

(1)

Ahsanullah University of Science & Technology
 Department of Computer Science and Engineering
 Year: 3rd, Semester: 1st, Final Examination (Fall 2016)
 Course No: CSE 3107, Course Title: Microprocessors

Time: 3 Hours

Full Marks: 70

[There are Seven (7) Questions. Answer any Five (5) Questions.]
 → [Marks allotted are indicated in the margin.]

- Q1. a) The instruction code 01010111 (57 H) is stored in memory location 2100 H. Illustrate the data flow and list the sequence of events when the instruction code is fetched by the MPU. [4]
- b) Compare the following pairs of instructions with their operations, instruction bytes, addressing modes, affected flags and the results: [4]
- i. LXI B, 2034H and MVI B, 20H.
 - ii. SUB B and CMP M.
- c) Write 8085 assembly code which will perform the following tasks and store the program in memory locations starting from 2000H: [4]
- i. Find the 2's complement of the number stored at memory location 4200H.
 - ii. Shift the complemented number from the above operation, three bits right and store the result at memory location 4300H.
- d) What is the function of the 8085 ALE pin? If a crystal of 4 MHz is connected to the 8085 X1X2 pins, what will be the 8085 internal clock period? [2]

- Q2. a) Draw the timing diagram for the following instruction: [6]
 LXI B, F045h

Corresponding Coding:

A000h	21
A001h	45
A002h	F0

Also calculate the execution time for this memory read operation if the clock frequency is 2 MHz.

- b) Consider the following code which generates a continuous square wave with the period of 500 Micro Sec. Assume the system clock period is 325 ns. Use bit D₀ to output the square wave. Also calculate the value of COUNT. [4]

```

Mov D,AAH
X: Mov A,D
    RLC
    Mov D,A
    ANI A,01H
    OUT PORT#
    MOVI C,COUNT
Y: DCR C
    JNZ Y
    JMP X
    
```

(2)

With a neat diagram explain the interfacing circuit needed to connect 8 switches and 8 LEDs using buffer and latch IC as input and output devices, with 8085 in IO mapped IO scheme. The input and output have port address 20H. [4]

- Q3. a) Differentiate between memory mapped I/O and I/O mapped I/O. [2]
- b) What is subroutine? How is it useful? Explain the use of stack in CALL and RET instructions. [4]
- c) Describe the action taken by 8085 when INTR is activated. [3]
- d) Assume that 8085 microprocessor is completing an RST 7.5 interrupt request. Write code to check if RST 5.5 is pending. If it is pending, write a service routine at memory location 2070H to flash LED five times with 1 sec delay between each flash; otherwise return to the main program. [5]

- Q4. a) Draw the internal organization of 8086 microprocessor and describe the operation of BIU. [4]

- b) Describe how 20-bit address is used by 16-bit 8086 microprocessor. [2]
- c) Suppose in a 8086 microprocessor, DS contains 5000H and SS contains 3000H.
 i. What physical address will be read by the instruction MOVAL, [234B]?
 ii. If SP = 8434H, what is the physical address of the top of the stack? [4]

- d) Write the machine codes (in hexadecimal) for the following assembly instructions: [4]

Instructions	Corresponding Opcode of the instructions
MOV CX, 08h	B9
LOOP1: ADD AX,[SI]	03 04
ADD SI,02h	83 C6
LOOP LOOP1	E2

Assume that the address of the first byte of the first instruction is 01000h.

- Q5. a) Write short notes on the following: [3]
- i. Based Indexed addressing mode of 8086.
 - ii. Relative Based Indexed addressing mode of 8086

- b) For the following instructions, identify the addressing modes with explanation. [4]
 Also calculate the physical address of the source operand. Assume CS = 2000H, DS = 543AH, SS = 9AC5H, SI = 3200H, DI = 2ABCH, BX = 3F00H, BP = 329AH.

- i. MOV CL, 50h[BX][DI]
- ii. JMP BX → BP, SS
- iii. ADD AX, [SI]
- iv. MOV [BX+100H], AX

- c) Suppose that AX and BX both contain positive numbers and ADD AX, BX is executed. Show that there is a carry out of the MSB but no carry into the MSB, if and only if signed overflow occurs. [2]

- d) For each of the following instruction, give the new destination contents and the new setting of CF, SF, PF, ZF and OF. Suppose that the flags are initially 0 for each instruction. [5]

(i) ADD AX, BX	Where AX contains 7FFFh and BX contains 0001h
(ii) SUB AL, BL	Where AL contains 01h and BL contains FFh
(iii) DEC AL	Where AL contains 00h
(iv) NEG AL	Where AL contains 7Fh
(V) XCNG AX, BX	Where AX contains 1ABCCh and BX contains 712Ah

- Q6. a) Assume that an 8086 microprocessor is interrupted by any user defined software interrupt. Then how does an 8086 microprocessor respond to the interrupt? [4]

- b) Explain the following interrupts: [3]
- i. Divide-by-zero interrupt
 - ii. Breakpoint interrupt
 - iii. Overflow interrupt
- c) What do you mean by Interrupt Vector Table (IVT) in 8086? Find the physical address of INT 13H and INT 8H in the IVT. [3]
- d) Draw and explain a block diagram showing 8086 in minimum mode configuration. [4]

- Q7. a) The content of DS is 0094H and the memory segment contains the following [6] values.

