Maharashtra Board Class 12 Computer Science (P2-D-9-V-298) 2024 Question Paper with Solutions

Time Allowed :3 Hour	**Maximum Marks :**50	**Total questions :**5

General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 5 questions. All questions are compulsory.
2. All questions are compulsory.
3. Figures to the right indicate full marks.
4. Draw a neat and labelled diagram whenever necessary.
5. Use of any type of calculator not allowed.
6. Due marks will be given for any other equivalent logic in questions wherever program code/mnemonics are expected.
7. Comments are must in assembly language program.

1(A). Select the correct alternative for blank space and rewrite entire statement, for the following:

(a) The invalid register pair in 8085 Microprocessor is _____.

(1) BC

(2) HL

(3) SP

(4) DE

Correct Answer: (3) SP

Solution:

In the 8085 Microprocessor, the Stack Pointer (SP) cannot be utilized as a register pair, unlike the BC, HL, and DE pairs.

Other options: - BC, HL, and DE are valid register pairs.

Quick Tip

In the 8085 microprocessor, the Stack Pointer (SP) is a specialized register and cannot be used in instructions involving register pairs.

(b) The length of instruction PUSH Rp is _____ byte(s).

(1) 2

(2) 1

(3) 3

(4) 4

Correct Answer: (2) 1

Solution:

The ‘PUSH Rp‘ instruction in the 8085 microprocessor occupies only 1 byte of memory. The instruction set of the 8085 defines the ‘PUSH‘ command as a 1-byte opcode, with the register pair encoded implicitly, making it a single-byte instruction.

Quick Tip

The ‘PUSH‘ instruction in the 8085 uses just 1 byte for the opcode, with the register pair implicitly encoded within it.

(c) 8051 is _____ bit microcontroller.

(1) 8

(2) 4

(3) 16

(4) 32

Correct Answer: (1) 8

Solution:

The 8051 microcontroller is an 8-bit device, meaning it handles 8 bits of data at once.

Quick Tip

The 8051 microcontroller is widely used in embedded systems due to its popularity as an 8-bit microcontroller.

(d) The device used to extend cable length of a computer network is _____.

(1) Modem

(2) Hub

(3) Repeater

(4) Router

Correct Answer: (3) Repeater

Solution:

A Repeater is a device that enhances the range of a computer network by amplifying or regenerating signals, enabling them to travel longer distances.

Quick Tip

A Repeater strengthens the signal, ensuring data can travel farther without loss of quality.

(B) Answer any two of the following:

(a) Contents of flag register of 8085 Microprocessor is 55H. Write its bit pattern and give interpretations.

Solution:

The flag register in the 8085 Microprocessor is represented by the value 55H. The corresponding bit pattern of 55H is:

$$55\text{H} = 0101\ 0101_2$$

Interpretation of the bits in the flag register:

- Sign Flag (S): Bit 7 (0) - No negative result.
- Zero Flag (Z): Bit 6 (1) - Indicates a result of zero.
- Auxiliary Carry Flag (AC): Bit 4 (0) - No carry from bit 3 to bit 4.
- Parity Flag (P): Bit 2 (1) - Indicates even parity.
- Carry Flag (CY): Bit 0 (1) - Indicates a carry-out.

Quick Tip

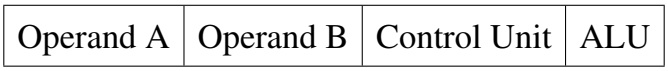
The flag register in the 8085 holds key status bits used during arithmetic and logical operations.

(b) Explain the organisation of ALU with the help of block diagram.

Solution:

The Arithmetic and Logic Unit (ALU) is the core component of a microprocessor responsible for carrying out all arithmetic and logical operations.

Block diagram of the ALU:



The ALU receives the input operands and performs operations as directed by the control unit. These operations include addition, subtraction, logical AND, OR, and others.

Quick Tip

ALU's role is crucial as it enables the processor to perform mathematical and logical operations.

(c) Define Microcontroller. State any 4 advantages of same over microprocessor based system.

