COMA

(1) How many output pins does an 8085 microprocessor include?

a) 16 **b) 40** c) 20 d) 64

(2) Which of the following 16-bit registers is for 8085?

a) Accumulator b) Register C **c) Stack pointer** d) Register

(3) How many address lines are present in the 8085 microprocessor?

a) 6 b) 20 **c) 32** d) 40

(4) Which of the following is the correct sequence of operations in a microprocessor?

a) Opcode fetch, memory read, memory write, I/O read, I/O write

b) Opcode fetch, memory write, memory read, I/O read, I/O write

c) I/O read, opcode fetch, memory read, memory write, I/O write

d) I/O read, opcode fetch, memory write, memory read, I/O write

(5) LXI H, 2000H MVI M, 32H HLT What is the contents of the 2000h memory location?

(a) 20H **b) 32H** (c) 00H (d) None of the above

(6) Compulsory Question (Fill in the Blanks):

1. What is an Assembler?
2. **Answer: An Assembler is a program that translates assembly language code into machine code or object code.**
3. ALE stands for...
4. **Answer: ALE stands for Address Latch Enable.**
5. What is Mnemonics?
6. **Answer: Mnemonics are symbolic codes or abbreviations used in assembly language programming to represent machine language instructions.**
7. XCHG stands for...
8. **Answer: XCHG stands for Exchange. It is an instruction in assembly language that swaps the content of two registers.**
9. When pins S0 = 1 and S1 = 1, then HALT operation is performed. TRUE/FALSE.
10. **Answer: TRUE.**

(1) Difference between microprocessor and microcontroller. **Microprocessor:**

- A microprocessor is the central processing unit (CPU) of a computer system.
- It is designed to perform general-purpose tasks and is the core component in a computer.
- Microprocessors usually need external components like memory, input/output devices, and additional circuits to function.

Microcontroller:

- A microcontroller is a compact integrated circuit that includes a processor, memory, and input/output peripherals.
- It is designed for specific tasks and applications, often embedded in devices like appliances, automotive systems, and industrial equipment.
- Microcontrollers are more self-contained and may not require as many external components as microprocessors.

(2) Explain the following terms. (i) 1 byte, 2 bytes, and 3 bytes instructions. **Answer:**

- 1 byte instructions: These instructions consist of a single byte of machine code. Examples include simple operations like NOP (no operation).
- 2 bytes instructions: These instructions consist of two bytes and usually involve an operation code (opcode) and an immediate operand or address.
- 3 bytes instructions: These instructions involve three bytes, typically comprising an opcode and a 16-bit address or operand.

(ii) Define opcode and operand using one instruction. **Answer:**

- Opcode: It is the operation code, a part of the machine language instruction that represents a specific operation or command.
- Operand: The operand is the data or the address upon which the operation specified by the opcode is to be performed.

(3) Explain the following instructions. (i) SHLD 2000H **Answer:**

- SHLD 2000H: This instruction is used to store the content of the HL register pair in the memory address specified (2000H in this case).

(ii) CMP B (Write Conditions) **Answer:**

- CMP B: This instruction compares the contents of the accumulator with the contents of register B without affecting the accumulator. Conditions (like zero or carry) are set based on the result of the comparison.

(iii) INX B **Answer:**

- INX B: This instruction increments the contents of the BC register pair by one.

(4) Define: Low-level language, medium language, high-level language. **Answer:**

- Low-level language: A programming language that is closer to machine code, often specific to a particular computer architecture.
- Medium language: An intermediate-level language, providing a balance between low-level and high-level languages, often with some abstraction but still closely tied to hardware.
- High-level language: A programming language with higher abstraction, making it more user-friendly and independent of hardware details.