Global Descriptor	Local Descriptor
18	18
00	AA <i>7</i>
00	83 <i>4</i>
92	92 <i>5</i>
10	10 <i>4</i>
00	02 <i>3</i>
00	01 <i>2</i>
00	00 <i>1</i>
FF	1F <i>0</i>

Local Descriptor	Global Descriptor
16	16
FF	1F
B0	B2
00	01
00	00
10	10
92	90
7F	7F
60	40

Find out the descriptor number, table indicator, table index RPL, base address, and end address. Also give the status of access right bits and segment size.

- b) Draw and explain flag register of the Pentium processor [4]
- c) Explain Turbo Boost and Hyper Threading. [4]

Ahsanullah University of Science & Technology

Department of Computer Science and Engineering

Year: 3rd, Semester: 1st, Final Examination (Spring 2016)

Course No: CSE 3107, Course Title: Microprocessor

Date: 05/09/2016

Full Marks: 70

[There are Seven (7) Questions. Answer any Five (5) Questions.]

[Marks allotted are indicated in the margin.]

- Q1. a) What is microprocessor? Discuss the three types of operations performed by the [4] microprocessor.
- b) Compare the following pairs of instructions with their operations, instruction bytes, [4] addressing modes, affected flags and the results:
- i. LXI B, 2034H and MVIB, 20H.
 - ii. SUB B and CMP M.
- c) List the sequence of events that occurs when the microprocessor reads from the [2] memory.
- d) Write 8085 assembly code which will perform the following tasks and store the [4] program in memory locations starting from 2000H:
 - i. Find the 2's complement of the number stored at memory location 4200H.
 - ii. Shift the complemented number from the above operation, three bits right and store the result at memory location 4300H.

- Q2. a) Explain with schematic diagram how separate address and data signals can be [3] generated from 8085 common address data lines.

- b) With a neat diagram explain the interfacing circuit needed to connect 8 switches and [4] 8 LED's using buffer and latch IC as input and output devices, with 8085 in IO mapped IO scheme. The input and output have port address 20H.
- c) Draw the timing diagram of the instruction LXI B, F045H. State the no. of [4] instruction cycles and machine cycles required for this operation. Calculate the execution time for this memory read operation if the clock frequency is 2 MHz.
- d) Draw the pin diagram of Intel 8085 microprocessor. [3]

- Q3. a) What is subroutine? How is it useful? Explain the use of stack in CALL and RET [4] instructions.

- b) Describe the action taken by 8085 when INTR is activated. [3]
- c) Explain SIM and RIM instructions. [2]

- d) Assume that 8085 microprocessor is completing an RST 7.5 interrupt request. Check to see if RST 5.5 is pending. If it is pending, write a service routine at memory location 2070H to flash LED five times with 1 sec delay between each flash; otherwise return to the main program. [5]

- Q4. a) Draw the bit pattern for flag register of 8086 and explain the significance of each bit. [4]

- (5)
- Explain with a suitable example how 8086 access a byte from EVEN and ODD memory address. [2]
 - Explain vectored and non-vectored interrupt. [2]
 - Write a program to provide the given on/off time to three traffic lights (Green, Yellow, and Red) and two pedestrian signs (WALK and DON'T WALK). The signal lights and signs are turned on/off by the data bits of an output port as shown below. [6]

Lights	Data Bits	On Time
Green	D1	15 Seconds
Yellow	D3	10 Seconds
Red	D5	25 Seconds
WALK	D6	
DON'T WALK	D7	

The traffic and pedestrian flow are in the same direction, the pedestrian should cross the road when the Green light is on.

- Q5 (a)
- Explain the architecture of 8086 microprocessor with the help of neat block diagram. [5]
 - Draw and explain a block diagram showing 8086 in maximum mode configuration. [3]
 - Explain how 8086 provides 1 MB memory address space using the segment register. [2]
 - Read the following instructions and specify the register contents and the status flag after the execution of each instruction. Assume that DS = 0011 H and BX = 1121 H. [4]

LD AX, [0024]	00132	03
XCHG [BX+01H], AX	00133	30
LEA CX, [0100]	00134	11
ADD CX, AX	00135	2F
ROL AX, CL	00136	40
	00137	05
	06522	01
	06523	21

Fig: Memory

- Q6. a) Write a short notes on the following: [4]
- Based Indexed addressing mode of 8086.
 - Relative Based Indexed addressing mode of 8086
 - Single Step interrupt
 - Breakpoint interrupt
- b) Draw and explain the timing diagram of 8086 minimum mode memory read cycle. [3]
- c) What do you mean by Interrupt Vector Table (IVT) in 8086? Find the physical address of INT 15H and INT 22H in the IVT. [3]
- d) What are the pins associated with the maximum mode of the Intel 8086? Discuss them. [4]
- X Q7. a) Explain the functional unit of Intel 80386 with the help of neat block diagram. [4]
- b) In Global descriptor table or Local descriptor table, each descriptor has 64 bits, now describe all the bit position of a descriptor. [4]

- (6)
- Draw and explain flag register of the Pentium processor. [2]
 - The content of DS is 0094H and the memory segment contains the following values. [4]

Local	Global	Global	Local
Descriptor	Descriptor	Descriptor	Descriptor
16	16	18	18
FF	1F	00	7 AA
B0	B2	00	6 83
00	01	92	5 92
00	00	10	4 10
10	10	00	3 02
92	90	00	2 01
7F	7F	00	1 00
60	40	FF	0 1F

Find out the descriptor number, table indicator, table index RPL, base address, and end address. Also give the status of access right bits and segment size.

