Exercise 7

CSE2012 DAA Lab

Slot: L31+L32

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1. In matrix chain multiplication problem, given the number of matrices to be multiplied, write a C++ program to find the number of ways it may be parenthesized. For example, when there are three matrices A1, A2 and A3 there are two ways to parenthesize them. (A1(A2A3)) and ((A1A2)A3). If there are four matrices A1, A2, A3 and A4 then there are five ways to parenthesize as shown (A1(A2(A3A4))), (A1((A2A3)A4)), ((A1,A2)(A3A4)), ((A1(A2A3))A4), (((A1A2)A3)A4).
2. Matrix chain multiplication problem aims at finding the optimal way to parenthesize the matrix chain so that the number of multiplications (cost) will be minimum. The matrices are compatible for matrix multiplication so the number of columns in the ith matrix will be equal to number of rows in the (i+1)th matrix. Given dimension of ‘n’ matrices in the chain, write a recursive algorithm and code to find the minimum cost required to multiply the matrices in the chain. For example, if there are three matrices A1, A2, A3 and the dimension are 10 x 100, 100 x 5 and 5 x 50 respectively then input will 10, 100, 5, 50 and

minimum cost will be 7500 when parenthesized as ((A1A2)A3).

3. Implement bottom up dynamic programming algorithm to find the minimum number of multiplications required in matrix chain multiplication problem. Print the matrices with parenthesis that will need minimum number of multiplications
4. Develop a top down dynamic programming algorithm to find minimum cost for matrix chain multiplication. Print the tables maintained by the algorithm
5. Modify the algorithm developed in problem 4 to find the way to parenthesize that will have maximum number of multiplications. Print the matrices with parenthesis that will have maximum number of multiplications as well.

6. MyBinomial coefficient is defined as follows:

$C(n, 1) = 1$

$C(n, n) = 1$

$C(n, a) = 0$ if $a < 0$ or $n<0$

If n is odd then

$C(n, k) = C(n-1, k-1) + C(n-1, k)$

If n is even then

$C(n, k) = C(n-2, k-2) + C(n-2, k)$

Given values of n and k, use dynamic programming to compute MyBinomial coefficient C(n,k).