(5) Draw and explain the function of the flag register in 8085. **Answer:** The flag register in the 8085 microprocessor consists of various status flags, including the Zero flag (Z), Sign flag (S), Parity flag (P), Carry flag (CY), Auxiliary Carry flag (AC), and others. These flags indicate the outcome of arithmetic and logic operations. For example:

- Zero Flag (Z): Set if the result of an operation is zero.
- Sign Flag (S): Indicates the sign of the result (positive or negative).
- Carry Flag (CY): Set if there is a carry-out or borrow into the high-order bit.
- Auxiliary Carry Flag (AC): Used for binary-coded decimal (BCD) arithmetic.

The flag register is crucial for conditional branching and decision-making in program flow control

(1) Draw the timing diagram of the instruction MOV B, C.

Answer: The MOV B, C instruction in the 8085 microprocessor involves the transfer of the content of register C to register B. The timing diagram for this instruction includes several phases. Initially, the microprocessor enters the instruction fetch phase, during which it fetches the opcode for MOV B, C from memory. The subsequent phases involve the decoding of the instruction and the actual transfer of data.

The first part of the diagram shows the address bus and data bus activities during the opcode fetch phase. The second part illustrates the read operation for the source register, in this case, register C. Following this, the third part of the timing diagram depicts the write operation to the destination register, register B. The entire process involves specific clock cycles, and the timing diagram provides a visual representation of these activities.

(2) Explain all addressing modes of 8085 with examples.

Answer: The 8085 microprocessor supports various addressing modes, each defining how operands are accessed for instructions. The addressing modes include Immediate, Direct, Register, Register Indirect, Implicit, and Indexed.

- Immediate: In this mode, the operand is specified directly in the instruction. Example: MVI A, 05H.
- Direct: The operand is the data stored at a memory address mentioned in the instruction. Example: MOV A, 2050H.
- Register: The operand is in one of the registers. Example: ADD B.
- Register Indirect: The operand is in the memory location pointed to by a register. Example: MOV A, (H).

- Implicit: The instruction implies the operand; no explicit operand is specified. Example: HLT.
- Indexed: The operand is located at an address formed by adding an index or offset to a base register. Example: MOV A, (D+E).

Each addressing mode provides flexibility for different scenarios in programming.

(3) Draw the programming model of 8085.

Answer: The programming model of the 8085 microprocessor illustrates its internal architecture and registers. The key components include registers such as Accumulator (A), General-Purpose Registers (B, C, D, E, H, L), Flags Register, Stack Pointer (SP), and Program Counter (PC). Additionally, there are various control and status signals.

The Accumulator is the primary register for arithmetic and logic operations, and the General-Purpose Registers provide additional storage. The Flags Register contains status flags like zero, carry, sign, etc. The Stack Pointer manages the stack, and the Program Counter keeps track of the next instruction to be executed.

Control signals like RD (Read), WR (Write), ALE (Address Latch Enable), and others coordinate data and address bus activities. The programming model provides a comprehensive view of the 8085's architecture for software developers and assembly language programmers.

(A) Draw pin diagram of 8085 microprocessor and explain any five pins.

Answer: The pin diagram of the 8085 microprocessor consists of 40 pins. Here are explanations for five important pins:

1. **Vcc (Pin 40):** This is the power supply pin, and it requires +5V DC for normal operation. It provides the necessary power to the microprocessor.
2. **A15-A8 (Pins 24-31):** These are the address bus pins, and they carry the most significant bits (MSBs) of the 16-bit memory address. These pins are crucial for addressing external memory and peripherals.
3. **D7-D0 (Pins 14-21):** These are the data bus pins, and they carry the bi-directional data between the microprocessor and external devices. These pins are essential for data transfer.
4. **RD (Read, Pin 32):** This pin is used to initiate a read operation. When activated, it enables the microprocessor to read data from external devices or memory.
5. **WR (Write, Pin 33):** This pin is used to initiate a write operation. When activated, it enables the microprocessor to write data to external devices or memory.

(B) Design memory interfacing circuit for the 8085 microprocessor for a given 8Kbyte EPROM and 4Kbyte of RAM with starting addresses 0000H and 6000H respectively.