(7)

Date: 12/03/2016

Ahsanullah University of Science & Technology
Department of Computer Science and Engineering
Year: 3rd, Semester: 1st, Final Examination (Fall 2015)
Course No: CSE 3107, Course Title: Microprocessors

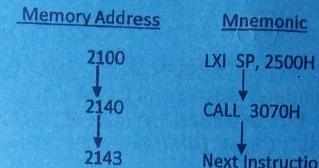
Time: 3 Hours

Full Marks: 70

[There are Seven (7) Questions. Answer any Five (5) Questions.]
 [Marks allotted are indicated in the margin.]

- Q1. a) Give a general block diagram of a microprocessor based system. Explain briefly the various blocks of the system. [3]
- b) Assume that before the execution of any instruction we have $(A) = B8H$, $(B) = B9H$, $(H) = F9H$, $(L) = 50H$, Cy flag = 1, and content of memory location $F950H$ is $38H$. What is the value of A register and flag register after execution of each of the following instructions?
 i. Add M
 ii. CMP B
 iii. RAL
- c) The instruction code 01010111 (57 H) is stored in memory location 2100 H. Illustrate the data flow and list the sequence of events when the instruction code is fetched by the MPU. [3]
- d) Write 8085 assembly code which will count from 0 to 9 with a one-second delay between each count. At the count of 9, the counter should reset itself to 0 and repeat the sequence continuously. Use register pair HL to set up the delay, and display each count at output port 01H. Assume the clock frequency is 1 MHz. [5]
- Q2. a) Explain the role of IR, Temp, W and Z registers in the architecture of 8085. [3]
- b) Explain the need to demultiplex the bus $AD_7 - AD_0$. How is demultiplexing done? [3]
- c) Draw the timing diagram of the instruction OUT, 01H. State the no. of instruction cycles and machine cycles required for this operation. Calculate the execution time for this memory read operation if the clock frequency is 2 MHz. [4]
- d) Draw a diagram to interface the following memory to 8085:
 ROM: 4K x 8-bit, using 2732, starting address: 2000H
 RAM: 2K x 8-bit, using 6116, starting address: 4000H
 Also show their memory address range.
- Q3. a) What is stack? On what principle does it work? Is it necessary to initialize the stack pointer while writing a program? Explain with example. [4]
- b) Assume that an Intel 8085 microprocessor is interrupted by any non-vectored interrupt. Then how does 8085 microprocessor respond to the interrupt? [3]
- c) Differentiate between memory mapped I/O and I/O mapped I/O. [2]
- d) The sequence of the program execution and the events in the execution of the CALL and subroutine are shown below: [5]

(8)



Discuss the sequence of events in each machine cycle during the execution of the CALL instruction.

- Q4. a) Explain the functions of different registers in 8086. Explain with examples, the various flags of 8086 and their conditions in various instances. [6]
- b) Why is the memory of 8086 divided into even and odd memory banks? How are these memory banks selected for byte and word access? [3]
- c) How does 8086 convert a logical address to a physical address? Explain with an example. [2]
- d) For the following instructions, indicate the addressing modes type, the effective address and the physical address of the source operand, if $CS = 2000H$, $DS = 543AH$, $SS = 9AC5H$, $SI = 3200H$, $DI = 2ABCH$, $BX = 3F00H$, $BP = 329AH$.
 i. MOV AX, [BX+SI] ii. ADD AL, [BX + 04] iii. MOV AX, [BX+SI+04]
- Q5. a) Assume that an 8086 microprocessor is interrupted by any user defined software interrupt. Then how does an 8086 microprocessor respond to the interrupt? [4]
- b) Draw and explain a block diagram showing 8086 in minimum mode configuration. [3]
- c) Briefly explain the functions of the following pairs of pins and signals of 8086:
 i. BHE/S7 and A0 ii. HOLD and HLDA iii. DEN and DT/R [3]
- d) Read the following instructions and specify the register contents and the status flag after the execution of each instruction. Assume that $DS = 0311H$ and $BX = 1233H$. [4]

LDS AX, [0014]	$DS:10 = 0310$ 31 10	03122	03
XCHG [BX+01H], AX	31 24	03123	30
LEA CX, [0100]	0100	03124	11
ADD AX, CX		03125	2F
ROL AX, CL		03126	40
		03127	05
		06634	01
		06635	21

DS:10
Fig: Memory

- Q6. a) Explain the following interrupts:
 i. Divide-by-zero interrupt ii. Single step interrupt
 iii. Breakpoint interrupt iv. Overflow interrupt [4]
- b) Draw and explain the timing diagram of 8086 minimum mode memory write cycle. [3]
- c) What do you mean by Interrupt Vector Table (IVT) in 8086? Find the physical address of INT 13H and INT 8H in the IVT. [3]
- d) Draw a diagram to interface a latch and a buffer IC with 8085 in memory mapped I/O technique. [4]

- Q7. a) The content of DS is 0014H and the memory segment contains the following values. [6]

Local Descriptor 3	Global Descriptor 3
FF	1F
B0	B2
00	01
00	00
10	10
92	90
7F	7F
60	40

Local Descriptor 2	Global Descriptor 2
00	AA
00	03
92	92
10	10
00	02
00	01
00	00
FF	1F

Find out the descriptor number, table indicator, table index RPL, base address and end address. Also give the status of access right bits.

