Computer Organization and Architecture Laboratory (CS39001)

Expts. on MIPS Assembly Language Programming

1. Aim:

   Writing a recursive function subprogram in MIPS
   Dynamically allocating variables on the stack
   Passing parameters to functions by value
   Passing arrays to functions by their address

   Assignment statement:

   (a) Write a subroutine `sqMatPrint` that is passed the following parameters: A (positive) integer n and the address of a two dimensional integer square matrix A storing the matrix in row major form. It is to print the elements of A in a row major manner.
   (b) Write a *recursive* subroutine `findDet` that is passed the following parameters: A (positive) integer n and the address of a square integer matrix A.
   It first prints the matrix A using the subroutine `sqMatPrint` with the preceding prompt "The matrix passed on this invocation is:"
   It recursively computes the determinant of the matrix A. On exit it returns the determinant value with the prompt "The determinant value returned in this invocation is :"
   (c) Write a MIPS program which:
      i. prompts the user for a positive integer n as "Enter the order of the square matrix whose determinant is to be found",
      ii. allocates space for a square integer matrix A and an integer square matrix A of order n on the stack,
      iii. prompts the user for a positive integer s as "Enter some positive integer for the value of the seed s:",
      iv. 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).
      v. prints the elements of A using `matPrint`,
      vi. Computes the determinant $|A|$ using `findDet`,
      vii. prints the determinant with the prompt "Finally the determinant is : %d"

   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 2
   Passing the array addresses to the functions as parameters 2
   Passing other parameters by value and by reference 2
   Allocating space for the relevant array in the subroutine 5
   Overall working of program 10
   Printing the array on entry to the subroutine and the determinant on exit – 5
   Commenting of program 4
   Total Marks 30

   The breakup of marks should be entered as remarks as the sum of the marks given for each component (eg: 2+2+2+6+2+2).

   Any deficiency in the student submission should also be entered as remarks (e.g., "(d) space allocation of A in the subroutine is faulty (2/5); (f) comments are grossly inadequate (0/4); (g)).