(T) Roll No. .....

PAPER ID—21132

B.Tech. EXAMINATION, 2025

(Fourth Semester)

COMPUTER SCIENCE AND ENGINEERING

Computer Organization and Architecture

Time : 3 *Hours* *Maximum Marks* : 70

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) In what situations might fixed-point representation be preferable to floating-point representation ?

(b) Discuss the impact of memory hierarchy (cache, main memory) on bus traffic.

(c) How can logic microoperations be used to perform comparisons (greater than, less than, equal) ?

(d) What are status flags and how are they used by the ALU (Arithmetic Logic Unit) to indicate conditions (carry, zero) ?

(e) How does the control unit utilize the clock signal to synchronize operations within a processor ?

(f) What are the benefits of instruction pipeline ?

(g) What exactly is virtual memory, and why is it required ? Explain. 14

Section A

2. What do you mean by error detection code ? What are the types of error detection ? Explain. What are complements in computer architecture ? What is the purpose of Complements in Computer Architecture ? Explain with suitable example. What are the applications of complements ? 14

3. What do you mean by logic micro-operations ? List out all logic micro-operations with truth table. Also discuss Hardware implementation of logic micro-operations with suitable example. 14

Section B

4. What is memory reference instructions in computer architecture ? How do you identify the instruction in memory reference instructions ? Draw and explain the flowchart for memory reference instructions with suitable example. Also discuss design of Accumulator Logic in brief. 14

5. What is Addressing Modes ? Explain all addressing mode with suitable diagram and example for each in detail. An instruction is at memory location 1000. Its operand address is specified in the instruction itself. List all addressing modes where the effective address could be 1020. **14**

Section C

6. (a) What is Amdahl's Law ? Discuss speedup and proof Amdahl's Law.

   (b) What is instruction pipelining ? Explain with suitable diagram. What are the 5 stages of instruction pipeline ? **14**

7. What is vector processing ? What are the characteristics of vector processing ? Discuss SISD SIMD MISD and MIMD with structural diagram of each 14

Section D

8. What are the IO device interfaces ? Explain with neat and clean diagram. Which are four types of commands received by an interface ? List out functions of Input-Output Interface. What is the need of IO interface in COA ? How does Data transfer between CPU and the I/O devices take place ? Explain. 14

9. What do you mean by associative memory ? Show the block representation of an Associative memory. What is mapping and explain associative and set associative mapping ? What is the difference between direct mapping and associative mapping ? Explain with example and neat and clean diagram. 14