Answer: To design the memory interfacing circuit for the 8085 microprocessor, connect the EPROM starting from address 0000H and the RAM starting from address 6000H. Use address lines

A13-A0 for the EPROM and A13-A0 for the RAM. Connect the chip enable (CE) and output enable (OE) pins of the EPROM to appropriate control signals. Similarly, connect the chip select (CS) and write enable (WE) pins of the RAM. Ensure proper power supply connections and connect the data lines D7-D0 to both EPROM and RAM.

(C) Write a program of 8085 to multiply two 8-bit numbers and store result in 2050H memory location.

Answer:

assemblyCopy code

```
ORG 0000H ; Starting address of the program MOV C, 00H ; Initialize the result register to 0 MOV B, 08H ; Initialize the loop counter to 8 MULTIPLY_LOOP: MOV A, M ; Load the first 8-bit number from memory RLC ; Rotate A through carry, bringing the MSB to carry MOV M, A ; Store the result in memory at 2050H MOV A, C ; Load the result register RLC ; Rotate through carry, bringing the MSB of result to carry MOV C, A ; Update the result register with the rotated value DCR B ; Decrement loop counter JNZ MULTIPLY_LOOP ; Jump to loop if not zero HLT ; Halt the microprocessor
```

This program multiplies two 8-bit numbers stored in memory locations starting from the address mentioned in the `MVI` instruction. The result is stored at memory location 2050H. The program uses rotation operations to perform the multiplication.

PSNM

1. Binomial distribution tends to which distribution when the number of trials n is very large, p and q are not very small. **Answer: (a) Normal distribution**
2. The mean of Poisson distribution is 1.44 and its S.D. is - **Answer: (c) 1.2**
3. The mean of binomial distribution is 8, and the probability of success is 0.5, then n = **Answer: (b) 16**
4. When a dice is thrown, A and B are the events respectively then, P(A ∩ B) = **Answer: (c) 0**

Match the following: A) Newton-Raphson method 1) Evaluating Integration B) Runge-Kutta method C) Gauss-Seidel method D) Simpson's Rule **Answer: (b) A - 1, B - 4, C - 3, D - 2**

6. The range of the correlation coefficient is - **Answer: (a) (-1, 1)**
7. Newton's first divided difference [x1, x2] = **Answer: (a) (y1 - y2) / (x1 - x2)**
8. If P(B) = 1, P(A ∩ B) = 1, and P(A ∩ B') = 0, then P(A) = **Answer: (a) 0**
9. The probability that a student A solves a mathematics problem is 1/2, and the probability that a student B solves it is 1/3. The probability that the problem is solved = **Answer: (c) 1/6**
10. For a Poisson variate P(x=3) = P(x=4), find mean and variance. **Answer: Since P(x=3) = P(x=4) in a Poisson distribution, the mean (λ) and variance (σ^2) are both equal to 3.**
11. If A and B are mutually exclusive events, then P(A ∩ B) = 0. (True/False) **Answer: True**
12. If both the regression coefficients are positive, then the correlation coefficient is negative. (True/False) **Answer: False**
13. P(A ∪ B ∪ C) = **Answer: The probability of the union of events A, B, and C.**

14. Write the formula of Simpson's one-third rule to evaluate the integration. **Answer: ∫[a, b] f(x)dx ≈ (h/3) [f(x0) + 4f(x1) + 2f(x2) + 4f(x3) + ... + 2f(xn-2) + 4f(xn-1) + f(xn)]**
15. V(ax + b) = **Answer: Variance of the random variable ax + b is a^2 times the variance of x.**

Question: Find the Lagrange interpolating polynomial for the following data:

X	0	1	4	5
$y = f(X)$	1	3	24	39

Answer:

The Lagrange interpolating polynomial is given by:

$$P(x) = L_0(x) \cdot y_0 + L_1(x) \cdot y_1 + L_2(x) \cdot y_2 + L_3(x) \cdot y_3$$

Where the Lagrange basis polynomials $L_i(x)$ are given by:

$$L_0(x) = \frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)}$$

$$L_1(x) = \frac{(x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_2)(x_1-x_3)}$$

$$L_2(x) = \frac{(x-x_0)(x-x_1)(x-x_3)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)}$$

$$L_3(x) = \frac{(x-x_0)(x-x_1)(x-x_2)}{(x_3-x_0)(x_3-x_1)(x_3-x_2)}$$

Substitute these into the formula for $P(x)$:

$$P(x) = L_0(x) \cdot 1 + L_1(x) \cdot 3 + L_2(x) \cdot 24 + L_3(x) \cdot 39$$

Perform the necessary calculations to obtain the expression for $P(x)$.

