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53 (IE 501) MCMC

2016

**MICROPROCESSOR AND
MICROCONTROLLERS**

Paper : IE 501

Full Marks : 100

Time : Three hours

***The figures in the margin indicate
full marks for the questions.***

Answer any five questions.

1. (a) What is the function of ALU and control unit in any microprocessor based system ? 2
- (b) Differentiate between Assembly and Machine level language. 2
- (c) Specify the Byte size and meaning of the following instructions : 6
 - (i) JNZ D080 H
 - (ii) CPI 05 H
 - (iii) RLC

Contd.

(d) Write an Assembly language program to add any two 8-bit data and store the result and carry (if any) in two different memory locations. 4

(e) From the Figure-1 given below, answer the following questions: 6

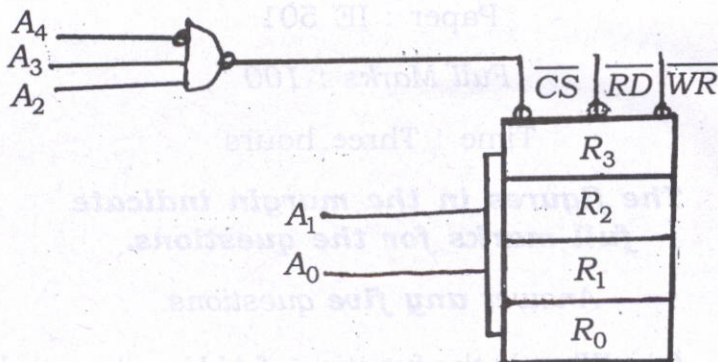


Figure-1

- (i) Functions of \overline{CS} and \overline{RD} pins
- (ii) Address Range of the system
- (iii) Modify the external hardware logic, so that the address of R_3 is $(01011)_2$

2. (a) Specify the content of Accumulator and register B after the following program is executed. Also, specify the status of flags. 4

MVI B, 7F H

MVI A, 4B H

ANI F8 H

DCR B

SUB B

HLT

- (b) Explain the functions of following signals: 4

ALE, $\text{IO}/\overline{\text{M}}$, HOLD and Reset

- (c) Find the memory address range of the chips M_1 , M_2 and M_3 for the arrangement given below: 6

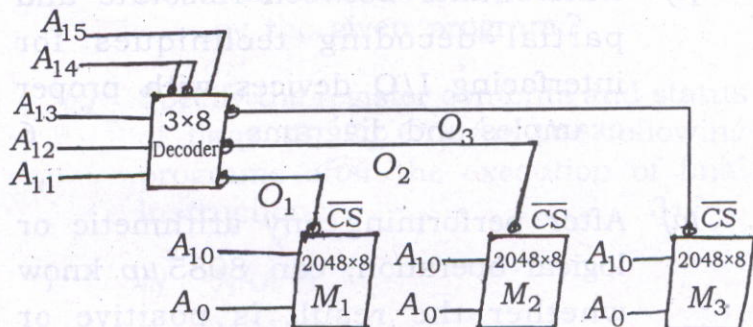


Figure-2

- (d) The final address of a memory chip (4096×8) is DFFF H. Find its starting address and design a hardware logic for this chip to be interfaced with 8085 microprocessor. 6
3. (a) Identify the Machine cycles and state the total number of T-states for the following instructions — $4 \times 2 = 8$
- (i) MVI B, 0B H (ii) LDAX B
- (iii) CALL D050 H (iv) SHLD C005 H
- (b) Explain the instruction OUT 05 H with the help of its bus timing diagram. 6
- (c) Differentiate between Absolute and partial decoding techniques for interfacing I/O devices with proper examples and diagrams. 6
4. (a) After performing any arithmetic or logical operation, can 8085 μp know whether the result is positive or negative? Justify. 2

- (b) For the program given below, answer the questions that follow : $1+2+2=5$

MVI A, 05 H

MOV B, A

LOOP : ADD A

DCR B

JNZ LOOP

OUT 02 H

HLT

- (i) What will be the value of 'LOOP' if the program is assembled starting at address C0F8 H ?
- (ii) What will be displayed at port 02 H ?
- (iii) Which mathematical function is achieved by the given program ?
- (c) Specify the register contents and status of flags (S, Z, CY) for the following programs after the execution of final instruction : $3+3=6$

(i) XRA A

MOV B, A

DCR B

(ii) MVI A, FF H
MVI B, 04 H
ADD B
ORA A

(d) Ten Bytes of data are stored in memory locations starting at D000 H. Write an Assembly language program to count the number of data that are greater than 0A H. Also, the total COUNT should be displayed at port 05 H.

