

Name: Georges Hatem

CS 590 Homework Assignment
10: Dynamic Programming
Reinforcement Exercises

Due Date: April 3, 2022

Problem 12.8.5:

In the shown below table, the i th row, j th column represents the solution to the following subproblem: the max. Weight limit is j and the only items which are allowed to be picked are from row i and above.

We have to calculate 2 things for each subproblem:

- (i.) The maximum possible benefit obtainable
- (ii.) The subset of items required to get that benefit.

The benefit is present on the top, the subset required is present on the bottom.

Note: The table fills only those values which are necessary to obtain the final answer to the

problem, in column 18, which is row g (The table below was done in Excel and attached here. It was so difficult to make that table in Word.)

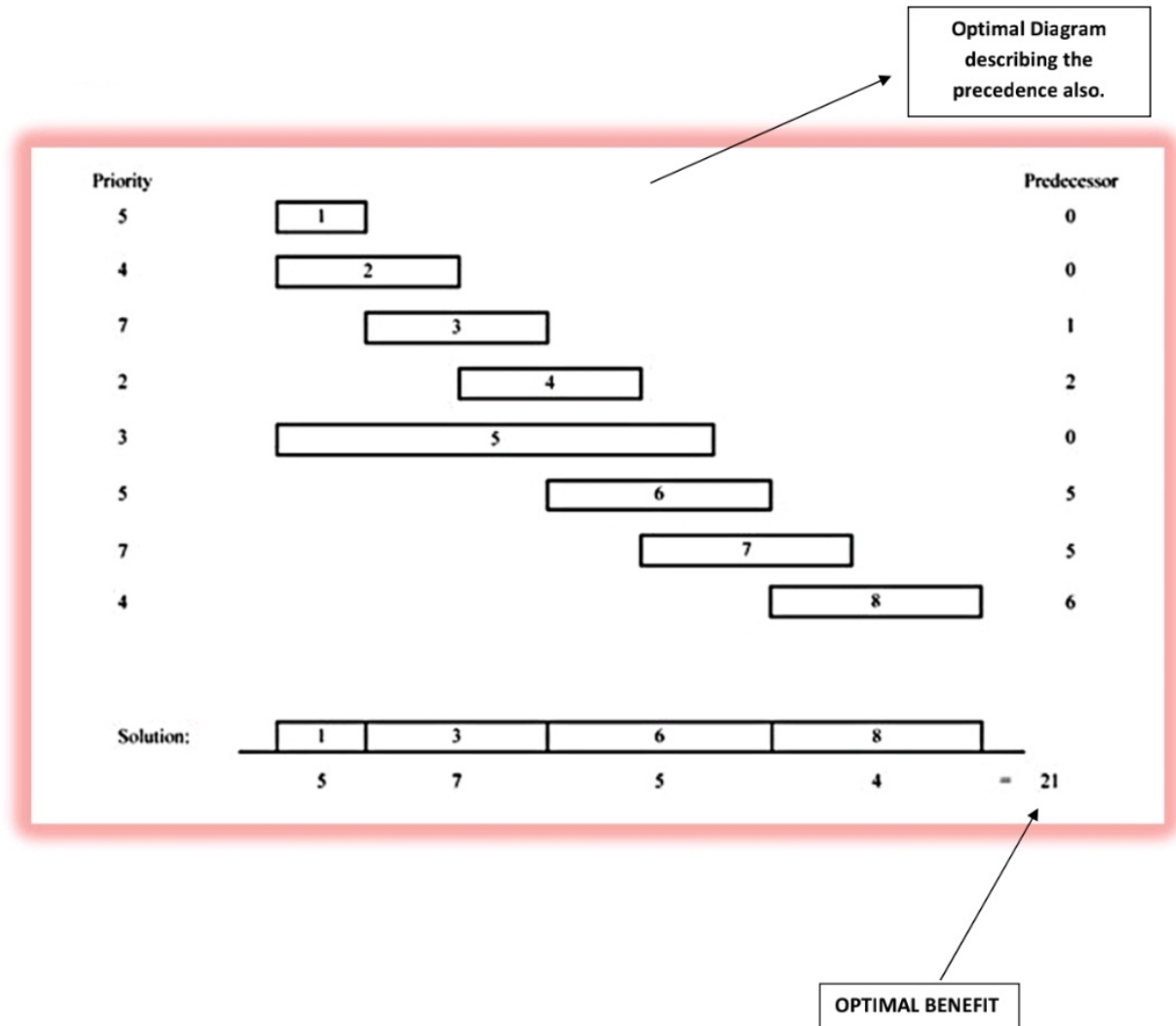
Item (value, weight) pairs	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
(12,4) a	0	0	0	0	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
					a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
(10,6) b	0	0	0	0	12	12	12	12	12	12	22	22	22	22	22	22	22	22	22
					a	a	a	a	a	a	a,b	a,b	a,b	a,b	a,b	a,b	a,b	a,b	a,b
(8,5) c		0	0		12	12		12	12	20	22	22	22		22	30	30	30	30
					a	a		a	a	a,c	a,b	a,b	a,b		a,b	a,b,c	a,b,c	a,b,c	a,b,c
(11,7) d									12	20		23	23		23	30	31	33	33
								a	a,c			a,d	a,d		a,d	a,b,c	a,c,d	a,b,d	a,b,d
(14,3) e												28	34			37		37	44
												a,e	a,c,e			a,d,e		a,d,e	a,b,c,e
(7,1) f													34						44
													a,c,e						a,d,e,f
(9,6) g																			44
																			a,d,e,f

The solution to maximum total weight 18, and items a,b,c,d,e,f,g, the best way to choose the items is to choose (a,d,e,f), and get a benefit of 44.

Note: There is a second solution also possible: If choosing items a,b,c,e, for a benefit of 44. The solution chosen truly depends on which

subset you have decided to store when your two possible choices have the same benefit.

Problem 12.8.6:



The left and right boundary of each rectangle represent the start and finish times for an observation request. The height of each rectangle represents its benefit. We list each request's benefit (Priority) on the left.

The optimal solution has total benefit
 $21 = 5 + 7 + 5 + 4$.

Defining precedence-

For any request i , the set of other requests that conflict with i form a contiguous interval of requests in L . Define the predecessor, $\text{pred}(i)$, for each request, i , then, to be the largest index, $j < i$, such that requests i and j don't conflict. If there is no such index, then define the predecessor of i to be 0.