Master of Computer Applications
MCAC 102- Computer Organization and Architecture
Unique Paper Code: 223421107
Semester I
Dec 2024
Year of admission: 2024

Time: Three Hours   Max. Marks: 70

Instruction: All questions are compulsory. Attempt all the parts of a question together.

1. A). Construct a common bus system using tri-state buffers for 4 registers   6
   of 8-bits each.
   B). Design a 4-bit combinational circuit decrementer.   4

2. A). How does program interruption work? Explain how the interrupt cycle   6
   works in the branch and save the address operation.
   B). Design a block diagram of the hardwired control unit for a basic   4
   computer with control time signals.

3. A). Find out the total number of registers needed in overlapped RISC   6
   architecture where we have four windows with 32 registers in each.
   The number of local registers in each window is 8. And we have 10
   registers that are common to all procedures.
   B). Starting from an initial value of Register Reg 11011101, determine the   4
   sequence of binary values in Reg after a logical shift-left, followed by a
   circular shift-right, followed by a logical shift-right and a circular shift-
   left.

4. A). Design and Describe the flowchart for the Memory reference   6
   instruction with timing signal.
   B). Design a digital circuit that performs the four logic operations: 4
   Exclusive-OR, Exclusive-NOR, NOR, and NAND. Show the logic diagram
   of one typical stage.

5. A). A digital computer has a common bus system for 16 registers of 32 bits   6
   each. The bus is constructed with multiplexers.
   i.   How many selection inputs are there in each multiplexer?
   ii. What size of multiplexers are needed?
   iii. How many multiplexers are there in the bus?
   B). Describe the steps of input-output configuration in detail.   4

6. Design a detailed circuit for Accumulator Logic. Also, show the circuit for   10

load, increment and clear logic for the Accumulator.

7. Design and implement a detailed arithmetic logic shift unit circuit that   10
   demonstrates the functionality of all three microinstructions: arithmetic
   operations, logical operations, and shift operations.