- b) Describe the internal register layout of the Pentium processor.
[4]
c) Draw and explain flag register of the Pentium processor.
[2]
d) List the characteristic features of 80286 and 80386 microprocessors.
[2]

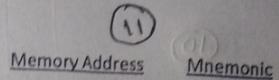
(10) Date: 05/10/2015
Ahsanullah University of Science & Technology
Department of Computer Science and Engineering
Year: 3rd, Semester: 1st, Final Examination (Spring 2015)
Course No: CSE 3107, Course Title: Microprocessor

Time: 3 Hours

Full Marks: 70

[There are Seven (7) Questions. Answer any Five (5) Questions.]
[Marks allotted are indicated in the margin.]

- a) What is Microprocessor? Discuss the Microprocessor-Initiated Operations, Peripheral-Initiated Operations, and Internal Operations performed by the microprocessor. [4]
- b) Compare the following pairs of instructions with their operations, instruction bytes, addressing modes, and affected flags: [3]
- i. MVI M, 8DH and LXI H, 008DH
 - ii. ADD M and ADI 45H
 - iii. CMC and CMP B
- c) Draw the programming model of 8085 microprocessor. [2]
- d) Write 8085 assembly code which will perform the following tasks and store the program in memory locations starting from 10F1H: [5]
- i. Subtract the contents of memory location 2001H from the memory location 2000H.
 - ii. Shift the result from the above operation, four bits right and display at the output port, where output port address is 04H.
- a) Draw the internal architecture of Intel 8085 microprocessor and discuss the control unit block. [4]
- b) Write down the difference between absolute and partial decoding in memory interfacing with examples. [2]
- c) What is the function of Intel 8085 ALE pin? [2]
- d) Write the steps and draw the timing diagram to read the instruction MOV M, AH from memory location of 3100H to the MPU. State the no. of instruction cycles and machine cycles required for this operation. Calculate the execution time for this memory read operation if the clock frequency is 2 MHz. [6]
- a) Draw the block diagram of I/O interfaces. Also discuss the steps involved in I/O device selection and data transfer. [5]
- b) What is RIM and SIM? [2]
- c) Draw the circuit diagram for the RST5 8085 interrupt. [2]
- d) The sequence of the program execution and the events in the execution of the CALL and subroutine are shown below: [5]



Discuss the sequence of events in each machine cycle during the execution of the CALL instruction.

- a) What do you understand by memory segmentation techniques? How does a CPU calculate physical address of a memory location? [3]
- b) List the segment registers and default registers used to hold offset addresses in memory address calculation. Also mention purpose of each case. [2]
- c) Calculate the delay in the following loop, Assume that $f = 3 \text{ MHz}$. [4]

Label Mnemonic

S1:	MVI A, 80H
S2:	OUT PORT2
S3:	MVI B, 20H
	LXI D, 2050H
	DCX D
	JNZ S3
	DCR B
	JZ S2
	DCR A
	JNZ S1

- d) Write a program to provide the given on/off time to three traffic lights (Green, Yellow, and Red) and two pedestrian signs (WALK and DON'T WALK). The signal lights and signs are turned on/off by the data bits of an output port as shown below:

<u>Lights</u>	<u>Data Bits</u>	<u>On Time</u>
Green	D1	10 Seconds
Yellow	D3	5 Seconds
Red	D5	15 Seconds
WALK	D6	10 Seconds
DON'T WALK	D7	20 Seconds

The traffic and pedestrian flow are in the same direction; the pedestrian should cross the road when the Green light is on.

- a) Write a short notes on the following: [6]
- i. I/O addressing mode of 8086.
 - ii. Register Relative addressing mode of 8086.
 - iii. Relative Based Indexed addressing mode of 8086.
- b) Explain with a suitable example how 8086 access a byte from EVEN and ODD memory address. [2]
- c) Describe Effective Address with example. [2]



- d) Read the following instructions and specify the register contents and the status flag after the execution of each instruction. Assume that DS = 1000 H and BX = 034A H. [4]

LDS AX, [0020]

XLAT

MOV CX, [BX + 01H]

ADD CL, AL

SAR BX, CL

10020	30
10021	03
10022	11
10023	10
1048A	01
1048B	A2
1045B	00
1045C	01

Fig: Memory

- a) Draw a simplified diagram of a system based on 8086 running in the maximum mode [6] and describe briefly.

