ECSE210L: Design and Analysis of Algorithms

Tutorial 6 (Week 6: February, 10 - 14, 2020)

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(**Q1**) Find an optimal solution of the following fractional Knapsack problems using the greedy algorithm discussed in the class.

a) Take the size and profit as in the following table. Further, Knapsack size is 14.

Item	A	B	C	D	E	F
Profit	7	8	14	5	10	15
Size	2	1	5	2	4	3

b) Take the size and profit as in the following table. Further, Knapsack size is 26.

Item	A	B	C	D	E
Profit	24	13	23	15	16
Size	12	7	11	8	9

c) Take the size and profit as in the following table. Further, Knapsack size is 104.

Item	A	B	C	D	E	F	G	H
Profit	350	400	450	20	70	8	5	5
Size	25	35	45	5	25	3	2	2

(**Q2**) Find the maximum number of disjoint intervals for the following instances using the greedy algorithm discussed in the class. Every interval is given in the form (a, b) where $a < b$.

a) $(1, 5), (2, 4), (2, 6), (5, 10), (4, 7), (9, 14), (8, 16), (2, 10), (4, 12), (7, 11), (9, 12)$, and $(10, 14)$

b) $(2, 4), (2, 6), (3, 7), (3, 5), (2, 5), (7, 10), (3, 8), (4, 11), (5, 9), (9, 11), (6, 9), (7, 12)$, and $(4, 12)$.

(**Q3**) Consider the job scheduling problem, where each job has processing time as well as a deadline to complete it. Further, every job is ready to be processed

at anytime. Compute the maximum lateness for the schedule if the shortest execution time first is followed for all instances given in the below. Further, compute the optimal lateness schedule for the each instance.

a)

Job	1	2	3	4	5
processing time	3	2	1	4	2
deadline	4	7	8	8	10

b)

Job	1	2	3	4	5	6
processing time	4	7	2	6	10	8
deadline	10	7	3	10	8	12

(**Q4**) Consider an another variation of job scheduling problem. In this problem, we are given a set of jobs, each job takes one unit of time to process on the resource. Further, each job is associated with a deadline and a profit if it is processed on or before the deadline. In the following, two instances of the problem are given, find the schedules which returns the maximum profit for each instance.

a)

Job	1	2	3	4	5
deadline	2	1	3	2	1
profit	6	10	2	4	2

b)

Job	1	2	3	4	5	6	7	8	9	10
deadline	9	2	5	7	4	2	5	7	4	3
profit	15	2	18	1	25	20	8	10	12	5