Solution:

A Microcontroller is a compact, integrated circuit designed to handle specific functions within an embedded system. It integrates a processor, memory, and input/output peripherals

on a single chip.

4 Benefits of Microcontrollers over Microprocessors:

1. Integrated Peripherals: Microcontrollers come with built-in components like timers, counters, and I/O ports, whereas microprocessors typically need external peripherals.

2. Low Power Usage: Microcontrollers are optimized for low power consumption, making them perfect for portable and battery-operated devices.

3. Cost-Effective: With their all-in-one design, microcontrollers are usually more economical compared to systems built around microprocessors.

4. Real-Time Operation: Microcontrollers are ideal for applications that demand fast processing and quick control, making them suitable for real-time systems.

Quick Tip

Microcontrollers are designed for embedded systems, offering a balance of functionality and efficiency in their architecture.

2(A). Answer any two of the following:

(a) Identify 1-byte, 2-byte, and 3-byte instructions from the following and write the same:

(1) LDA CO40H

Solution:

LDA CO40H is a 3-byte instruction that loads the accumulator with the value from memory location CO40H.

Quick Tip

LDA is a 3-byte instruction because it requires the memory address as an operand (2 bytes for the address and 1 byte for the opcode).

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(2) ADC M

Solution:

ADC M is a 1-byte instruction that adds the content from the memory location specified by the HL register pair to the accumulator, along with the carry bit.

Quick Tip

ADC M operates on the memory location addressed by the HL register pair and requires only 1 byte for execution.

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(3) CPI D4H

Solution:

CPI D4H is a 2-byte instruction. It compares the contents of the accumulator with the immediate data D4H.

Quick Tip

CPI uses 2 bytes because it includes the immediate operand (1 byte for data and 1 byte for the opcode).

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(4) ORI 9DH

Solution:

ORI 9DH is a 2-byte instruction. It performs a logical OR operation between the contents of the accumulator and the immediate data 9DH.

Quick Tip

ORI requires 2 bytes, with 1 byte for the operand (immediate data) and 1 byte for the opcode.

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(5) XTHL

Solution:

XTHL is a 1-byte instruction. It exchanges the contents of the top two stack bytes with the HL register pair.

Quick Tip

XTHL is a single byte instruction that exchanges the stack contents with the HL register pair.

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(6) LHLD 2060H

Solution:

LHLD 2060H is a 3-byte instruction. It loads the HL register pair with the contents from memory address 2060H and 2061H.

Quick Tip

LHLD is a 3-byte instruction because it involves a 2-byte memory address operand.

(b) List any six characteristics of transmission media.

Solution:

Transmission media possess six key characteristics:

1. Bandwidth: The rate at which data can be transmitted through the medium.
2. Propagation delay: The duration it takes for data to travel from the sender to the receiver.
3. Attenuation: The reduction in signal strength as the signal moves through the medium.
4. Noise: Unwanted interference that can degrade the quality of the signal.
5. Cost: The overall expense of establishing and maintaining the transmission medium.
6. Reliability: The medium's capacity to deliver consistent and uninterrupted service.

Quick Tip

The choice of transmission media is influenced by factors such as distance, transmission speed, and cost-effectiveness.

(c) State any three addressing modes of 8085 Microprocessor instructions with one example of each.

Solution:

The 8085 Microprocessor supports three primary addressing modes:

1. Immediate Addressing Mode:

- Example: MVI A, 32H - In this mode, the operand is directly specified within the instruction.

2. Register Addressing Mode:

- Example: MOV A, B - Here, the operand is located in one of the processor's registers.

3. Direct Addressing Mode:

- Example: LDA 2050H - In this mode, the operand is located at a specific memory address.

Quick Tip

Addressing modes determine how the processor retrieves data from memory or registers during instruction execution.

2.(B) Answer any one of the following:

(a). Explain the function of following pins of 8085 Microprocessor:

(i) $\overline{\text{RD}}$

Solution:

The RD pin is an active low signal used for reading data from the memory or I/O devices into the microprocessor.

