**Department of Computer Systems Engineering,
University of Engineering and Technology, Peshawar,
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Midterm Exam (5th Semester, Fall 2023)   Paper: CSE-304 Computer Organization and Architecture
Time: 2 Hours
Marks: 30

Note: Attempt all questions briefly and precisely on the answer sheet, be specific.

Question No. 1 (Marks=5)

Given $x=11111101$ and $y=11111101$ in twos complement notation (**i.e. $x=-3, y=-3$**), compute;
   a. X + Y using 2's compliment.
   b. X − Y using 2's compliment.

Question No. 2 (Marks=5)

What is the purpose of an Instruction Register in a CPU? How does the Instruction Register use Opcode and Operand? How are the number of bits allocated to the Opcode and Operand?

Question No. 3 (Marks=5)

Consider a hypothetical microprocessor generating a 64-bit address and having a 64-bit data bus. What is the maximum memory address space that the processor can access directly if it is connected to "32-bit memory"?
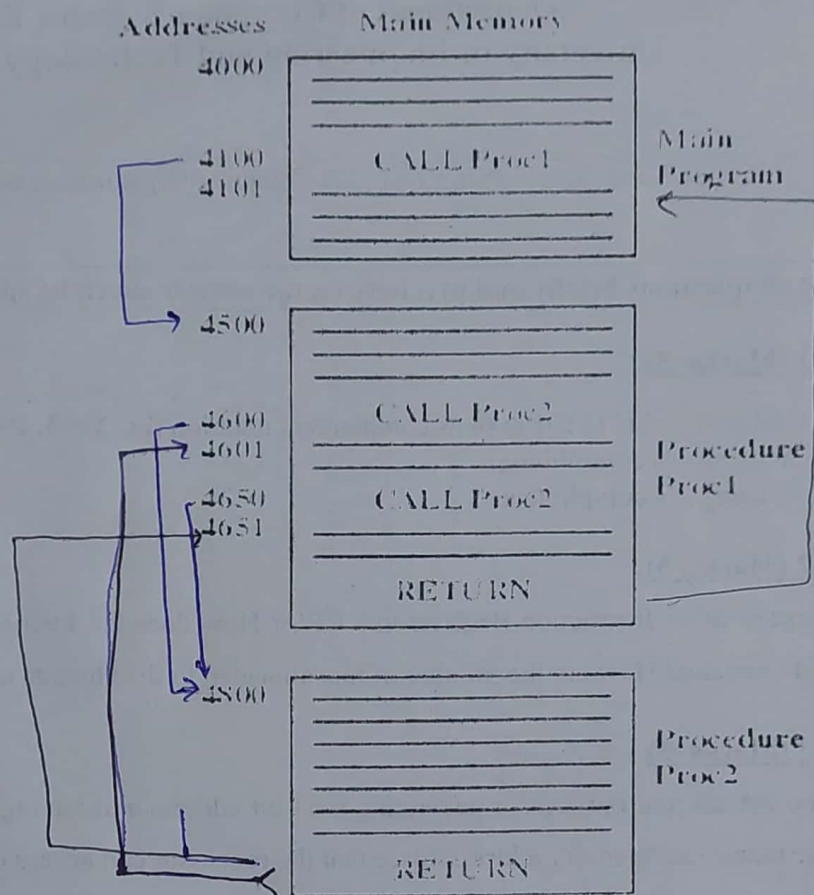
Question No. 4 (Marks=5)

What is the purpose of the Control Register? How are macro instructions and micro instructions related to the control register?

Question No. 5 (Marks=5)

How does the Program Counter point towards the instruction with reference to the System Clock? If the Program Counter is 16-bit wide, what will be the number of locations in the Memory (RAM).

Question No. 6 (Marks=5)

What will be the contents of the stack and stack pointer for the following scenario shown in Figure 1? Assume the stack pointer value is 5100H.

Addresses   Main Memory

4000

4100   CALL Proc1   Main
4101   Program

4500

4600   CALL Proc2
4601   Procedure
4650   CALL Proc2   Proc1
4651

          RETURN

4800
                              Procedure
                              Proc2

          RETURN

(a) Calls and returns

Figure 1