COMA

1. **8085 has how many address bits?** a. 4
   b. 3
   c. 8
   d. 16
2. **Total number of Pins in 8085 are?** a. 40
   b. 40
   c. 20
   d. 16
3. **MOV A, B is a _____ instruction.** a. Byte
   b. 3 Byte
   c. 2 Byte
   d. None
4. **LXI H, 2048H is a _____ instruction.** a. 1 Byte
   b. 3 Byte
   c. 2 Byte
   d. None
5. **Which among these is a non-vectored Interrupt?** a. XlNTR
   b. INTA
   c. RST4.5
   d. RST7.5

(B) Compulsory Question (5)

1. **Define: Opcode and Operand.**
   - **Answer:** Opcode is a part of a machine language instruction that specifies the operation to be performed, and Operand is the data on which the operation is to be performed.
2. **ALE is used to perform arithmetic and logical functions. (TRUE/FALSE)**
   - **Answer:** False
3. **In LDA 5041H instruction, what is Opcode and what is Operand?**
   - **Answer:** Opcode is LDA, and Operand is 5041H.
4. **What is Microprocessor?**
   - **Answer:** A microprocessor is an integrated circuit that contains the functions of a central processing unit (CPU) of a computer. It performs arithmetic and logic operations and controls other peripherals.
5. **Define: T-state.**
   - **Answer:** T-state (Time State) is the unit of time in which a microprocessor completes one machine cycle. It is the basic timing unit for the microprocessor.

(Q.2) Attempt any four (Short Questions) 12

1. **Describe: LDA, STA, and MVI instructions with examples.**
   - *Answer: LDA (Load Accumulator), STA (Store Accumulator), and MVI (Move Immediate) are instructions in 8085 microprocessor. LDA loads the accumulator with data from a*

memory address, STA stores the accumulator content to a memory address, and MVI loads immediate data into a register or memory.

2. **Explain the classification of Addressing modes.**
    - *Answer: Addressing modes in microprocessors define how operands are specified in instructions. They are classified into various types, such as Immediate, Register, Direct, Register Indirect, Indexed, and Implied addressing modes.*
3. **What is Address Bus, Data Bus, and Control Bus?**
    - *Answer: The Address Bus carries the address of the memory locations or I/O devices, the Data Bus carries the data between the microprocessor and memory or I/O devices, and the Control Bus carries control signals to coordinate and manage data transfers.*
4. **What is memory? Give the difference between static and dynamic RAM.**
    - *Answer: Memory is a component that stores data and instructions for a computer. Static RAM (SRAM) uses flip-flops for storage and is faster but more expensive, while dynamic RAM (DRAM) uses capacitors and requires refreshing, making it slower but more cost-effective.*
5. **Draw and explain the Flag register?**
    - *Answer: The Flag register in the 8085 microprocessor holds status flags such as zero, carry, sign, parity, and auxiliary carry. Each flag indicates a specific condition, and the microprocessor uses them for decision-making during program execution.*

Question 1: Write a program to add two 8-bit data F5H and 43H stored in memory locations 3041H and 3042H.

assemblyCopy code

```
ORG 3000H MOV A, M ; Load the first operand from memory location 3041H into accumulator MOV B, M ; Load the second operand from memory location 3042H into register B ADD B ; Add the contents of register B to the accumulator STA 3043H ; Store the result in memory location 3043H HLT ; Halt the program
```

Answer:

This assembly program loads two 8-bit data, F5H and 43H, from memory locations 3041H and 3042H. It adds these two values and stores the result in memory location 3043H. The `HLT` instruction then halts the program.

