M.Sc. (INFORMATICS)/ MIT/I Sem – 2014

Paper IT15 – MICROPROCESSOR AND INTERFACE PROGRAMMING

4044

Attempt five questions in all
Question No. 1 is compulsory

1. (a) 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)

(b) Explain the BSR mode operation of 8255. (2)

(c) What is REP prefix? What is its use? (2)

(d) What is the result of IDIV CX if AX contains 7960H, DX contains FFFEH and CX contains 1388H ? (2)

(e) Write the instructions needed to solve the equation

AX=(5BX +CX/3) (2)

(f) What should be the OCW code if interrupt inputs IR_0 through IR_3 are to be marked and IR_4 through IR_7 are to be unmarked ? (2)

(g) i) Counter 1 of an 8254 is programmed to operate in mode 1 and is loaded with the decimal value 10. The clock frequency is 1.19318 MHz. How long is the output pulse ?

ii) The counter 8254 is programmed to operate in mode 3 and is loaded with the decimal value 15. Determine the characteristics of the square wave at OUT.

(1,2)

2. (a) Write an instruction sequence to set up the three counters of the 8254 as follows :
Counter 0 : Binary counter operating in mode 0 with an initial value of 1234H.
Counter 1 : BCD counter operating in mode 2 with an initial value of 0100H.
Counter 2 : Binary counter operating in mode 4 with an initial value of 1FFFH.

Assume that the base address for counter 0 is 40H. Show also the interfacing circuit. (6)

(b) An 8254 receives the control word 10010000. What configuration is set up for the timer? (3)

(c) Configure PPI – 8255 such that port A is an output port, and both port B and C are input ports. All three ports are set up for mode 0 operation. Write a program that will input the data at port B and C, find the difference (Port C)-(Port B), and output this difference to port A. The base address for port A is given as 38H. (6)

3. (a) Write a segment of main program and show its subroutine structure to perform the following operations. The program is to check the three most significant bits in the register DX and, depending on their setting, execute one of three subroutines : SUBA, SUBB, OR SUBC. The subroutines are selected as follows :

(i) If bit 15 of DX is set, initiate SUBA
(ii) If bit 14 of DX is set and bit 15 is not set, initiate SUBB.
(iii) If bit 13 of DX is set and bits 14 and 15 are not set, initiate SUBC.

If a subroutine is executed, the corresponding bit(s) of DX should be cleared and then control returned to the main program. After returning from the subroutine, the main program is repeated. (6)

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

$$B(I) = A(I) \qquad for\ I = 1\ and\ 100$$

and $$B(I) = \frac{3}{4}[A(I-1) - 5A(I) + 9A(I+1)]. \qquad for\ all\ other\ I's$$

(6)

(c) How many times the NOP instruction execute in the follow ng sequence?

```
        MOV CX,20H
XYZ :   PUSH CX
        MOV CX,9
ABC :   NOP
        LOOP ABC
        POP CX
        LOOP XYZ
```

(3)

4. a) Explain the following signal description of 8251

(i) $\overline{TXD}$ (ii) $\overline{RXC}$ (iii) TXRDY (iv) $\overline{DTR}$
(v) $\overline{CTS}$

(5)

b) Interface DAC AD 7523 with an 8086 CPU running at 8MHz and write an assembly language program to generate a sawtooth wave form of period 1ms with Vmax = 5V (5)

c) Interface two 4K×8 EPROMS and two 4K×8 RAM chips with 8086. Select suitable maps. (5)

5. a) Write a program sequence to evaluate the Boolean expression,-

$$x_6\bar{x}_5x_3x_0 + \bar{x}_3\bar{x}_1 + x_5\bar{x}_4x_0$$

and store the result (0 or 1) in DX. (5)

b) Write the part of assembly language program to show the double precision equivalent of the calculation.

(P) ← Quotient of (Q*R-36+5)/Q
(T) ← Remainder (5)

c) Explain various kinds of unconditional branching. (5)

6. a) Explain the control signal definitions of stroked bidirectional I/O (mode 2) (4)

b) Explain various interrupts of 8086 microprocessor. (4)

c) Write a program sequence to calculate $|x - y|$ where x is not greater than 100 (4)

d) How would the integer +500 and -1000 be stored in memory starting at address 0A000H ? (3)