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Your Roll No. ....

M.Sc. (INFORMATICS) / MIT / I Sem. - 2010

Paper IT15 - MICROPROCESSOR AND INTERFACE  
PROGRAMMING

[0-11-12-1]

Time: 3 hours

Maximum Marks: 75

(Write your Roll No. on the top immediately  
on receipt of this question paper.)

Attempt five questions in all.

Question No. 1 is compulsory.

1. (a) The original contents of AX, BL, word-size memory location SUM, and carry flag CF are 1234H, ABH, 00CDH, and 0H, respectively. Describe the results of executing the following sequence of instructions.

ADD AX, [SUM]

ADC BL, 05H

INC WORD PTR [SUM] (2)

- (b) Describe what happens to the status flags as the sequence of instructions that follows is executed.

MOV AX, 1234H

MOV BX, 0ABCDH

CMP AX, BX

Assume that flags ZF, SF, CF, AF, OF, and PF are all initially reset. (2)

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(c) Data are to be read in from two byte-wide input ports AAH and A9H and then output as a word to a word wide output port at address B000H. Write a sequence of instructions to perform this input/output operation. (2)

(d) What value should be written ICW<sub>1</sub> in order to configure the 8259 so that ICW<sub>4</sub> is needed in the initialization sequence, the system is going to use multiple 8259s, and its inputs are to be level sensitives? Assume that all unused bits are to be logic 0. (2)

(e) Describe the operations performed by each of the following instructions.

(i) IDIV BYTE PTR [BX][SI] + 0030H

(ii) NOT WORD PTR [BX + DI]

(iii) OR BYTE PTR [BX][DI] - 10H, 0F0H

(iv) SBB DL, [0200H] (2)

(f) A 16 KB block of memory, composed of two 8 KB EPROMS, is to have a starting address of 4000H. What is the address range for each EPROM? (1)

(g) Explain the following signal description of 8251.

(i) TXD

(ii) TXRDY (2)

- ✓ (h) What is the mode and I/O configuration for ports A, B and C of an 8255 after its control register is loaded with 82H? (2)

2. (a) (i) What instructions are needed to program counter 0 for BCD counting in mode 4 of 8254? The initial count is 4788.

✓ (ii) What control word is needed to program counter 2 for binary counting in mode 1, with an initial count of A0H?

✓ (iii) What instructions are needed to latch the count in counter 1 and save it in register BX?

[Assume that control word location as CC83H and initial count to port C at CC80H].

(3,3,3)

(b) Design an interface of an input port 74LS245 to read the status of switches SW<sub>1</sub> to SW<sub>8</sub>, and an output port 74LS373 with 8086. Display the number of a key that is pressed, i.e., from 1 to 8 on a 7 seg. display with help of a output port. The input port address is 0008H and output post address, is 000AH. (6)



3. Describe the architecture and explain the working of programmable interrupt controller 8259A. (15)

4. (a) Interface DAC AD7523 with an 8086 CPU running at 8 MHz and write an assembly language program to generate a sawtooth waveform of period 1ms with  $V_{max} = 5V$ . (5)

(b) Explain briefly the interfacing of static and dynamic RAM. (5)

(c) Write an instruction sequence that generates a byte size integer in the memory location defined as RESULT. The value of the integer is to be calculated from the logic equation.

$$(RESULT) = (AL) \cdot (NUM1) + (\overline{NUM2}) \cdot (AL) + BL$$

Assume that all parameters are byte sized. NUM1 NUM2 and RESULT are the offset addresses of memory location in the current data segment. (5)

AP = 0010  
0100  
A = 0110  
= 1100

(a) Implement the following operation using shift and arithmetic instructions.

0001  
0010

$$7(AX) - 5(BX) - (BX)/8 \rightarrow (AX)$$

Assume that all parameters are word sized. State any assumptions made in the calculations. (5)

shl AX, 1  
shr AX, 1  
shr AX, 1  
shr AX, 1

shr AX, 3

shr AX, 3  
shr AX, 3  
shr AX, 3  
shr AX, 3

shr AX, 3  
shr AX, 3  
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shr AX, 3

shr AX, 3  
shr AX, 3  
shr AX, 3  
shr AX, 3

- (b) Given an array A(I) of 100 16 bit signed integer numbers, write a program to generate a new array B(I) so that

$$B(I) = A(I) \text{ for } I = 1 \text{ and } 100$$

$$\text{and } B(I) = \frac{1}{4} [A(I-1) - 5A(I) + 9A(I+1)]$$

for all other Is.

For the calculation of B(I), the values of A(I-1), A(I) and A(I+1) are to be passed to a subroutine in registers AX, BX and EX and the subroutine returns the result B(I) in register AX. (6)

- (c) Explain various interrupts of 8086  $\mu$ p. (4)

6. (a) Explain various addressing modes of 8086  $\mu$ p. (4)

- (b) Write a program sequence to move a string located at SRCADDR to the location DSTADDR for the condition (i) SRCADDR > DSTADDR and (ii) SRCADDR < DSTADDR. (5)

- (c) Write a complete data segment DATA\_SEG that would assign the integer 5 to a byte NUM and the integers -1, 0, 2, 5, and 4 to the first five elements of the 10 word array DATA\_LIST. Then write a complete code segment that would :

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- (i) Place the largest and smallest of the first five numbers of DATA\_LIST in BX and DX respectively.
- (ii) Calculate the sum and the product of first five numbers in DATA\_LIST and store the results in SUM and PRODUCT respectively.

(6)