Features:

- When RD is low, data is read from memory or I/O.
- It is synchronized with the system clock to ensure correct data retrieval.
- It enables the processor to fetch instructions or data.

Quick Tip

The RD signal is crucial for fetching data from external devices or memory.

(ii) HOLD

Solution:

The HOLD pin allows external devices to take control of the system's buses during Direct Memory Access (DMA) operations.

Features:

- It notifies the microprocessor to release control of the buses.
- It is vital for transferring large volumes of data without requiring the processor's involvement.
- When the HOLD signal is asserted, the microprocessor releases control of the buses.

> **Quick Tip**
>
> The HOLD pin is essential for efficient data transfers in systems using DMA, enabling direct access to memory.

(iii) RST 7.5

Solution:

RST 7.5 is a restart interrupt pin that triggers an interrupt service routine at vector address 0x003C.

Features:

- It is a software interrupt that can be invoked by external devices.
- Used for handling high-priority events in the system.
- Provides direct control over program flow during critical operations.

> **Quick Tip**
>
> RST 7.5 is essential for responding to high-priority tasks quickly.

(iv) $\overline{\text{INTA}}$

Solution:

The INTA pin is used to acknowledge an interrupt request from an external device.

Features:

- It is used by the microprocessor to signal an interrupt request.
- When low, it indicates that an interrupt has been acknowledged.
- Ensures proper handling of interrupts during system operation.

Quick Tip

The INTA pin is critical for managing interrupt-driven processes in microprocessor systems.

(b) What is Ring Topology? Draw neat labelled diagram to show Ring Topology. State one advantage and one disadvantage of Ring Topology.

Solution:

Ring Topology: In a Ring Topology, each device is connected to two other devices, forming a ring-like structure. Data travels in one direction around the ring, passing through each device until it reaches the destination.

at (0, 1) [draw, circle, minimum size=1cm] (A) A; at (3, 1) [draw, circle, minimum size=1cm] (B) B; at (6, 1) [draw, circle, minimum size=1cm] (C) C; at (9, 1) [draw, circle, minimum size=1cm] (D) D; at (12, 1) [draw, circle, minimum size=1cm] (E) E; [-¿] (A) – (B); [-¿] (B) – (C); [-¿] (C) – (D); [-¿] (D) – (E); [-¿] (E) – (A); at (4.5, 2) Data flows in one direction;

Advantage: - Efficient for small networks and data is transmitted in one direction, reducing collisions.

Disadvantage: - A failure in any device or connection can disrupt the entire network.

Quick Tip

Ring Topology is more efficient for small networks but can be difficult to troubleshoot due to its dependency on every device in the network.

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3. (A) Answer any one of the following:

(a) Differentiate between UTP and STP Cables.

Solution:

UTP (Unshielded Twisted Pair)	STP (Shielded Twisted Pair)
1. **No Shielding** – UTP cables do not have any shielding to protect against external interference.	1. **Shielding Present** – STP cables have an additional shielding layer to protect from external interference.
2. **Lower Cost** – UTP is cheaper due to the absence of shielding.	2. **Higher Cost** – STP cables are more expensive because of the extra shielding material.
3. **Used for Shorter Distances** – Best for shorter-range communication due to susceptibility to interference.	3. **Used for Longer Distances** – STP cables are better for long-distance communication with minimal interference.

Quick Tip

UTP is often preferred for cost-effective, short-distance communication, while STP is ideal for environments with high interference.

(b) What is Bus? Explain address Bus and Data Bus of 8085 Microprocessor.

Solution:

Bus: A bus is a communication pathway that facilitates the transfer of data between various components within a computer system or between multiple systems. It enables the exchange of data, instructions, and control signals.

Address Bus of 8085 Microprocessor:

1. The address bus is unidirectional, meaning it transmits addresses from the microprocessor to memory or I/O devices.
2. It carries the address of the memory location or I/O device from which data is to be retrieved or to which data is to be written.
3. The 8085 microprocessor has a 16-bit address bus, allowing it to access up to 64KB (65536 memory locations).