- b) List all flag bits of 8086 microprocessor and state their functions. [2]

- c) What are the different modes of operation of 8086 microprocessor? How is it selected? [2]

- d) Assume that: CS = 1000H, DS = 3000H, ES = 4000H, SS = 6000H, SP = 1258H, BP = 3254H, AX = 1234H, BX = 3456H, CX = 8760H, DX = 2893H, DI = 3210H, SI = 1000H. Show the contents of stack and relevant registers after each instructions:

PUSH AX
PUSH SI
POP CX
POP DX

- a) The content of DS is 001CH and the memory segment contains the following values. [6]

Local Descriptor 3	Global Descriptor 3
FF	1F
B0	B2
00	01
92	92
00	00
10	10
92	90
7F	7F
00	01
60	40

Local Descriptor 2	Global Descriptor 2
00	AA
00	03
92	92
10	10
00	02
00	01
00	00
FF	1F

Find out the descriptor number, table indicator, table index RPL, base address, and end address. Also give the status of access right bits.

- b) State the significance of LOCK signal in 8086. [2]

- c) Draw the bus timing diagram of 8086 maximum mode memory write cycle. [3]

- d) List the characteristic features of 80286, 80386, and 80486 microprocessors. [3]

(13)

Ahsanullah University of Science & Technology
 Department of Computer Science and Engineering
 Year: 3rd, Semester: 1st, Final Examination (Fall 2014)
 Course No: CSE 3107, Course Title: Microprocessor

Date: 05.05.2015

Time: 3 Hours

Full Marks: 70

[There are Seven (7) Questions. Answer any Five (5) Questions.]
 [Marks allotted are indicated in the margin.]

- Q1.**
- a) What are the various status flags provided in 8085? Discuss their roles. [4]
 - b) Compare the following pairs of instructions with their operations, instruction bytes, addressing modes, affected flags and the results:
 - i. *MVI A, 00H* and *XRA A*.
 - ii. *SUB B* and *CMP B*.
 - iii. *RRC* and *RAR*.
 - c) The instruction code 01001111 (4F H) is stored in memory location 2005H. Illustrate the data flow and list the sequence of events when the instruction code is fetched by the MPU. [3]
 - d) Add the 16-bit number in memory locations 4000H and 4001H to the 16-bit number in memory locations 4002H and 4003H. The most significant eight bits of the two numbers to be added are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H. Now write down the Intel 8085 instructions beginning at memory location 2030H. [4]
- Q2.**
- a) What is the need for chip selection in a microcomputer? With a neat diagram explain the interfacing circuit needed to connect a 8K x 8-bit RAM chip in the address space C000H - DFFFH. [4]
 - b) Explain the need to demultiplex the bus AD₇ - AD₀. How is demultiplexing done? [3]
 - c) Discuss instruction cycle, machine cycle and T-state in conjunction with 8085 microprocessor. [3]
 - d) Explain how STA 2800H is executed. Draw its timing diagram. [4]

- Q3.**
- a) What is stack? On what principle does it work? Is it necessary to initialize the stack pointer while writing a program? Explain with example. [3]
 - b) Write a subroutine to clear the flag register and accumulator. [2]
 - c) Assume that 8085 microprocessor is completing an RST 7.5 interrupt request. Check to see if RST 6.5 is pending. If it is pending, enable RST 6.5 without affecting any other interrupts; otherwise check to see if RST 5.5 is pending. If it is pending, enable RST 5.5 without affecting any other interrupts; otherwise return to the main program. [5]
 - d) Write a 8085 assembly program to count from 0 to 9 with one-second delay between each count. At the count of 9, the counter should reset itself to 0 and repeat the sequence continuously. Use register pair HL to set up the delay, and display each count at the output port 01H. Assume the clock frequency is 1 MHz. [4]

- Q4.**
- a) With a neat diagram explain the architecture of 8086 microprocessor along with function of each block and register. [6]
 - b) What is the length of the instruction queue in 8086? Discuss the use of the queue. [2]
 - c) Explain how 8086 provides 1 MB memory address space using the segment register. [2]
 - d) Assume that before the execution of any instruction we have AX = A234H, BX = 2345H, CX = 1082H and CF = 1. What is the value of different flags after execution of each of the following:
 - i. ADC AX, BX.
 - ii. INC CX.
 - iii. AND BX, CX.
 - iv. NOT BX.

- Q5.**
- a) Explain different addressing modes of 8086 with examples. [6]
 - b) What is the difference between:
 - i. SAL and SAR instructions.
 - ii. RCL and RCR instructions.

- Q6.**
- c) Assume that: CS = 1000H, DS = 3000H, ES = 4000H, SS = 6000H, SP = 1258H, BP = 3254H, AX = 1234H, BX = 3456H, CX = 8760H, DX = 2893H, DI = 3210H, SI = 1000H. Show the contents of stack and relevant registers after each instructions:
PUSH AX
PUSH SI
POP CX
POP DX

- Q6.**
- a) Why the memory of 8086 is divided into even and odd memory banks? How these memory banks are selected for byte and word access? [4]
 - b) Draw and explain a block diagram showing 8086 in maximum mode configuration. [3]
 - c) Describe the function of the following pins and their use in 8086 based system: [4]
 - i) NMI
 - ii) LOCK
 - iii) TEST
 - iv) RESET
 - d) Draw and explain the timing diagram of 8086 minimum mode memory write cycle. [3]

- Q7.**
- a) Write short notes on the following: [6]
 - i. Protected mode of the Pentium.
 - ii. Real address mode of the Pentium.

