Arab Academy for Science &Technology and Maritime Transport (AASTMT)
College of Computing and Information Technology (CCIT)
Computing Alg. CS312 – Spring 2014
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Section 9 – May, 11, 2014

Q1.

a. Apply the bottom-up dynamic programming algorithm to the following instance of the knapsack problem:

item	weight	value
1	3	$25
2	2	$20
3	1	$15
4	4	$40
5	5	$50

, capacity $W = 6$.

b. How many different optimal subsets does the instance of part (a) have?

c. In general, how can we use the table generated by the dynamic programming algorithm to tell whether there is more than one optimal subset for the knapsack problem's instance?

Hint:

a. Use formulas (8.6)—(8.7) to fill in the appropriate table, as is done for another instance of the problem in the section.

b.—c. What would the equality of the two terms in

$$\max\{F(i-1;j);\ v_i + F(i-1;j-w_i)\}$$

mean?

Q2.

a. Write pseudo code of the bottom-up dynamic programming algorithm for the knapsack problem.

b. Write pseudo code of the algorithm that finds the composition of an optimal subset from the table generated by the bottom-up dynamic programming algorithm for the knapsack problem.

Hint:

a. Write pseudo code to fill the table in Fig. 8.4 (say, row by row) by using formulas (8.6)—(8.7).

b. An algorithm for identifying an optimal subset is outlined in the section via an example.