Data Bus of 8085 Microprocessor:

1. The data bus is bi-directional, meaning it can transfer data in both directions: from memory to microprocessor or vice versa.
2. It is used to transfer the actual data between the microprocessor and memory or I/O devices.
3. The 8085 microprocessor features an 8-bit data bus, enabling it to transmit one byte of data at a time.

Quick Tip

While the address bus transmits addresses, the data bus carries the actual data between components within the system.

(c) State any two advantages and any one disadvantage of wireless media in networking.

Solution:

Benefits of Wireless Media in Networking:

1. **Mobility** – Wireless media enables devices to move freely within a network, without the constraints of wired connections.
2. **Simple Installation** – Wireless networks eliminate the need for physical cables, making setup quicker and more adaptable.

Drawback of Wireless Media in Networking:

1. **Limited Range** – Wireless media has a restricted range, with signal strength diminishing over distance, which can make it less ideal for large networks.

Quick Tip

Though wireless media provides flexibility and convenience, it is essential to account for range and security considerations when designing wireless networks.

(B) Answer any one of the following:

(a). Explain the following connectivity devices :

(i) Modem

Solution:

Modem: A Modem (Modulator-Demodulator) is a device that converts digital data from a computer into analog signals for transmission over phone lines or cable systems, and vice versa. It facilitates internet access by encoding and decoding signals.

Quick Tip

A modem is crucial for internet connectivity, particularly in regions without broadband access.

(ii) Hub

Solution:

Hub: A Hub is a basic networking device used to link multiple devices within a Local Area Network (LAN). Operating at the physical layer of the OSI model, it broadcasts data to all connected devices. However, it lacks the ability to filter or route traffic, meaning all data is sent to every device attached to the hub.

Quick Tip

Although hubs are simple and cost-effective, they are largely replaced by switches, which can manage traffic more efficiently.

(b) Consider Accumulator contains FFH and register C contains 4DH. Execute following instructions one after the other and write contents of Accumulator after each instruction:

(i) XRA A

Solution: The instruction `XRA A` performs a bitwise XOR operation between the Accumulator and register A. Since both the Accumulator and A hold the value FFH (1111 1111 in binary), the result of the XOR operation will be:

$$\text{FFH} \oplus \text{FFH} = \text{00H}$$

After executing XRA A, the Accumulator holds: 00H.

Quick Tip

XRA performs an XOR operation, and XORing a value with itself always yields zero.

(ii) ADD C

Solution: The instruction `ADD C` adds the contents of register C (which is 4DH) to the Accumulator. At this point, the Accumulator is 00H, so the result of adding 4DH to 00H is:

$$00\text{H} + 4\text{DH} = 4\text{DH}$$

After ADD C, the Accumulator contains: 4DH.

Quick Tip

The ADD instruction adds the contents of a specified register to the Accumulator, modifying only the Accumulator's value.

(iii) CPI 4D H

Solution: The instruction `CPI 4D H` compares the value in the Accumulator with the immediate value 4DH. It subtracts the immediate value (4DH) from the Accumulator, but the result is not stored in the Accumulator; instead, only the flags are affected.
Since the Accumulator holds 4DH, subtracting 4DH results in 00H, but the Accumulator remains unchanged.
After executing CPI 4D H, the Accumulator remains: 4DH.

Quick Tip

The CPI instruction does not modify the Accumulator; it only updates the flags based on the subtraction result.

(iv) SUB C:

Solution: The instruction SUB C subtracts the contents of register C (4DH) from the Accumulator. At this point, the Accumulator contains 4DH, and subtracting 4DH from it

results in:

$$4\text{DH} - 4\text{DH} = 00\text{H}$$

After SUB C, the Accumulator contains: 00H.

Quick Tip

SUB instruction subtracts the contents of a specified register from the Accumulator and stores the result in the Accumulator.

