

## SHORT ANSWER QUESTIONS

1. What is a decoder?

Decoder is a combinational circuit that converts binary information from  $n$  coded inputs to a maximum of  $2^n$  unique outputs.

2. What is a multiplexer?

Multiplexer is a combinational circuit that receives binary information from one of  $2^n$  input data lines and directs it to a single output line.

3. What is a Register?

A register is a group of flip-flops with each flip-flop capable of storing one bit of information.

## REGISTER TRANSFER AND MICROOPERATIONS

1. What is Register Transfer Language?

- The Symbolic notation used to describe the microoperation transfers among registers is called register transfer language.

2. What is the significance of Memory Address Register?

- The register that holds an address for the memory unit is called Memory Address Register.

3. What is a Control Function?

- Control Function is a Boolean variable that is equal to 1 or 0 and is included in the statement as  $P : R2 \leftarrow R1$ . The control condition is terminated with a colon and symbolizes the requirement that the transfer operation be executed by the hardware only if  $P = 1$ .

4. Specify the basic symbols for Register Transfers

- Letters and numerals – denotes a register
- Parentheses ( ) – denotes a part of a register
- Arrow  $\leftarrow$  - denotes transfer of information
- Comma , - Separates two microoperations

5. What is a Bus?

- Communication system that transfers data between components inside a computer, or between computers.
- Bus Structure consists of a set of common lines one for each bit of a register, through which binary information is transferred one at a time.

6. Define Three state gate.

- A Three state gate is a digital circuit that exhibits three states, where two of them are signals equivalent to logic 1 and 0 as in a conventional gate and the third state

is a high- impedance state that behaves like an open circuit and does not have any logic significance.

7. Give the graphic symbol for three state buffer .

8. What is Memory Read operation?

- The transfer of information from a memory word to the outside environment is called a write operation.

9. What is Memory write operation?

- The transfer of new information to be stored into the memory is called a write operation.

10. What is an micro operation?

- A Microoperation is an elementary operation performed with the data stored in registers

11. What are the categories of microoperations?

The microoperations are classified into four categories

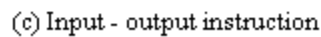
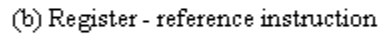
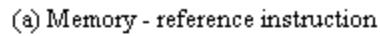
1. Register transfer Micro operations - transfer binary information from one register to another.
2. Arithmetic Micro operations – perform arithmetic operation on numeric data stored in registers.
3. Logic Micro operations – perform bit manipulation operations on nonnumeric data stored in registers
4. Shift microoperations –perform shift operations on data stored in registers.

12. What is a binary adder?

- The digital circuit that performs the arithmetic sum of two binary numbers of any lengths is called a binary adder.

## **BASIC COMPUTER ORGANIZATION AND DESIGN**

1. What is an instruction code?
  - An instruction code is a group of bits that instruct the computer to perform a specific operation.
2. What is an operation code?
  - The operation code of an instruction is a group of bits that define such operations as add, subtract, multiply, shift and complement.
  - Specifies the operation to be performed
3. What is an effective address?
  - The effective is the address of the operand in a computation type instruction or the target address in a branch type instruction.
4. What is the difference between direct address and indirect address?
  - Direct address – specifies the address of the operand and needs one memory reference
  - Indirect address – specifies the address of the address of the operand and needs two memory references to retrieve the operand.
5. What is PC (Program Counter)?
  - The program counter holds the address of the next instruction to be read from memory after the execution of the current instruction.
6. Specify the instruction formats of a basic computer.



1. What is a control word?
  - Control variables represented by a string of 1's and 0's is called control word

**2. What is microprogrammed control unit?**

- A control unit whose binary control variables are stored in memory is called a microprogrammed control unit

**3. What is a microinstruction?**

- Each word in control memory is called a microinstruction

**4. What is a microprogram?**

- Sequence of microinstructions is called microprogram

**5. What is control memory?**

- Memory that is part of the microprogrammed control unit is referred to as control memory

**6. What is the significance of control address register?**

- Control address register is used to specify the address of the microinstruction

**7. What is the significance of Control Data Register?**

- Control Data Register holds the microinstruction read from memory.