Question 2: What is an Interrupt? Describe the function of each interrupt.

Answer:

An interrupt is a mechanism by which a microprocessor can be interrupted to temporarily halt its normal program flow to handle a specific event. In the context of the 8085 microprocessor, there are five types of interrupts:

1. **RST 7.5, RST 6.5, RST 5.5:** These are hardware interrupts. When any of these pins is activated, the microprocessor jumps to a predefined memory location to execute a specific routine.
2. **INTR (Interrupt Request):** This is a hardware interrupt request. When this pin is activated and the interrupt enable bit is set, the microprocessor acknowledges the request and jumps to a predefined memory location.
3. **TRAP:** TRAP is a non-maskable interrupt. It is an internal interrupt that cannot be disabled. When TRAP is encountered, the microprocessor jumps to a fixed memory location (0024H).
4. **INTR (Software Interrupt):** This is a software-generated interrupt. The programmer can use the `RIM` instruction to check the status of this interrupt.

Interrupts enhance the functionality of a microprocessor by allowing it to respond to external or internal events promptly.

Question 3: Draw and explain the programmable model of 8085.

Answer:

The programmable model of the 8085 microprocessor consists of various components:

1. **Accumulator (A):** A register that performs arithmetic and logic operations.
2. **General Purpose Registers (B, C, D, E, H, L):** Used for various data manipulation operations.
3. **Flags Register:** Contains flags like Zero, Carry, Sign, Parity, Auxiliary Carry, and Overflow, providing information about the result of arithmetic operations.
4. **Stack Pointer (SP):** Points to the memory location of the current stack.
5. **Program Counter (PC):** Holds the address of the next instruction to be executed.
6. **Memory Unit:** Stores data and instructions.
7. **ALU (Arithmetic Logic Unit):** Performs arithmetic and logic operations.
8. **Control Unit:** Manages the flow of data and control signals.

The control signals are generated by the control unit based on the instructions being executed. The ALU performs operations based on the data provided by registers. The PC and SP help in managing the program flow and the stack. Overall, the model depicts the interaction between different components to execute instructions in a program.

Question: Draw the architecture of the 8085 microprocessor.

Answer:

The 8085 microprocessor has a simple architecture consisting of various functional units. At its core, it includes an Arithmetic and Logic Unit (ALU), a Control Unit, a set of registers, and a set of flags. The ALU performs arithmetic and logical operations, while the control unit manages the flow of data and instructions. The register set includes the Accumulator, General Purpose Registers, Stack Pointer, and Program Counter. The 8085 also has a set of flags to indicate various conditions such as zero, carry, and sign.

Question: Draw the interfacing of a 4Kbyte EPROM and 8Kbyte RAM with the 8085 using a decoder. Also, find the starting and ending addresses of EPROM & RAM.

Answer:

The interfacing involves using a decoder to select either the EPROM or RAM based on the address lines generated by the 8085. The EPROM and RAM will have separate chip enable lines controlled by the decoder. The starting address for the EPROM can be, for example, 0000H, and the ending address can be 0FFFH for a 4Kbyte EPROM. For the 8Kbyte RAM, the starting address may be, for instance, 4000H, and the ending address can be 7FFFH. These addresses will be determined by the connections to the decoder.

Question: Draw the timing diagram of the MVI A, 06H instruction for the 8085 microprocessor.

Answer:

The timing diagram for the MVI A, 06H instruction involves various phases. Initially, the instruction is fetched from memory during the opcode fetch phase. Then, the microprocessor decodes the instruction and prepares for the data fetch phase. In the data fetch phase, the immediate data 06H is fetched from the memory and loaded into the accumulator. The entire process involves a series of clock cycles, and the timing diagram illustrates the states of various control signals such as RD (Read), WR (Write), and others throughout the execution of the instruction.