COA UNIT-1 (2 MARKS)

1. List the major components of a computer system.

- ALU
- Control unit
- Memory
- Input Devices
- Output Devices

2. Define addressing modes and list the types.

The different modes/methods that are used for specifying the address of the operand in the given instructions are called the addressing modes.

Types:

Immediate, Direct, Indirect, Register, Register

Indirect, Relative, Auto increment/decrement.

3. What is indirect addressing mode?

The address of the operand is the contents of a register or memory location whose address appears in the instruction.

Add (R1),R0 R0 <-R0+M[M[R1]]

Add (A),R0 R0 <- R0+M[M[A]]

4. How to represent instruction in a computer system?

Computer instructions are represented as a sequence of bits (0s and 1s) that are grouped into fields. Each field provides specific information to the CPU about the operation and location of the data. The two fields of a computer instruction are:

- Opcode field

Specifies the operation to be performed, such as addition, subtraction, multiplication, and more

- operand field

Indicates the memory location of the operand, or the data to be operated on

5. Define Relative mode addressing.

The address of the operand is determined by adding a constant value (offset) to the contents of the program counter (PC).
X(PC) EA= X+ [PC]

6. Define Little Endian and big Endian arrangement.

Little Endian: The least significant byte is stored at the lowest memory address. Big Endian: The most significant byte is stored at the lowest memory address.

7. What is a bus? What are the different buses in a CPU?

Group of wires transfers data between components.

Types:

Data Bus, Address Bus, Control Bus.

8. What is meant by MAR and MDR?

MAR (Memory Address Register): Holds the memory address of data to be accessed.

MDR (Memory Data Register): Holds the data read from or written to memory.

9. What is auto increment and auto decrement addressing mode?

Automatically increases or decreases the address pointer after the operand is accessed.

1. Autoincrement Add (R2)+ ,R4 R4 <- R4 + M[R2] R2 <- R2 + 4 (in case of 32 bit word length)

Autodecrement Add (R2)-, R4 R4 <- R4 + M[R2] R2 <- R2 - 4

10. What is the role of PC and IR?

PC (Program Counter): Holds the address of the next instruction.

IR (Instruction Register): Holds the currently executed instruction.

11. State and explain the performance equation?

Performance equation:

$$\text{CPU Performance} = \frac{InstructionCount \times CPI}{ClockCycleTime}$$

Where, CPI is Cycles Per Instruction.

12. What is the straight line-sequencing?

A method where instructions are executed in the order they are stored in memory without any branching.

13. How do you measure performance of a computer system?

- ✓ **System Performance Evaluation Corporation (SPEC) selects and publishes representative application programs for different application domains, together with test results for many commercially available computers.**
- ✓ $$SPEC\ rating = \frac{\text{Running time on the reference computer}}{\text{Running time on the computer under test}}$$

$$SPEC\ rating = (\prod_{i=1}^{n} SPEC_i)^{\frac{1}{n}}$$

If the SPEC rating = 50 means that computer under test is 50 times as fast as the reference computer

Geometric mean of the result

n= number of programs

14. List out the methods used to improve system performance.

Pipelining, increasing clock speed, using cache memory, parallel processing, improving algorithms.

15. Define immediate mode addressing.

The operand is directly specified in the instruction itself.

Add #3,R4 R4 <- R4 + 3

16. What is assembly language?

An assembly language is **a type of low-level programming language** that is intended to communicate directly with a computer's hardware.

A low-level programming language that uses mnemonics for machine instructions.

17. What is RISC architecture?

Reduced Instruction Set Computer; focuses on a small set of simple instructions, usually executed in one clock cycle.

18. What is CISC architecture?

Complex Instruction Set Computer; uses a large set of complex instructions, capable of executing multiple operations per instruction.

19. List memory operations with example.

Reading from and writing to memory.

Example:

Load (or Read or Fetch)

- Copy the content from memory using the address present in the instruction.
- The memory content doesn't change.
- Registers can be used to store content
- LDR r2, [r1] ; Load r2 with contents of memory location pointed to by contents of r1.

Store (or Write)

- Write the content (data)in memory using the address present in the instruction.
- Registers can be used to provide content(data)

STR r0, [r1] ; Store contents of r0 to location pointed to by contents of r1.

20. What is the purpose of memory location addresses?

Memory locations are individual cells in memory,

and addresses are unique identifiers used to access them.