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4. (A) Answer any two of the following:

(a) Differentiate between Hardware and Software interrupts of 8085 Microprocessor. (Any three points)

Solution:

Difference between Hardware and Software Interrupts:

Hardware Interrupts	**Software Interrupts**
Initiated by external hardware devices	Initiated by the program instructions
Takes place automatically when an interrupt occurs	Triggered explicitly by executing an interrupt instruction
Requires external hardware support (e.g., interrupt pins)	Does not require external hardware; it is initiated by software
Faster response time due to direct hardware signals	Slower response time since it depends on the program's instruction cycle
Examples: INTR, RST7.5, RST6.5, etc.	Example: SIM (Software Interrupt) in 8085

Quick Tip

Hardware interrupts are faster and are used for immediate attention to an external device, while software interrupts are more flexible and can be programmed for specific software operations.

(b) State any six features of 8051 Microcontroller.

Solution:

Six Key Features of the 8051 Microcontroller:

1. 8-bit Processor: The 8051 is an 8-bit microcontroller, capable of processing 8 bits of data at a time.
2. 4KB ROM: It comes with 4KB of built-in ROM for storing the program code.
3. 128 Bytes RAM: The 8051 includes 128 bytes of RAM for temporary data storage and variables.
4. 4 Parallel I/O Ports: Equipped with 4 parallel I/O ports, each 8 bits wide, it facilitates communication with external devices.
5. 16-bit Timer/Counters: The microcontroller includes two 16-bit timers/counters, ideal for precise timing and counting operations.
6. Serial Communication Support: The 8051 supports full-duplex serial communication, allowing data transmission and reception via serial ports.

Quick Tip

The 8051 microcontroller is popular in embedded systems due to its flexible I/O options, on-chip memory, and support for serial communication.

(c) Draw and label programming model of 80286 Microprocessor.

Solution:

The 80286 microprocessor has a 24-bit address bus and an 8-bit data bus. It uses segmentation and paging for memory management, and its programming model consists of multiple registers.

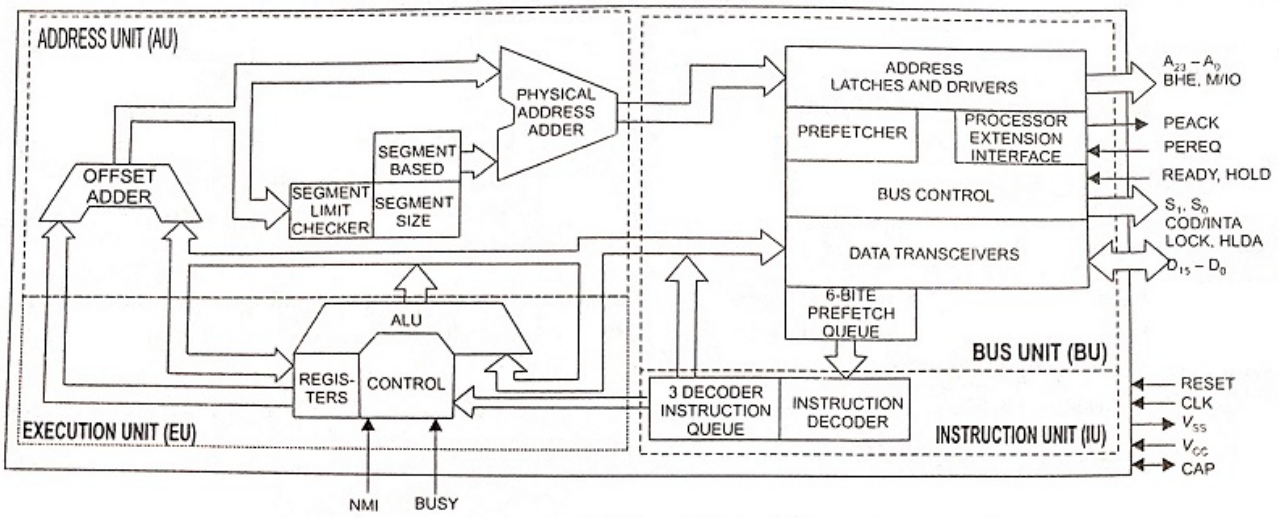

Fig. 11.15 *Internal block diagram of the 80286 processor*

Quick Tip

The 80286 microprocessor introduced segmentation, which allows the system to use larger memory spaces efficiently compared to earlier microprocessors.

