Seat No. 3133007

ITM (SLS) BARODA UNIVERSITY, VADODARA

SOCSET- B. Tech – Semester – III (Regular) Examination – Winter, 2023

Course Code : C2310C2
Course Name : Computer Architecture
Time : 10:00 am – 01:00 pm

Date : 28.12.2023
Day : Thursday
Total Marks : 100

Instructions:

1. All questions are mandatory. There are no external options.
2. Make suitable assumptions, wherever necessary, and state them clearly.
3. Use of Non-Programmable Calculator is allowed/Not allowed.
4. Figures to the right indicate maximum marks.

Q:1 **<Twenty MCQs:** (20)

1. Which of the following is NOT a type of micro-operation?
   a) Arithmetic b) Logic c) Control d) Shift

2. Which type of instruction cycle involves the CPU processing data and performing operations?
   a) Fetch b) Execute c) Load d) Store

3. Which type of computer architecture has a large number of simple instructions?
   a) Reduced Instruction Set Computer (RISC)
   b) Complex Instruction Set Computer (CISC)
   c) Both RISC and CISC
   d) None of the above

4. Which of the following registers stores the memory address of the next instruction to be fetched?
   a) Instruction Register b) Program Counter
   c) Memory Address Register d) Memory Buffer Register

5. The time taken to complete one instruction cycle is called _____.
   a) Processing time b) Execution time
   c) Instruction time d) Clock cycle time

6. In computer arithmetic, Booth's algorithm is used for:
   a) Addition b) Subtraction c) Multiplication d) Division

7. Which programming language is closest to machine language?
   a) Assembly Language b) High-level Language
   c) Object-oriented Language d) Scripting Language

8. Which construct is used to repeat a set of instructions in assembly language programming?
   a) Looping Construct b) If-Else Construct
   c) Switch-Case Construct d) Function/Procedure Construct

9. Which type of instruction is used in assembly language programming to perform arithmetic and logic operations?
   a) ALU Instruction b) Control Instruction
   c) Memory-Reference Instruction d) Input-Output Instruction

10. Which of the following is responsible for generating micro-instructions in a micro programmed control unit?

a. Control Memory
b. Address sequencing
c. Micro program example
d. Design of Control Unit

11. The register transfer language is used for:
a) Defining micro-operations
b) Defining assembly language
c) Defining high-level language
d) Defining computer architecture

12. In a micro programmed control unit, the design of control unit involves
a. Designing the memory
b. Designing the instruction set
c. Designing the datapath
d. Designing the finite state machine

13. Which addressing mode allows the use of an address register and an index register to calculate the effective address of an operand?
A) Indexed addressing mode
B) Indirect addressing mode
C) Immediate addressing mode
D) Register addressing mode

14. Which of the following is responsible for performing arithmetic and logical operations in the CPU?
a) Control Unit
b) Arithmetic and Logic Unit (ALU)
c) Memory Unit
d) Input-Output Unit

15. Which type of instruction is used in assembly language programming to perform arithmetic and logic operations?
a) ALU Instruction
b) Control Instruction
c) Memory-Reference Instruction
d) Input-Output Instruction

16. DMA stands for:
a) Direct Memory Access
b) Data Memory Allocation
c) Direct Memory Allocation
d) Data Memory Access

17. Which instruction type accesses memory for both operands?
a) Register-reference instruction
b) Memory-reference instruction
c) Input-output instruction
d) None of the above

18. Which memory organization scheme allows for parallel access to memory locations?
a) Hierarchical memory
b) Associative memory
c) Virtual memory
d) Segmented memory

19. Which memory technology provides the fastest access time?
a) Auxiliary memory
b) Main memory
c) Cache memory
d) Virtual memory

20. Which of the following is a non-volatile memory?
a) Cache memory
b) RAM
c) Hard disk
d) Register

Q:2 **Answer Any Four Questions Out of Six:** (2(

1. Explain the assembly language programming process and discuss Register Transfer Language.
2. Describe the basic computer design and the role of each component, including the accumulator unit.
3. Discuss the design of a control unit using microprogramming and provide an example.
4. What is a bus? Explain the different types of bus architectures that are used in computer systems.
5. Explain the difference between RISC and CISC architectures, and provide examples of each.
6. What is an interrupt and how does it affect the operation of a computer system?

(20)

Q:3 **Answer Any Four Questions Out of Six:**

1. Explain the difference between direct and indirect addressing modes.
2. What are micro-operations? Discuss the various types of micro-operations.
3. Discuss the various types of memory organization techniques. Which technique do you think is the most efficient and why?
4. Discuss the role of a cache memory in a computer system. How does it help in improving the performance of the system?
5. Compare and contrast synchronous and asynchronous data transfer. Which one do you think is better and why?
6. Explain micro program instruction format with suitable example.

(20)

Q:4 **Answer Any Four Questions Out of Six:**

1. List out any five registers of CPU with their core functionalities.
2. Draw the block diagram of DMA and explain.
3. Represent 10 and -10 using 2's complement.
4. What is pipelining? Explain the various stages involved in the instruction cycle.
5. Write micro operations needed to execute the following instructions:
   - ADD
   - Load and store
6. Write one, two and three address instructions program for the following arithmetic expression $Z = (A + B) * (C - D / E) + F / G$

Q:5 **Answer Any Four Questions Out of Six:** (20)

1.
2. Write a program to evaluate the following arithmetic statement:
   $X = C + D * (A - B) * (F / E + H)$
3. Write any assembly level program for addition of three numbers.
4. Convert given decimal number to binary and then into hexadecimal(a) 1026 (b) 223
5. Discuss the various addressing modes that are used in computer systems. Provide examples of instructions that use each of these addressing modes.
6. What does this micro operation mean a) R2 ← R1 b) R1← A^B c) A← shr A d) R← R1+R2 e) PC←PC+1

--- END OF PAPER ---

1) Perform addition operation for the following numbers using signed magnitude number format. (Write necessary assumptions if required)

A = +5 and V = -3