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15CS44

Fourth Semester B.E. Degree Examination, July/August 2022 Microprocessor and Microcontrollers

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain with a neat internal block diagram, the architecture of 8086 and also explain how pipelining is achieved in 8086. (08 Marks)
- b. List the 8086 segment registers and explain their functions. If CS = 3499H, IP = 2500H, find : (i) Logical address (ii) Physical address (iii) Lower and upper range address (04 Marks)
- c. What is stack and why it is needed? Explain how the stacks are accessed in 8086 with example. (04 Marks)

OR

- 2 a. Explain the steps in creation and execution of 8086 assembly language program. (05 Marks)
- b. Assume that the register have the following values (all in hex) and that CS = 1000, DS = 2000, SS = 3000, SI = 4000, DI = 5000, BX = 6080, BP = 7000, AX = 25FF, CX = 8791 and DX = 1299. Calculate the physical address of the memory where the operand is stored and the contents of memory locations in each of the following addressing examples:
(i) MOV [SI], AL (ii) MOV [SI + BX + 8], AH (iii) MOV [BX], AX
(iv) MOV [3600], AX (v) MOV [BP] + 200, AX (vi) MOV [DI + BP + 100], AX (06 Marks)
- c. Explain the different addressing mode of 8086 with example. (05 Marks)

Module-2

- 3 a. Write a 8086 program to calculate the total sum of 5 words of data. Each data value represents the yearly wages of a worker. This person does not make more than \$65, 555 (FFFFH) a year. The decimal data is as follows: 27345, 28521, 29533, 30105, 32375. Sum to be stored to memory location with offset 0028H. (06 Marks)
- b. Explain the following instructions with an example:
(i) MUL (ii) DIV (iii) CMP (iv) SHR (v) RCL (vi) DAA (06 Marks)
- c. Write an 8086 assembly language program to convert ASCII to packed BCD with appropriate comments. (04 Marks)

OR

- 4 a. Write an 8086 program that
(i) Clears the screen
(ii) Puts the cursor on position row = 15 and column = 20.
(iii) Displays the prompt "What is your name?"
(iv) Gets a response from the keyboard and displays it at row = 17 and column = 20. (06 Marks)
- b. Write a program to count number of 1's in a word data and provide the count in BCD. (04 Marks)
- c. What is an interrupt? Explain various types of 8086 interrupt with interrupt vector table. (06 Marks)

Module-3

- 5 a. Explain the following instructions with an example:
 (i) CBW (ii) IDIV (iii) SAL (iv) CMPSB (04 Marks)
- b. Write a program that scans the initials "IbM" and replaces the lowercase "b" with uppercase "B". (04 Marks)
- c. Find the address range of the following memory design [Fig.Q5(c)].

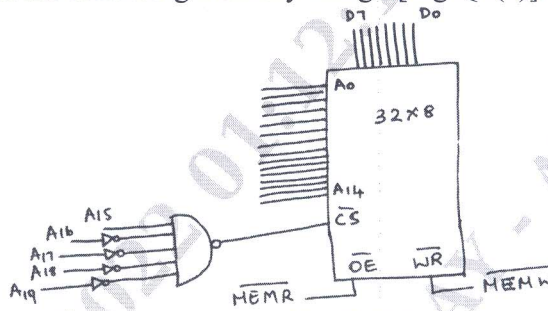


Fig.Q5(c)

(04 Marks)

- d. Assume that we have 4 bytes of hexadecimal data 25H, 62H, 3FH and 52H.
 (i) Find the checksum byte.
 (ii) Perform the checksum operation to ensure data integrity.
 (iii) If the second byte 62H had been changed to 22H, show how checksum detects the error. (04 Marks)

OR

- 6 a. With a neat diagram, explain the 8255 programmable peripheral interface. (06 Marks)
- b. Write control word register format. Find the control word if PA = out, PB = in, PC₀ – PC₃ = in, PC₄ – PC₇ = out. Program the 8255 to get data from Port B and sent it to Port A. Use port addresses of 300 – 303 for the 8255 chip. (06 Marks)
- c. Illustrate the XLAT instruction with an example program. (04 Marks)

Module-4

- 7 a. Contrast CISC and RISC design philosophy. (05 Marks)
- b. Write a note on AMBA Bus protocol. (05 Marks)
- c. Explain with neat figure the Data flow/program model of ARM. (06 Marks)

OR

- 8 a. Explain the registers and CPSR of ARM. (06 Marks)
- b. Explain the different processor modes of ARM. (06 Marks)
- c. Explain the vector table with respect to ARM processor. (04 Marks)

Module-5

- 9 a. Explain the syntax with an example the following instructions of ARM processor:
 (i) MVN (ii) LSL (iii) ASR (iv) BIC (v) RSB (05 Marks)
- b. Explain various formats of Branch instructions in ARM. (04 Marks)
- c. Explain syntax of different comparison instructions. (04 Marks)
- d. List the features of ARM instruction set. (03 Marks)

OR

- 10 a. Explain different program status register instructions. (04 Marks)
- b. Describe 3 types of load-store instructions. (08 Marks)
- c. If $r_0 = 0X00000000$ $r_1 = 0X00090000$
 $mem\ 32\ [0X00009000] = 0X01010101$
 $mem\ 32\ [0X00009004] = 0X02020202$
 Write the values of r_0, r_1 after execution of instruction LDR $R_0, [R_1 \# 4]$ in different indexing methods: (i) Preindex with writeback (ii) Preindex (iii) Post index (04 Marks)