(B) Answer any one of the following :

(a) List all conditional jump instructions of 8085 Microprocessor with the condition of flag in each.

Solution:

The 8085 microprocessor has the following conditional jump instructions along with their corresponding flag conditions:

Instruction	Condition of Flag
JZ (Jump if Zero)	Zero Flag (Z) = 1
JNZ (Jump if Not Zero)	Zero Flag (Z) = 0
JC (Jump if Carry)	Carry Flag (C) = 1
JNC (Jump if No Carry)	Carry Flag (C) = 0
JP (Jump if Positive)	Sign Flag (S) = 0
JM (Jump if Minus)	Sign Flag (S) = 1
JPE (Jump if Parity Even)	Parity Flag (P) = 1
JPO (Jump if Parity Odd)	Parity Flag (P) = 0

Quick Tip

Conditional jump instructions are used to alter the flow of the program depending on the status of flags set by previous instructions.

(b) Explain the feature of Dual Pipeline in Pentium Microprocessor:

(i) Dual Pipeline

Solution:

Dual Pipeline Architecture: The Pentium microprocessor features a dual pipeline design, enabling it to fetch and execute two instructions simultaneously. This parallel execution enhances the throughput and processing speed, making the processor more efficient in multitasking.

Quick Tip

The dual pipeline architecture allows the processor to process two instructions concurrently, improving execution speed and overall performance.

(ii) On-chip Cache

Solution:

On-chip Cache: The Pentium microprocessor is equipped with on-chip cache memory that stores commonly accessed data. By keeping this data closer to the processor, it reduces the time required to fetch information from slower main memory, thereby boosting overall speed and performance.

Quick Tip

The on-chip cache helps to minimize memory access time by storing frequently used data, thus enhancing the processor's speed.

(iii) Branch Prediction

Solution:

Branch Prediction: The Pentium microprocessor employs branch prediction techniques to anticipate the result of a branch instruction before it is completely executed. This enables the processor to proceed with subsequent instructions without waiting for the branch outcome, enhancing overall performance.

Quick Tip

By predicting branch directions, branch prediction minimizes delays and ensures smoother execution of instructions.

(iv) 64-bit Data Bus

Solution:

64-bit Data Bus: The Pentium microprocessor is equipped with a 64-bit data bus, enabling it to transfer data in 64-bit blocks. This enhances the processor's capacity to manage large volumes of data and speeds up processing, leading to improved overall performance.

Quick Tip

With a 64-bit data bus, the processor can transfer data more quickly and process more data simultaneously, enhancing performance.

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5. Answer any two of the following:

(a) Write an assembly language program to multiply two 1-byte data stored at memory locations C600 H and C601 H respectively. Store the 16-bit result at locations C602 H and C603 H beginning with lower order byte of the result.

Solution:

```
MVI H, C6     ; Load memory location C600 H into HL pair
MOV L, M      ; Move contents of C600 H to L register
INX H         ; HL = C601 H
MOV H, M      ; Move contents of C601 H to H register
MOV A, L      ; Load A with the first byte
MUL H         ; Multiply L by H (multiplication result in AL)
```

```
MOV C, A      ; Store result (lower byte) in C602 H
MOV D, B      ; Store result (higher byte) in C603 H
```

Quick Tip

Use ‘MOV‘ and ‘INX‘ instructions for memory manipulation, and ‘MUL‘ for multiplication. Don’t forget to store both high and low bytes of the result.

(b) Consider a block of memory locations from C300 H to C30F H, another block from C400 H to C40F H. Write an assembly language program to exchange contents of these two blocks.

