which is an integer.Option 1
- m(x,y) - given an instance x and a feasible solution of x, m(x,y) denotes the measure of y, which is usually a positive real.

The schedule shown in the Figure here is a counterexample to prove that _____ does not work when the goal is to minimize the maximum lateness in a given schedule. 2 points

	1	2
t_j	1	10
d_j	2	10

- Shortest-job first
- shortest-slack time first
- none of these
- earliest deadline first

With reference to the Classroom scheduling problem, the depth of the schedule shown in the figure here is _____. 2 points



- 5
- 3
- 2
- 4

Consider an instance of the input job schedule as well as the algorithm run, as shown in the figure. This is for the problem in which, under the constraint that the each of the given job j that starts at time sj and finishes at time fj, is to be scheduled on machines, such that no two jobs occur at the same time on the same machine; the goal is to minimize the number of machines used. Here the last job to be scheduled on the machine M3 is _____. 2 points

task	start_ time	finish_ time	time required	availability time now on respective classroom
A	0	2	2	2(M1)
B	3	7	4	7(M1)
C	4	7	3	7(M3)
D	9	11	2	11(M3)
E	7	10	3	10(M1)
F	1	5	4	5(M2)
G	6	8	2	8(M2)

- ○ G
- ○ C
- ○ F
- ○ D

Assume there are 6 persons whose cab requirements with the start time and end time (both inclusive i.e. closed intervals) during which each person will travel are as shown in the table below. The minimum number of cabs required to enable all of them travel using a cab each is _____. 2 points

Person	Start-time	End-time
1	01:00	02:00
2	16:00	21:30
3	09:30	13:00
4	21:30	22:30
5	21:30	22:30
6	12:00	12:30

- ○ 5
- ○ 4
- ○ 2
- ○ 3

Consider a job scheduling problem in which we are given Jobs j1, j2, j3.....jn with running times t1, t2, t3, ...tn to be scheduled on a single processor such as to minimize the average completion time. Given the job mix as shown in the table below, the optimal value of average waiting time is _____. 2 points

- ○ 12
- ○ 10
- ○ 13
- ○ 7

Consider the last scheduling algorithm studied i.e. scheduling to minimize the lateness. Consider only two jobs with their execution times tj and their deadlines dj, as shown in the diagram below. Then, if scheduled in ascending order of slacktime dj - tj, then the job 1 misses its deadline by _____ whereas job 2 misses its deadline by _____ time units.

2 points

	1	2
t_j	1	10
d_j	2	10

- 1, 0
- 9, 0
- 0, 1
- 0, 10

Consider an instance of the input job schedule as shown in the figure. This is for the problem in which, under the constraint that the each of the given job j that starts at time sj and finishes at time fj, is to be scheduled on machines, such that no two jobs occur at the same time on the same machine; the goal is to minimize the number of machines used. Here the last job to be scheduled on the machine M1 is _____. 2 points

task	start_ time	finish_ time	time required	availability time now on respective classroom
A	0	2	2	2(M1)
B	3	7	4	7(M1)
C	4	7	3	7(M3)
D	9	11	2	11(M3)
E	7	10	3	10(M1)
F	1	5	4	5(M2)
G	6	8	2	8(M2)

- ○ E
- ○ B
- ○ C
- ○ A

Consider an instance of the input job schedule as shown in the figure. This is for the problem in which, under the constraint that the each of the given job j that starts at time sj and finishes at time fj, is to be scheduled on machines, such that no two jobs occur at the same time on the same machine; the goal is to minimize the number of machines used. Here the first job to be scheduled on the machine M1 is _____ whereas the third job is _____. 2 points

task	start_ time	finish_ time	time required	availability time now on respective classroom
A	0	2	2	2(M1)
B	3	7	4	7(M1)
C	4	7	3	7(M3)
D	9	11	2	11(M3)
E	7	10	3	10(M1)
F	1	5	4	5(M2)
G	6	8	2	8(M2)

- ○ A, C
- ○ C, E
- ○ A, E
- ○ A, B

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