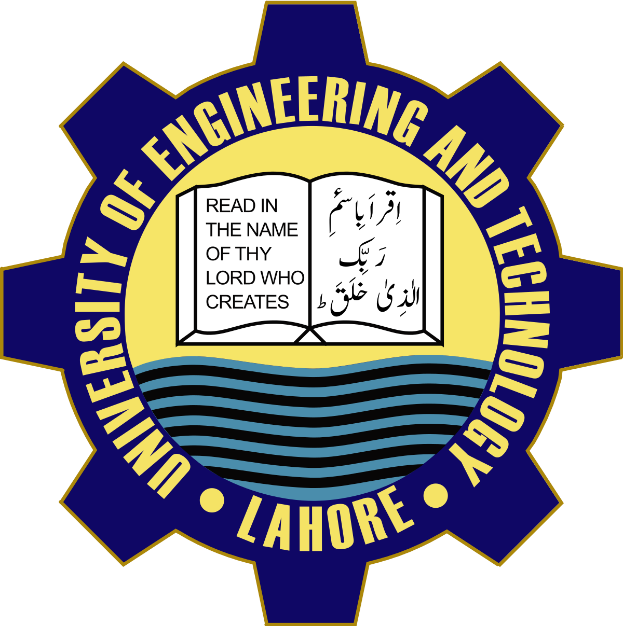
**EE-475L: Computer Architecture**



**Lab Report 3**

**GNU Tool Chain for RISC-V**

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# Task

Write an assembly program to find factorial of a number and convert it to machine code using GNU tool chain for RISC-V.

# Solution

The assembly program to find factorial of a number is given below:

Table : factorial.s

|  |
| --- |
| addi x3, x0, 5 #the number for which we want to find factorial, n  addi x10, x0, 2  blt x3, x10, negative\_and\_zero #if n < 1 then return 1  beq x3, x0, negative\_and\_zero #if n == 0 then return 1  addi x1, x0, 2 #used for comparison  beq x3, x1, two #find factorial of 2  add x4, x0, x3 #result will be stored in this register  add x2, x0, x3 #copy of n  addi x5, x5, 1 #used for comparison  find**:** #used for n-1 (n)(n-1) ... 2  addi x2, x2, **-**1  add x3, x0, x4 #copy contents of x4 in x3  j multiply  done**:** #checks if the factorial is found  bne x2, x1, find  j stop  add x4, x4, x3  multiply**:** #used for repeated additions, checks if multiplication is completed  add x7, x0, x2  multiply1**:** #used for repeated additions  addi x7, x7, **-**1  add x4, x4, x3  bne x7, x5, multiply1  j done    negative\_and\_zero**:** #exception handler  addi x4, x0, 1 #give factorial of negative numbers = 1  j stop  two**:**  addi x4, x0, 2  stop**:**  j stop |

and the machine code for the above assembly program is given below:

Table : machine code for factorial.s

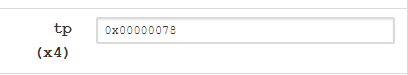
|  |
| --- |
| 00500193  00200513  04a1c463  04018263  00200093  04118263  00300233  00300133  00128293  fff10113  004001b3  0100006f  fe111ae3  0280006f  00320233  002003b3  fff38393  00320233  fe539ce3  fe5ff06f  00100213  0080006f  00200213  0000006f |

# Verification of generated machine code

Expected results from the above machine code are:

|  |  |
| --- | --- |
| **Register** | **Value (hex/decimal)** |
| x4 | 0x78/120 |

Actual results are:



# Conclusion

As the actual result is same as the expected result. So assembly code and machine code are working fine.