**8. What is microprogram sequencer?**

- Microprogram sequencer is the one that generates the next address of the microinstruction

**9. What is mapping process?**

- The transformation from the instruction code bits to an address in control memory where the routine is located is referred to as mapping process

**10. What is the address sequencing capabilities required in control memory?**

- Incrementing of the control address register
- Unconditional branch or conditional branch, depending on status bit conditions
- A mapping process from the bits of the instruction to an address for control memory
- A facility for subroutine call and return

**11. Specify the microinstruction format for the control memory.**

## 12. Specify the fields of symbolic microinstruction?

- Label field
- Microoperations field
- CD – contains one of the letters U, I, S, Z
- BR – contains one of the symbols JMP, CALL, RET, MAP
- AD – specifies value for the address field of the microinstruction

## CENTRAL PROCESSING UNIT

### 1. Specify the major components of CPU.

- Control Unit, Register Set, Arithmetic Logic Unit(ALU)

### 2. What is a stack?

- Stack in digital computer is essentially a memory unit with an address register that can count

### 3. What is a stack pointer?

- The register that holds the address for the stack. Always points at the top item in the stack.

### 4. Convert the given expression to reverse polish notation.

### 5. Specify the fields of an instruction format.

- An Operation code field that specifies the operation to be performed
- An address field that designates a memory address for a processor register
- A mode field that specifies the way the operand or the effective address is determined

### 6. What are the different types of CPU organizations?

The three different types of CPU organizations are

1. Single accumulator organization
2. General Register organization
3. Stack organization.

### 7. What is an addressing mode?

- The way you specify the address of the operand
- The way the operands are chosen during program execution depends on addressing mode
- Specifies the rule for interpreting or modifying the address field of the instruction before the operand is actually referenced.

8. Specify different categories of computer instructions.

- Most of the computer instructions can be classified into three categories

1. Data transfer instructions

2. Data Manipulation instructions

3. Program control instructions

9. What is PSW (Program Status Word)?

- PSW is the collection of all status bit conditions in the CPU
- PSW is stored in a separate hardware register and contains the status information that characterizes the state of the CPU.

10. What is an interrupt?

- An interrupt is a signal from a device attached to a computer or from a program within the computer that causes the main program that operates the computer (the operating system) to stop and figure out what to do next.

11. What are the different types of interrupts?

1. **External Interrupts** – Come from input-output devices, from timing device or from any other external source. Ex: I/O device data transfer

2. **Internal Interrupts** – arises from illegal or erroneous use of an instruction or data. They are also called as traps. Ex: Divide by Zero

3. **Software Interrupts** – It is initiated by executing an instruction. Software interrupt is a special call instruction that behaves like an interrupt rather than a subroutine call.

12. What is subroutine call and return?

- The instruction that transfers program control to a subroutine is called subroutine call or branch to subroutine or branch and save address
- The last instruction of every subroutine commonly called return from subroutine, transfers the return address from the temporary location into the program counter.

13. What is the purpose of addressing modes?

- To give programming versatility to the user
- To reduce the number of bits in the addressing field of the instruction

### **UNIT III**

#### **COMPUTER ARITHMETIC**

1) What is an algorithm?

- Solution to any problem stated by a finite number of well- defined procedural steps is called an algorithm

2) When a floating point number is said to be normalized?

- A floating number is said to be normalized if the most significant digit of the mantissa is nonzero.

3) What is biased exponent?

- Sign bit is removed from being a separate entity.
- Bias is a positive number that is added to each exponent as the floating point number is formed, so that internally all exponents are positive.

4) What is the advantage of biased exponents?

- They contain only positive numbers and simpler to compare their relative magnitude without considering their signs.

5) What is a floating point number?

- Floating point number in computer registers consists of two parts



Mantissa ( m )– it may be a fraction or an integer

Exponent ( e ) – location of radix point and the value of the radix r is assumed and not included in the registers.

### **MEMORY ORGANIZATION**

1. Give memory hierarchy in a computer system.

2. What is an auxiliary memory?

- Devices that provide backup storage are called auxiliary memory

3. What is cache memory?

- A very high speed memory that increases the speed of processing by making current programs and data available to the CPU at a rapid rate.
- Extremely fast and small memory located between CPU and main memory whose access time is close to processor logic clock cycle time.

4 . What is an associate memory?

