MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
COURSE CODE: CSE-316, COURSE TITLE: DIGITAL SYSTEM DESIGN SESSIONAL

PROJECT-3, SECTION-B, GROUP:1-5

PROBLEM:

Design of simple 4-bit microprocessor which will have the following operations:
Here, M is denoted a 4-bit address of RAM

Sr.	opcode	Instruction	Function
1.	0000	LDA M	Load RAM data from memory address M to Accumulator
2.	0001	MOV B, A	Move the 4 bit *value* to B register from A register
3.	0010	INR A	Increment the value of Accumulator by 1
4.	0011	AND B	Perform AND operation on data of B register with accumulator and store the result in the A register
5.	0100	JM M	Jump to designated memory address M if $SF = 1$
6.	0101	OUT	Load data of Accumulator to output register
7.	0110	HLT	Stop the program (No operation)

Instructions for submitting the Design:

1. **Try to minimize T state**
2. Draw the detailed block diagram of the architecture
    a. With all the required components like registers, MUX- these are also need to be shown in the block diagram
    b. Mark all the signals and components properly
    c. Show the IC number in the block diagram for each component (Check whether that IC is available in the laboratory or not)
3. Write the equation for each signal needed for your design
4. Mark all the active signals in each state (for all the above instructions) in a table
5. Determine the total number of ICs and gates used in your design and in the hardcopy, write down the total number of gates, total number of ICs, and IC numbers.

Details of Term Paper: (Submission the final day, 14th week)

Instructions:

Your report should contain following sections:

1. Introduction
   i. Simple 4 bit Micro Processor (SAP-1)
   ii. Macro instruction set
   iii. Programming SAP-1
2. Architecture
   i. Block diagram
3. Fetch cycle and active control signals
4. Execution cycle and active control signals
5. Design of execution Unit
   i. Program counter, RAM, ALU
   ii. Registers (A, B, OUT, MAR, IR)
   iii. MUX and Buffers
   iv. Required IC's (IC number, function, counting)
6. Design of Control Unit
   i. Ring counter
   ii. Instruction decoder
   iii. Control Matrix
   iv. Required IC's (IC number, function, counting)
7. Problem faced
8. Future expansion