- b) Draw the pin diagram of the Pentium processor. [2]
- c) The content of SS = 003BH and the memory segment contains the following values. [6]

0000 0000 0000 1011 1011 1011 1011 1011

(15)

Descriptor 8	Descriptor 7
FF	FF
B0	A0
00	00
00	00
10	20
92	97
7F	9F
60	12

Find out the descriptor number, table indicator, table index RPL, base address, and end address. Also give the status of access right bits.

(16)

AHSANULLAH UNIVERSITY OF SCIENCE & TECHNOLOGY
 Dept. of Computer Science and Engineering
 Year: 3rd, Semester: 1st, Final Examination (Spring 2013)

Date: 21-08-13

Course No: CSE 307
 Full Marks: 70

Course Title: Microprocessors
 Time: 3 Hours

[There are Seven (7) Questions. Answer any Five (5) Questions.]
 [Marks allotted are indicated in the margin.]

- ✓ 1. a) With necessary block diagram explain how the MMUs in the 80286, 80386 and 80486 microprocessors manage segment based virtual memory. [6]
- b) How an Intel 80286 can switch from PVAM mode to real address mode and vice versa? [5]
- c) Write down the basic differences between Motorola 68000 user and supervisor modes. [3]
- ✓ 2. a) Describe Motorola 68000 programming model. [4]
- b) Assume that an 8086 microprocessor is interrupted by an interrupt of type int 03h. Then [3+2+1]
- i) Write down the major actions that take place during the interrupt process.
 - ii) Describe how the 8086 actually get to the interrupt procedure.
 - iii) Indicate the four memory locations from which the CPU will collect the starting address of Interrupt Service Routine.
- c) Describe how the 8086 microprocessor INTR input works with 8259A. [4]
- ✓ 3. a) Study the following 8086 instructions then answer the questions below with their actions. [3x2=6]
- i) CALL DWORD PTR [BX]
 Suppose, [BX]=2000h [DS]=4000h [42000h]=44h [42001h]=C3h [42002h]=77h [42003h]=A4h; then after execution what will be the value of CS and IP?
 - ii) LODS WORD
 Suppose, DF=0, [SI]= 0020h [DS]= 2000h [DI]= 0050h [ES]= 3000h [20020h]= 05h [20021h]= 02h [30050h]= 71h [30051h]= 40h; then after execution what will be the value of SI, DI and [30050h]?
 - iii) LDS SI, [BX]
 Suppose, [BX] = 1000h [DS] = 1000h [11000] = 12h [11001] = A3h

(17)

$[11002] = 90h$ $[11003] = D7h$; then after execution what will be the value of DS and SI?

- b) Describe the signals of 8086 when MN-MX/= HIGH. [5]

- c) For the following 8086 instructions what will be the ultimate fate of the program. Suppose, $[00002h]=45h$ $[00003h]=23h$ $[00004h]=03h$. [3]

```
MOV ds, 0000h
MOV bx, 0002h
MOV al, byteptr ds:[bx]
INC bx
MOV bl, byteptr ds:[bx]
INC bx
MOV cl, byteptr ds:[bx]
```

```
BEGIN: ADD al, bl
       DEC cl
       JNZ BEGIN
INC bx
MOV byteptr ds:[bx],al
HLT
```

4. a) Refer to Fig-1 assume that the Control Byte '80h configures Port-A of 8255 as an output port. Write 8086 assembly codes to display the characters a, b, A, B, c, d on the output device FND. [The segments of FND are labeled as 'a', 'b', 'c', 'd', 'e', 'f', 'g' and there is also a point 'p' in it to enable which should be grounded or at logic level-0.]

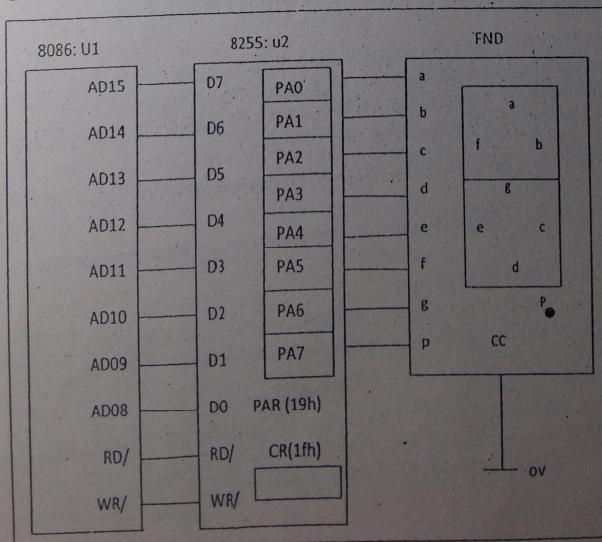


Fig:1 for question 4.a

(18)

- b) Write short notes on:

- i) Type-I Interrupt of 8086 microprocessor
- ii) Execution Unit of Intel 8086
- iii) Motorola 68000 Status Register

- c) Write 8086 assemble code for the following conditions: [2x1=2]

- i) Write 32h into a port address of 36h.
- ii) Assume that a port has an address of 3800h. Now write assemble codes for the pseudo code: $3800h \leftarrow 45h+13h$.

