Analysis and Design of Algorithms

MINOR I EXAMINATION - (Sem 1501)

Time: 1 hour **October 10, 2015** **Marks: 21**

Q1 **(a)** Explain why Chain Multiplication is considered as a Dynamic Programming problem.

(b) Find the optimal way of computing the following Chain Matrix multiplication. Justify your answer.

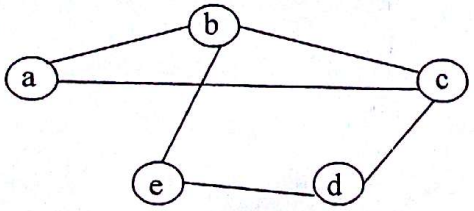
$$\begin{bmatrix} 1 & 7 & 4 \\ 4 & 2 & 5 \\ 2 & 8 & 3 \end{bmatrix} * \begin{bmatrix} 7 & 3 & 2 & 6 \\ 9 & 0 & 1 & 9 \\ 5 & 8 & 1 & 2 \end{bmatrix} * \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 14 & 15 & 16 & 17 & 6 \\ 13 & 20 & 19 & 18 & 7 \\ 12 & 11 & 10 & 9 & 8 \end{bmatrix} * \begin{bmatrix} 8 & 9 \\ 10 & 11 \\ 12 & 13 \\ 17 & 18 \\ 15 & 16 \end{bmatrix}$$

[2 + 6 = 8]

Q2. Consider the Graph Colouring problem in which the nodes of a graph are to be coloured in such a way that no two adjacent nodes have the same colour. Of course if there are n nodes then we can give each node a distinct colour - hence required number of colours is n. However, for practicality we try for k-colouring problem where k is a small number. For planar graphs $k = 4$ is sufficient.

(a) Explain how backtracking can be used to solve k-colouring problem. Give the corresponding recursive algorithm.

(b) Draw the search space tree for 3-colouring problem for the following graph.



[4 + 4 = 8]

Q3. (a) What do you mean by a Matroid? Explain by stating its properties.

(b) Consider the problem of Optimal Storage on a tape for n files of lengths $l_1, l_2, \ldots, l_n$. Can you explain the solution of the problem through Matroids?

[2 + 3 = 5]