Time : 3 hours   **Full Marks : 70**

(i) The questions are of equal value

(ii) Answer any *five* questions taking *at least two* from each group

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Group A

1. a) What is the difference between the functions of address registers and data registers of the M68000? Illustrate with an example.   [3]

    b) What function is served by $\overline{DTACK}$ during read / write operation in M68000? Explain with a diagram.   [4]

    c) Given that D_0 = \$12345678, D_1 = \$ABCDEF01 and A_0 = \$\$87654321, specify memory contents of address \$A000 to \$A002 after executing the following instruction:

        MOVE M.B   D0 / D1 / A0, \$00A000   [3]

    d) What will be the contents of D_0 and D_1 after executing the following set of instructions:

        MOVE.L \$13579BDF, D0
        MOVE.L \$02468ACE, D1
        SWAP D0
        EXG.W D0 , D1   [4]

2. a) Write a 68000 assembly language program to realize the following high-level language program segment:

        FOR I = 1 TO 100
        B(I) = 2 * A(I)
        END FOR

    Assume A and B to be arrays of 16 bit integers.   [6]

    b) Mention the functions of the following pins of 8259A:

        (i) $CAS_0 - CAS_2$ (ii) $\overline{SP}$ / $\overline{EN}$ [4]

    c) How does the 8259A differentiate between a 8-bit / 16-bit microprocessor? How does it know the starting address of the interrupt subroutine when an interrupt is received (for both 8-bit and 16-bit cases)?   [2 + 2]

3. a) What information is carried by the PSW register of Intel 8051? What is the functional difference between the 'C' and 'O' flags?   [3 + 2]

    b) What is the content of the accumulator at the end of execution of the following 8051 program:

        MOV A, #80H
        SETB C
        MOV R1, #05H
        LOOP: RRC A
        DJNZ R1, LOOP   [4]

c) Write a program in 8051 assembly language to write a 8-bit binary no. stored in memory location 3000H in reverse sequence and store it in memory location 3001H. (For example 1010 1100 becomes 0011 0101) [5]

4. a) What are the timer modes supported by 8051? Write a program to initialize timer 1 in mode 2 so that it overflows 10,000 times in a second. [2 + 4]

b) If two interrupt requests are received by the 8051 simultaneously, how are they handled? Which SFRs are involved in the process? [3 + 1]

c) Explain how digital data is transmitted over telephone lines using modems along with 'Data Terminal Equipment' (the functions of all standard signals should be mentioned). [4]

5. a) Given below are the names of certain signals. Point out the processor/peripheral with which each of them are associated along with its function mentioning clearly whether it is an input or output signal.

- $\overline{BERR}$

- $\overline{BG}$

- $\overline{INTA}$

- $\overline{TXEMPTY}$

- $SYNDET/\overline{BD}$ [5 X 2]

b) 8051 has 'relative' jump instructions – what is meant by this statement? Explain with an example. Also mention the advantages of such jumps. [3 + 1]

Group-B

5. What do you mean by the term 'virtual memory' and why is it necessary? Describe the role of the Memory Management Unit in relation to handling real memory and virtual memory for processors of higher configuration. Give suitable examples. [4 + 10]

6. Draw the base architecture of the ADSP 2101 and point out how execution speed and signal processing capability is enhanced. [14]

7. Write a program in ALL for the ADSP2101 to compute:

$S = (1 \times 2)^2 + (2 \times 3)^2 + (3 \times 4)^2$ up to 5 terms. Write suitable comments for proper understanding. [14]

8. Write a program in ALL for the 8086 to do the following:

Take as input, line voltage and line current. Use the 8086 to display the digitized data of the voltage and current signals. When interrupted, first the voltage will be displayed and then the current. Draw a diagram of the arrangement and also a flow chart of the program. [6 + 8]