- d) Classify the following 8086 assembly instructions according to their addressing modes. [4x5=2]

- i) MOV al, START [bx]
- ii) MOV bl, ARRAY [si]
- iii) MOV [di], bx
- iv) MOV bh, VALUE

5. a) Write a program in 8086 ASM language to transfer a block of 1KB data from one memory location to another memory location using string data transfer instruction. Assume that: CS=3000H, DS=5000H, ES=7000H, SS=9000H, SP=120FH, BP=3254H, DI=3A10H and SI=1025H. You have to load the segment and offset register with desired values and clear the direction flag initially.

- b) Assume that 8085 microprocessor is completing an RST 7.5 interrupt request. Check to see if RST 6.5 is pending. If it is pending, enable RST 6.5 without affecting any other interrupts; otherwise check to see if RST 5.5 is pending. If it is pending, enable RST 5.5 without affecting any other interrupts; otherwise return to the main program.

- c) Write 8085 assembly instructions which will do the following actions: [4x1=4]

- i) Initialize the stack pointer register at C099h and clear the flags.
- ii) Load data byte FFh into accumulator then add 01h with it.
- iii) Mask all the flags except CY flag.
- iv) Display the flags value at port 00h and also store this value on the stack.

- d) Write down the differences between subroutine and interrupt with examples. [3]

6. a) Write an 8085 assembly program to add the following data bytes stored in memory locations starting at C060h. If the sum does not generate a carry then display the sum at the output port 00h. During addition if a result generates a carry, stop the addition and display 01h at the output port 00h.
Data (h): 37, A2, 14, 78, 97

- b) Write down the differences between absolute and partial decoding in memory interfacing with examples. [3]

- (19) c) Calculate the delay in the following loops, Assume that $f = 2$ MHz. [6]

Label	Mnemonic	T-States
	MVI A, 80H	7
S1:	OUT PORT2	10
S2:	MVI B, 20H	7
	LXI D, 2050H	10
S3:	DCX D	6
	JNZ S3	10/7
	DCR B	4
	JZ S2	10/7
	DGR A	4
	JNZ S1	10/7

- d) What function is performed by each of the following 8085 instructions: [4x.5=2]

- i) LDAX B
- ii) INR M.
- iii) STAX D
- iv) LXIH C050h

7. a) Study the following figure-2 carefully and then write an 8085 assembly program that read the SID port. After reading SID port, read two numbers from the locations C050h and C051h and then store these numbers in registers A and B respectively. Now show the result of $A+B$ (SID) to the display (01h). If there is a carry in the addition, glow a LED connected to SOD port of the 8085 microprocessor. [4]

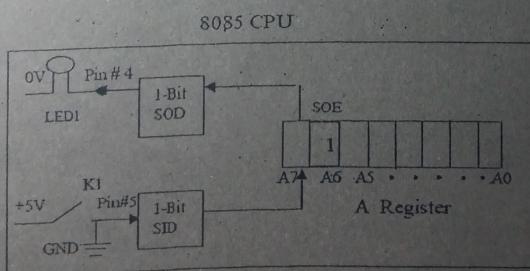


Fig: 2 for question 7.a

- b) Describe the internal register layout of Intel 8085 microprocessor. [4]
 c) Describe the addressing modes of Intel 8085 with examples. [4]
 d) Write down the modes of operation of the 8255 Peripheral Interface Controller. [2]

(20) AHISANULLAH UNIVERSITY OF SCIENCE & TECHNOLOGY

Dept. of Computer Science and Engineering
Year: 3rd, Semester: 1st, Final Examination (Fall 2012)

Date: 24.02.13

Course No: CSE 307
Full Marks: 70

Course Title: Microprocessors
Time: 3 Hours

[There are Seven (7) Questions. Answer any Five (5) Questions.]
[Marks allotted are indicated in the margin.]

1. a) Write down the modes of operation of the 8255 Peripheral Interface Controllers. [2]
 b) Describe a microprocessor based system with bus architecture. [3]
 c) Consider Intel 8085 system. Let C000h, C001h, C002h memory locations contain 3 values 59h, 9Ah, FFh respectively. Load C000h to register A, C001h to register B and C002h to register C and then perform the following action. After that store the result at C003h memory location.

$$(B \otimes C) \Delta (A \vee B)$$

- d) What function is performed by each of the following 8085 instructions: [4]
- i) INX B
 - ii) XRI 40H
 - iii) STAX D
 - iv) RLC
- e) What is the ultimate fate of the following 8085 ASM program? Finally what will flag register hold? [2]

```

MVI A, 67H
MVI C, 89H
SUB C
ORI 0IH
STA 3000H
HLT
  
```

- a) Explain complete or absolute decoding with an example. [3]

- b) What do you mean by Direct Memory Access (DMA)? Discuss the signals which are necessary for a DMA operation with a diagram. [2+2]

(21)

- c) Draw the timing diagram for the following instruction.

