C0-R4.B4: COMPUTER SYSTEM ARCHITECTURE

NOTE:

1.	**Answer question 1 and any FOUR from questions 2 to 7.**
2.	**Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours   **Total Marks: 100**

1.

a) What are the advantages and disadvantages of the three most types of general purpose register computers: Register-to-Register, Register-to-memory, and memory-to-memory?

b) Construct a 16 x 1 line multiplier with two 8 x 1 line multiplexers and one 2 x 1 line multiplier. Use block diagrams.

c) An 8-bit register contains the binary value 10011100. What is the register value after an arithmetic shift right? Starting from the initial number 10011100, determine the register after an arithmetic shift left, and state whether there is an overflow?

d) Write a program in assembly language that performs a logical right shift.

e) The following memory units are specified by the number of words and number of bits per word. Specify the number of address lines, data lines and memory size in bytes:
   i)   16 M x 32
   ii)   4G x 64

f) What is cache memory? Discuss Write-through and Write-back, scheme used by Cache? What is the difference between these schemes?

g) Discuss the steps when a high priority process interrupts the another process while it is still being processed by a previous interrupt request from the same source?

                                                                  (7x4)

2.

a) Give an example to illustrate zero-address, one-address and two-address instructions.

b) What do you mean by program control instructions? With a neat diagram, explain how the status register containing overflow, zero, sign and carry flags works with the status of the accumulator content obtained from ALU.

c) Construct a bus system with four registers. Assume that each register has four bits. What has to be done to the bus system to transfer information from any register to any of the register?

                                                                 (5+7+6)

3.

a) What are addressing modes? Write a note on immediate, index, and memory indirect addressing modes.

b) With the help of block diagram explain the function of a Microprogram Sequencer?

c) In a basic computer some of the memory-reference instructions with their respective Opcodes are as follows:

Symbol	Opcode	Description
XOR	000	Exclusive–OR to AC (assuming computer can perform XOR)
SUB	001	Subtract memory from AC
XCH	010	Exchange AC and memory

Give the sequence of register transfer statements needed to :
i)   Fetch and decode the instruction
ii)   Execute each of the above instruction

                                                                 (6+6+6)

4.

a) What is the use of Virtual Memory? Explain operation of virtual memory.

b) Show the step by step multiplication process using booth algorithm, when the following binary numbers are multiplied: (+15) x (-13). Assume 5- bit registers that hold signed numbers.

(10+8)

5.

a) Differentiate between RISC & CISC Architecture.

b) Discuss associative mapping technique and state its advantages over direct mapping technique.

c) Compare I/O mapped and memory mapped I/O. Give their applications.

(6+6+6)

6.

a) Show a block diagram for the data transfer from a CPU to an interface and then to an I/O device. Determine a procedure for setting and clearing the flag bit.

b) Draw & explain block diagram of RAM & ROM chips. Explain how are they connects to microprocessor?

(8+10)

7.

a) What are hazard problems in an instruction processing pipeline? Explain the different techniques used in the hazard detection and resolution.

b) Differentiate SIMD and MIMD in terms of Execution time, Program Memory Requirements, Ease of Programming, and Inter-processor Communications.

(12+6)