Solution:

```
MVI H, C3     ; Load C300 H into HL pair
MOV L, M      ; Move contents of C300 H to L
INX H         ; HL = C301 H
MOV H, M      ; Move contents of C301 H to H
MVI D, C4     ; Load C400 H into DE pair
MOV E, M      ; Move contents of C400 H to E
INX D         ; DE = C401 H
MOV D, M      ; Move contents of C401 H to D
; Repeat the process for entire block exchange
```

Quick Tip

Using ‘MOV‘, ‘INX‘, and ‘MVI‘ ensures you can move data between different memory locations efficiently.

(c) Write an assembly language program to get Binary Coded Decimal (BCD) sum of series of 1-byte numbers stored at locations beginning 2600 H. Length of series is at 25FF H. Store the 1-byte result in 2700 H.

Solution:

```
MVI H, 26     ; Load 2600 H into HL pair
```

```
    MOV L, M      ; Move data to L register
    INX H         ; HL = 2601 H
    MOV A, M      ; Load A with 2600 H value
    ADD A, L      ; Add next number
    MOV M, A      ; Store result back in memory
    ; Repeat the process for series length
```

Quick Tip

For BCD addition, use the 'ADD' instruction and ensure proper handling of carry and overflow.

OR

5. (a) A series of 1-byte hexadecimal data is stored at memory locations from D600 H to D60A H. Write an assembly language program to replace each odd number in the series with data 00H.

Solution:

```
    MVI H, D6     ; Load memory location D600 H into HL pair
    MOV L, M      ; Move contents of D600 H to L register
    INX H         ; HL = D601 H
    MOV H, M      ; Move contents of D601 H to H register
    MOV A, L      ; Load A with the first byte
    ANI 01H       ; AND the accumulator with 01H to check if odd
    JZ EVEN       ; If result is zero, it is an even number, jump to EV
    MVI M, 00H    ; Replace odd number with 00H if odd
EVEN:
    INX H         ; Move to the next memory location
    MOV L, M      ; Move contents to L for checking next byte
    MOV A, M      ; Check next byte
    JNZ LOOP      ; If there are more bytes, continue loop
    HLT           ; Halt when done
```

Quick Tip

Use the ‘ANI‘ instruction to check for odd numbers (bitwise AND with 01H). You can skip changing even numbers and handle only odd ones.

(b) Consider a block of memory locations beginning D600 H to D60F H. Write an assembly language program to find first occurrence of data byte A2 H in this block. Store the address of its first occurrence in HL pair. If not found, HL pair must contain 0000H.

Solution:

```
    MVI H, D6     ; Load memory location D600 H into HL pair
    MVI L, 00     ; Clear L register
    MOV A, M      ; Load the first byte into A
    INX H         ; Increment HL to D601 H
    MOV L, M      ; Move data of D601 H to L register
    MOV A, L      ; Load A with D601 H data
    CMP A2H       ; Compare with A2H
    JZ FOUND      ; If A2H is found, jump to FOUND
    INX H         ; Move to next byte
    MOV L, M      ; Move data into L register
    MOV A, L      ; Compare again
    JNZ LOOP      ; Continue loop until found or end
FOUND:
    MOV H, L      ; Store found address in HL
    MOV L, 00H    ; If not found, store 0000H
```

Quick Tip

Use the ‘CMP‘ instruction to compare bytes and ‘JZ‘ (Jump if Zero) for a condition-based jump. The loop will continue until the byte is found or the end is reached.

(c) A block of fifteen memory locations begins D200 H. Write an assembly language program to convert each data in the block into its 1's complement. Store the result at locations beginning D300 H.

Solution:

```
MVI H, D2     ; Load memory location D200 H into HL pair
MOV L, M      ; Move data to L register
INX H         ; HL = D201 H
MOV H, M      ; Move data to H register
COM A         ; Complement the data in the A register
MOV M, A      ; Store 1's complement at D200 H
INX H         ; Move to next location
MOV L, M      ; Move to L for next byte
MOV A, M      ; Complement the next byte
MOV M, A      ; Store the complement at the next location
LOOP:         ; Repeat for 15 bytes in total
JNZ LOOP      ; Loop until all bytes are converted
```

Quick Tip

Use the 'COM' instruction to convert data into 1's complement. Remember to store each converted byte at the corresponding memory location.
