

Assignment-6

911409, IV.2 (Understanding Computing Systems Architecture)

1. **(2x5=10 Marks)**

- a. How Call and Return instructions for a subroutine are handled in a computer?
- b. Explain the importance of different addressing modes in computer architecture with suitable example.
- c. What are the differences between circular and logical shift micro-operations?
- d. Explain the fetch cycle and execute cycle for an addition instruction.
- e. Differentiate Hardwired control unit Vs Micro-programmed control unit.

2. **(3x5=15 Marks)**

- a. Add the following numbers in 8-bit register using signed 2's complement notation
 - i. +50 and - 5
 - ii. +45 and - 65
- b. Construct a full adder using 2 half adders.
- c. Design a counter with the following repeated binary sequence: 0,1,2,3,4,5,6. using J K flip flop.
- d. What are the various micro-operations that will be performed in sequence to fetch an instruction from the memory to an Instruction Register (IR)? Assume suitable set of available registers.
- e. The following transfer statements specify a memory. Explain a memory operation in each case:
 - i. $M[AR] \leftarrow R3$
 - ii. $R2 \leftarrow M[AR]$

3.

- a. How many RAM chips of size $256K \times 1$ bit are required to build 1M Byte memory? **2 Marks**
- b. A memory has a capacity of $4K \times 8$ **3 Marks**
 - i. How many data input and data output lines does it have?
 - ii. How many address lines does it have?
- c. What is a multiplexer ? Explain how an 8×1 multiplexer can be designed using two 4×1 **4 Marks**
- d. A digital computer has a common bus system for 16 register of 32 bits each. The bus is constructed with multiplexers. **6 Marks**
 - i. How many selection inputs are there in each multiplexer?
 - ii. What sizes of multiplexers are needed?
 - iii. How many multiplexers are there in the bus?

4.

- a. An instruction is stored at location 300 with its address field at location 301. The address field at location 301. The address field has the value 400. A processor

register R1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is **(1.5 Marks each)**

- i. Direct
- ii. Immediate
- iii. Relative
- iv. Register indirect
- v. Index with R1 as the index register

b. Define the following:

(1.5 Marks each)

- i. Flip-flop
- ii. Microinstruction
- iii. Micro Program
- iv. Instruction format
- v. Interrupt