Computer Organization and Architecture Laboratory (CS39001)

Expts. on MIPS Assembly Language Programming

1. Aim : Writing a function subroutine in MIPS, allocating variables dynamically on the stack, passing parameters to functions by value, passing (local) arrays to functions by their addresses.

   Assignment statement:

   (a) Write a function `matPrint` that is passed the following parameters: (positive) integers m and n and the address of a two dimensional m $\times$ n integer array A storing the matrix in row major form. It is to print the elements of A in a row major manner.

   (b) Write a function `matTrans` that is passed the following parameters: (positive) integers m and n and addresses of two integer arrays A and B. It is to compute the transpose matrix of the matrix A in the n $\times$ m matrix B.

   (c) Write a MIPS program which:

      i. prompts the user for three positive integers m, n and s as "Enter three positive integers m, n and s: ",

      ii. allocates space for an m $\times$ n integer array A and an n $\times$ m integer array B on the stack,

      iii. populates the array A with random numbers generated using the linear congruential scheme: $X_{n+1} = (aX_n + c)$ mod m, taking a=7 $\times$ 47+1, c=100 and m = 482-1.
      Let $X_0 = s$ (the seed).

      iv. prints the elements of A using `matPrint`,

      v. Computes B $\leftarrow A^t$ using `matTrans`,

      vi. prints the elements of B using `matPrint`.

   Marking Guidelines: Assignment marking is to be done only after the deadline expires, as submissions gets blocked after the assignment is marked. Marks are to the awarded as per the components indicated below.
   Interactive interface, as specified 4
   Allocation of local variables on stack 4
   Passing the array addresses to the functions as parameters 4
   Properly accessing the elements of the two dimensional arrays 4
   Commenting of program, function modules and indicating how the arrays are being accessed 4
   Overall working of the program 5
   Total Marks 25

   The breakup of marks should be entered as remarks as the sum of the marks given for each component (eg: 3+4+4+4+3).

   Any deficiency in the student submission should also be entered as remarks (eg: "(b) global variables used instead of local variables (0/4); (e) comments are grossly inadequate (0/4)").