CMPS 340 — Design and Analysis of Algorithms

Assignment 3

Due: *Wednesday, December 4, 2019 by 11:50 pm*
Instructor: Aminul Islam, `aminul@louisiana.edu`
TA: Tingting Yang, `c00304740@louisiana.edu`

- This is an individual assignment.
- The assignment can be turned in only until 11:50 pm on Thursday (12/05/2019) with 20% penalty on the assignment points.
- The complete name and CLID of students must be written within the document.
- Each student should submit:
  - A document that includes answer of Questions 1, 2, and 3.
- The assignment must be submitted only through Moodle.
- This Assignment will be graded by Tingting Yang. If you have any **question regarding the grading of this assignment**, email/see her and resolve it by Wednesday December 11, 2019.

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1. (10 marks) Use the Backtracking algorithm for the 0-1 Knapsack problem to maximize the profit for the following problem instance. Show the pruned state space tree produced by using the Backtracking algorithm. Specify the 'profit', 'weight' and 'bound' from top to bottom at each node in the pruned state space tree (6 marks). Mark each nonpromising node with a cross (2 marks). Mark the node(s) with optimal solution (2 marks).

i	p_i	w_i	$\frac{p_i}{w_i}$	
1	\$20	2	\$10	
2	\$30	5	\$6	
3	\$35	7	\$5	$W = 9$
4	\$12	3	\$4	
5	\$3	1	\$3	

2. (10 marks) Use the Breadth-First Search with Branch-and-Bound Pruning algorithm for the 0-1 Knapsack problem to maximize the profit for the following problem instance. Show the pruned state space tree produced by using the Branch-and-Bound Pruning algorithm. Specify the 'profit', 'weight' and 'bound' from top to bottom at each node in the pruned state space tree (6 marks). Mark each nonpromising node with a cross (2 marks). Mark the node(s) with optimal solution (2 marks).

i	p_i	w_i	$\frac{p_i}{w_i}$	
1	\$20	2	\$10	
2	\$30	5	\$6	
3	\$35	7	\$5	$W = 13$
4	\$12	3	\$4	
5	\$3	1	\$3	

3. (10 marks) Use the Best-First Search with Branch-and-Bound Pruning algorithm for the 0-1 Knapsack problem to maximize the profit for the following problem instance. Show the pruned state space tree produced by using the Branch-and-Bound Pruning algorithm. Specify the 'profit', 'weight' and 'bound' from top to bottom at each node in the pruned state space tree (6 marks). Mark each nonpromising node with a cross (2 marks). Mark the node(s) with optimal solution (2 marks).

i	p_i	w_i	$\frac{p_i}{w_i}$	
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