**ASSIGNMENT 9 – Dynamic Programming**

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| Topics |
| * Dynamic Programming |
| Readings |
| * CLRS, Chapter 8 |
| Instructions | |
| 1. Select a **partner** and inform instructor who you will work with  2. Do the problems and answer the questions listed in the next section   * Keep in mind Guidelines on plagiarism.   3. Follow instructions for submitting your work.  PROBLEMS AND QUESTIONS | |
| Problems and Questions |
| Part A Tracing: Coin Collecting with restrictions. (15 pts) |
| How would you modify the dynamic programming algorithm for the coin-collecting problem if some cells are inaccessible for the robot? Apply your algorithm to the board below, where the inaccessible cells are shown by X’s. How many optimal paths are there for this board?   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  | 1 | 2 | 3 | 4 | 5 | 6 | | 1 |  | X |  |  |  |  | | 2 |  |  |  | X |  |  | | 3 |  |  |  | X |  |  | | 4 |  |  |  |  |  |  | | 5 | X | X | X |  |  |  | |

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| Part B Cut-rod implementation ( 20 pts) |
| Implement the cut-rod algorithm as a computer program and write a demo program which shows the results for several lengths: 5, 6, 10, 20 and others by your choice.  Use the following price table:   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | 1 | 5 | 7 | 8 | 10 | 16 | 18 | 19 | 25 | 26 | 30 | 38 | 46 | 41 | 50 | 61 | 70 | 75 | 80 | 86 | |

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| Part C Change-making implementation ( 65 pts) |
| The dynamic-programming algorithm for change-making problem assumes infinite amount of coins of any denomination. Modify the algorithm so that if there are not enough coins of certain denomination, it returns a special value (e.g. -1) and issues an error message. Implement solution to chain-making problem as a procedure (e.g. Java method), having an array of denominations and the change amount as input parameters, array of available amounts for each denomination as input-output parameter. As a demo, assume US denominations 1, 5, 10, 25, 50, start with 200 pennies, 40 nickels, 20 dimes, 8 quarters, and 4 half-dollars. Do a loop calling this procedure consecutively until either user stops it or some coins go out of stock. *Use the updated amounts on each new iteration*. |

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| Bonus problem (10 pts) |

See BonusProblemForWeek9 (*Minimum-sum descent)*

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2. **Summary questions:**

a. What concepts did you have trouble with? What still confuses you?

b. Suggestions for improving this assignment in the future?

Help instructor help you

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| Submitting your work |

1. Make sure that your name(s) are in all your files.
2. If you have more than one file for your solution, make a .zip file for your project
3. In Blackboard, attach your solution file to the submission for this assignment.

GUIDELINES ON

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| Guidelines on Plagiarism in Computer Science |

Outlined in the Syllabus