- A memory unit accessed by the content is called an associative memory or content addressable memory.

7 . What is locality of reference?

- References to memory at any given interval of time tend to be confined within a few localized areas in memory and this phenomenon is known as locality of reference.

8 . What is hit?

- When the CPU refers to memory and finds the word in cache it is said to produce a hit.

9. What is miss?

- When the CPU refers to memory and if the word is not found in the cache it is said to produce a miss

10. Define hit ratio?

- The performance of the cache memory is frequently measured in terms of a quantity called hit ratio.
- **The ratio of the number of hits divided by the total CPU references to memory is the hit ratio.**

11. What is mapping process?

- The transformation of data from main memory to cache memory is referred to as a mapping process.

12. Give the difference between write-through and write-back method.

- Write through – update the main memory with every memory write operation, with cache memory being updated in parallel if it contains the word at the specified address.
- The main advantage with this is that the main memory always contains the same data as the cache.
- Write-back – only the cache location is updated during a write operation. When the word is removed from the cache, it is copied into main memory.

#### UNIT IV

#### INPUT OUTPUT ORGANIZATION

1. What are peripherals?

- Input or output devices attached to the computer are called peripherals

2. What is an interface?

- Special hardware components placed between the CPU and peripherals to supervise and synchronize all input and output transfers.
- The interface is referred as a complementary set of signal connection points between two parts of a system

3. What is a control command?

- A command is issued to activate the peripheral and to inform it what to do.

4. What is status command?

- A status command is used to test various status conditions in the interface and the peripheral.

5. What are data output and data input commands?

6. What is isolated I/O?

- Use one common bus for both memory and I / O but have separate control lines for each
- The distinction between memory transfer and I/O transfer is made through separate read and write lines
- I/O read and I/O write control lines are enabled during I/O transfer
- Memory read and memory write control lines are enabled during memory transfer
- The configuration that isolates all I/O interface addresses from the addresses assigned to memory is referred to as isolated I/O method.

7. What is memory mapped I/O?

- Use one common bus for memory and I/O with common control lines
- Same address space is used for both memory and I/O
- One set of read and write signals are used in the computers and do not distinguish between memory and I/O addresses and this configuration is referred to as memory mapped I/O
- In memory mapped I/O organization there are no specific input or output instructions
- Same instructions are used for either input-output transfers or for memory transfers

**(\* same information can be used to distinguish between memory mapped I/O and Isolated I/O)**

8. What is asynchronous data transfer?

- The data transfer between two independent units is said to be asynchronous if each has its own private clock for its internal registers. The two units are said to be asynchronous to each other

9. What is handshaking?

- Asynchronous data transfer between two independent units requires control signals be transmitted between the communicating units to indicate the time at which data is being transmitted.
- The unit receiving the data item responds with another control signal to acknowledge receipt of the data
- This type of agreement between two independent units is referred to as handshaking.

10. What is the difference between vectored interrupt and non-vectored interrupt?

- Vectored Interrupt – the source that interrupts supplies the branch information to the computer
- Non Vectored Interrupt – the branch address is assigned to a fixed location in memory.

11. What is polling?

- In programmed I/O data transfer, the CPU stays in a program loop checking for the readiness of the device for data transfer and this is called polling

12. What is DMA?

- DMA (Direct Memory Access) transfers the data directly between the memory and I/O devices without the intervention of the CPU.
- The CPU is idle during the DMA data transfer and the DMA controller takes over the control of the buses to manage the transfer directly between the I/O devices and memory.
- DMA data transfer is preferred when large amounts of data need to be transferred

13. What is burst transfer?

- Block sequence consisting of number of memory words is transferred in a continuous burst while the DMA controller is master of the memory of the buses
- Data transmission will not be stopped until an entire block is transferred

14. What is cycle stealing?

- Allows the DMA controller to transfer one data word at a time, after which it must return control of the buses to the CPU.
- The CPU delays its operation for one memory cycle to allow the direct memory I/O transfer to steal one memory cycle.

15. What is half duplex transmission?

- A half duplex transmission system is one that is capable of transmitting in both directions but data can be transmitted in only one direction at a time.

16. What is full duplex transmission?

- A full duplex transmission can send and receive data in both directions simultaneously.

17. What is Input-Output Processor?

- Separate processor for handling I/O operations