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5. (a) Explain the meaning of following instructions with proper examples.

$3 \times 2 = 6$

(i) RAL (ii) INR M (iii) ADC B

(b) The following program checks a set of six signed numbers and adds only the positive numbers. The numbers are stored in memory locations starting from D050 H, as —

Data (H) : 20, 50, 8F, 03, F0, 02

MVI B, 00 H

MVI C, 06 H

LXI H, C050 H

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NEXT :MOV A, M
      RAL
      JC REJECT
      RAR
      ADD B
      MOV B, A

REJECT :INX H
        DCR B
        JNZ NEXT
        STA D070 H
        HLT

```

From the program given above, answer the following —

- (i) Identify the errors in the program and rewrite the program with necessary corrections.
- (ii) Value of 'NEXT' and 'REJECT' if the program is assembled starting at C000 H.
- (iii) What will be stored at D070 H?
 $4+2+2=8$

(c) Specify the number of times the following loops are executed — $3 \times 2 = 6$

(i) MVI B, 10 H

LOOP : DCR B

JNZ LOOP

(ii) LXI B, 0005 H

LOOP : DCX B

JNZ LOOP

(iii) MVI A, FF H

LOOP : DCR A

JNC LOOP

6. (a) Write an Assembly language program to count from 00 H to FF H with a delay of 100 ms between each count. After the count FF H, the counter should reset itself and repeat the sequence.

(Assume the system clock frequency is 2 MHz) 8

(b) With suitable examples, explain PUSH and POP instructions. 3+3=6

(c) Answer the questions below, based on the following program : $3 \times 2 = 6$

2000 → LXI SP, 2100 H

LXI B, 0000 H

PUSH B

POP PSW

LXI H, 200B H

CALL 2064 H

OUT 01 H

HLT

- (i) Content of accumulator and status of flags after POP instruction.
- (ii) Content of SP and PC after CALL instruction.
- (iii) Contents of memory locations affected by PUSH operation.

7. (a) List the various interrupts available in 8085 microprocessor in ascending order of priority. Also, specify whether these interrupts are maskable or not and vectored or non-vectored. 5

- (b) In the figure given below: $2+2+4=8$
- Identify the RST instruction.
 - Specify the memory location (restart) when the microprocessor is interrupted.
 - Show the steps that need to be done to locate the service routine.

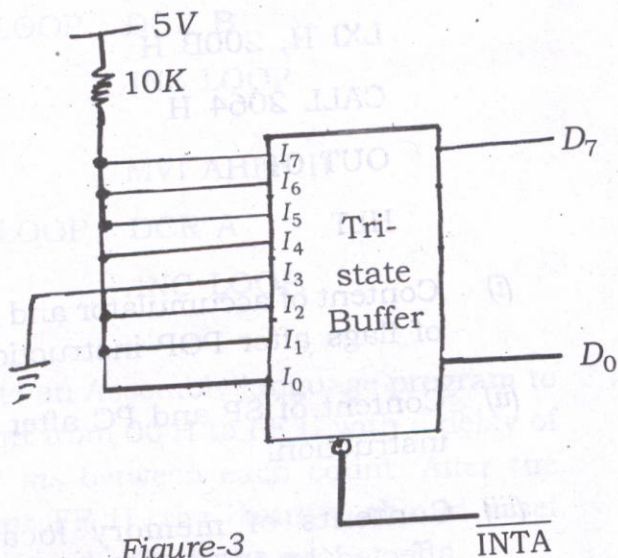


Figure-3

- (c) What is masking? Explain the two instructions SIM and RIM. $1+6=7$
8. (a) Draw the block diagram of 8155 multipurpose programmable device and explain the function of each block. 10

(b) Write short notes on: **(any two)** 5×2=10

- (i) DMA controller
- (ii) Control Logic of 8255 A
- (iii) Subroutine.

Time: Three hours

The figures in the margin indicate full marks for the questions.

Answer any five questions.

(a) What is the function of DMA and control unit in any microprocessor based system?

(b) Differentiate between Assembly and Macro level language.

(c) Specify the syntax and meaning of the following instruction.