Fundamentals of Algorithms
CS502-Spring 2015

<u>Assignment #3</u>

<u>Deadline</u>

Your assignment must be uploaded/submitted at or before 24th   **July 2015**

<u>Uploading instructions</u>

Please view the **assignment submission process** document provided to you by the Virtual University to upload the assignment.

<u>Rules for Marking</u>

It should be clear that your assignment will not get any credit if:

> o The assignment is submitted after due date.
> o The submitted assignment does not compile or run. Or corrupt file
> o **The assignment is copied.**
> o **Submit your solution in Microsoft Word document "doc/docx"**

<u>Objectives</u>

This assignment will help you to understand the concepts of Knapsack Problem and Huffman encoding. The grip on these topics will help you to understand the cores of Dynamic Programming and Greedy paradigms and increase your confidence to apply these strategies for real world problems.

<u>Guidelines</u>

1. In order to attempt this assignment you should have full command on Lecture # 17 to Lecture # 26 and also read the text book "Introduction to Algorithms" by Thomas H.Cormen particularly for Huffman encoding technique for compressing the data.

2. In order to solve this assignment you have strong concepts about following topics
    - ✓ Knapsack Problem(Dynamic Programming)
    - ✓ Radix Sort

Books to read for solution

Cormen, Leiserson, Rivest, and Stein (CLRS) 2001, **Introduction to Algorithms**, (2nd ed.) McGraw Hill.

Estimated Time   4 hours

For Question1 maximum time is 2.5 hours, divide the time according to your ease 1.5 hour will enough to understand the logics 0/1 Dynamic Programming and in 1 hour can design your problem solution according to given scenario; and for second problem focus on the radix sort and you can develop all this in 1.5 hour. It all depends upon your sheer concentration.

Question# 1   (10)

Let's assume, you are working in Multinational Organization XYZ and your company is going to launch projects at broader level. Your Company has 140 billion $ for investment. You are a Business analyst in your company and you have to develop the strategy to maximize the earned profit following the given limits; projects are to be launched in the year 2016.

- First project is about Research and Development of underdeveloped countries which has cost 40 billion $ and the profit earned will be 54 billion $, and
- The second project is to launch the Software Industries for security enhancements in different countries which has cost 60 billion $ and profit earned will be 40 billion $.
- The Third project is relating to Launch the Industry Plants Nano Technology design for the computing purposes the cost is 70 billion $ giving the profit of 72 billion $.
- The fourth project is to launch quality Medicine Formation (Pharmaceutical Oriented) project to serve Humanity and has cost 76 billion $ and profit is 84 billion $ and
- There is also fifth project which is relating to Chemical Industries in many countries which has cost 36 billion $ giving the profit of 40 billion $.

Find out the projects to be selected to earn the maximum profit using 0-1 Knapsack you may assign explicit simple variables for your ease to proceed the calculations.

Question# 2   (10)

Run the Radix sort on the following array of strings including characters, show all passes.

[Sour, Dual, Near, Fear, Fair, Main, Fame, Rear, Shut, Deer]

Enjoy Eid Gifts and Happy Eid ul Fitr
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