Memory Address	Machine Code	Instruction
2006H	4FH	MOV C, A

[4]

- d) Study the following figure carefully and then write an 8085 assembly program to check that if and only if the key K1 is closed then LED1 will glow and then halt.

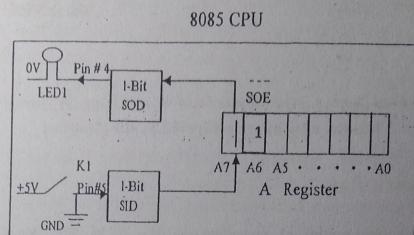


Fig. 2.d

3. a) Read the following 8085 ASM program and answer the questions given below:

Line no.	Mnemonics	Asm P
1.	LXI SP, 0400H	
2.	LXI B, 2055H	2055
3.	LXI H, 22FFH	22FF
4.	LXI D, 2090H	2090
5.	PUSH H	FF
6.	PUSH B	FF
7.	MOV A, L	
:	:	
:	:	
20	POP H	

- What is stored in the stack pointer register after the execution of line 1?
- What is the memory location of the stack where the first data byte will be stored?
- What is stored in memory location 03FEH when line 5 (PUSH H) is executed?
- After the execution of line 6 (PUSH B), what is the address in the stack pointer register and what is stored in stack memory location 03FDH?
- Specify the contents of register pair HL after the execution of line 20 (POP H).

(22)

- b) Calculate the delay in the following loops, Assume that $f = 2 \text{ MHz}$.

Label	Mnemonic	T-States
L2:	MVI B,38H	7
L1:	MVI C,FFH	7
	DCR C	4
	JNZ L1	10/7
	DCR B	4
	JNZ L2	10/7

[4]

- c) Write an 8085 ASM program to add the following data bytes stored in memory locations starting at C060h and display the sum at the output port 00h, if the sum does not generate a carry. If a result generates a carry, stop the addition and display 01h at the output port 00h. Data (h): 37, A2, 14, 78, 97

[3]

4. a) Assuming the 8085 microprocessor is completing an RST 6.5 interrupt request, check to see if RST 5.5 is pending. If it is pending, enable RST 5.5 without affecting any other interrupts; otherwise return to the main program.

[4]

- b) Assume that an 8086 microprocessor is interrupted by an interrupt of type int 04h. Then

[3+2+2]

- Write down the major actions that take place during the interrupt process.
- Describe how the 8086 actually get to the interrupt procedure.
- Indicate the four memory locations from which the CPU will collect the starting address of Interrupt Service Routine.

IP = An
CS [An+2]

- c) Write an 8086 interrupt sequence to set and reset the trap flag.

[3]

5. a) Draw the internal architecture of the Intel 8086.

[3]

- b) Describe functions of the control bits of the flag register of 8086 microprocessor.

[3]

Write short notes on:

[6]

- Break-Point Interrupt
- User Defined Hardware Interrupt
- Overflow Interrupt

- d) Write down three functions of SIM instruction.

[2]

6. a) Write down addressing modes of 8086; where segments could not be overridden.

[6]

- b) Describe the function of DEN and DT-R signals of 8086 microprocessor.

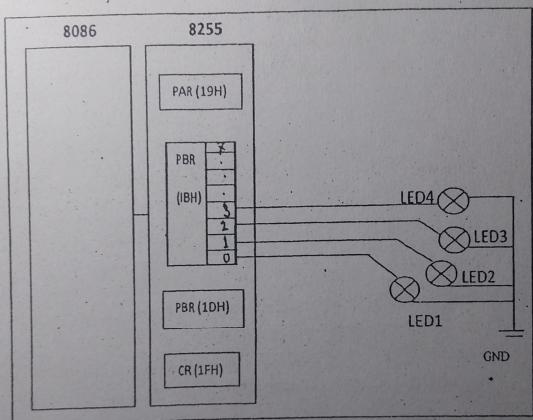
[2]

- c) Write short notes on:
 i) Real Address Mode of the 80286
 ii) Protected Mode of the 80286
 iii) Math Co-Processor

[6]

7. a) Study the following circuit which indicates that the lower 4 bits (PB3-PB0) of the PORT B register of the 8255 are connected with four LEDS. Write 8086 ASM program where LED1 will glow first, then the LED2, after it LED3 and finally the LED4.

[4]



- b) Write a program in 8086 ASM language to transfer a block of 2KB data from one memory location to another memory location using string data transfer instruction. Assume that: CS=3000H, DS=5000H, ES=7000H, SS=9000H, SP=120FH, BP=3254H, DI=3A10H and SI=1025H. You have to load the segment and offset register with desired values.

[4]

- c) Study the following 8086 instructions then answer the questions below with their actions.

[6]

i) LDS SI, [BX]
 Suppose, [BX] = 1000h [DS] = 1000h [11000] = 12h [11001] = A3h [11002] = 90h [11003] = D7h; then after execution what will be the value of DS and SI?

ii) LEA DI, [SI][BX]
 Suppose, [SI] = 2000h [BX] = 1000h; then after execution what will be the value of DI?

iii) LODS BYTE
 Suppose, DF=1 [SI] = 040H [DS] = 5000H [50040H] = 10H; then after execution what will be the value of AL and SI?