Computer Programming Lab: CS211 Date: 31.8.07

Pointers and 2 Dimensional Arrays

1 (a). Write a C function to read a two dimensional array or matrix, say **A**, of elements of data type int. The sizes of the matrices should be user defined and the space for the arrays is to be allocated at run time. Write a function **printmatrix(A,n,m)** to print the matrix of order nxm, when the pointer to the matrix is passed as an argument.

Write a C function **mult(A,B,n1,m1,n2,m2)** which takes as argument the matrices **A** (order **n1xm1)** and **B** (order **n2xm2)** and multiplies them if possible. If the product is not defined then flag an error message.
The function returns a pointer to the product matrix **P=A.B** to the calling function.

Write a main function in C to read two matrices **A** and **B**, print the results in matrix format and compute the product. Finally, the result matrix **P** should be printed in proper matrix format.

1(b) When the dimension of the matrices are 2^nx2^n, the **mult** function could be written in a recursive fashion. Write a recursive multiplication routine for matrices, **recmult(A,B,n)**, assuming that the order of the matrices are 2^nx2^n.

Hint: If the order of **A** and **B** are 2^n, then the matrices and its product could be defined as follows:

$$\boxed{\begin{array}{l} A = \begin{pmatrix} A_1 & A_2 \\ A_3 & A_4 \end{pmatrix}, B = \begin{pmatrix} B_1 & B_2 \\ B_3 & B_4 \end{pmatrix}, \\ C = \begin{pmatrix} A_1B_1 + A_2B_3 & A_1B_2 + A_2B_4 \\ A_3B_1 + A_4B_3 & A_3B_2 + A_4B_4 \end{pmatrix} \end{array}}$$

Note that the order of the sub-matrices, $\mathbf{A_1}$**,** $\mathbf{A_2}$**,** $\mathbf{A_3}$**,** $\mathbf{A_4}$**,** $\mathbf{B_1}$**,** $\mathbf{B_2}$**,** $\mathbf{B_3}$ and $\mathbf{B_4}$ are matrices of order 2^{n-1}x2^{n-1}.