Department of Electronics and Communication Engineering

National Institute of Technology; Rourkela

Subject: EC301; Microprocessor

Assignment-II

Submission Date and Time: 21 Aug 2012, 12noon (Mobile Communication Lab)

Memory structure and MOV Instruction

1. Write an 8086 ALP to find the factorial of the given byte of data using a recursive algorithm. The result is to be stored from the address 7000H: 1000H.

2. Is it possible to exchange the content of two memory locations or the content of two segment registers using the XCHG instruction? Why?

3. Let the content of different registers in the 8086 be as follows: DS= 1000H, SS=2000H, ES=3000H, BX=4000H, SI=5000H,DI=6000H AND BP=7000H. Find the memory address / addresses from where the 8086 accesses the data while executing the following instructions;

   MOV AX, [BX] MOV AL, [DI] MOV AX, [BX+DI]
   MOV CX, DS:[BP+4] MOV BX, [SI] MOV BH, SS: [SI] MOV AX, [BP+DI+5] MOV BX, [SI-5] MOV CX, [BP]
   MOV CX, ES: [DI] MOV AH, [BX+10H] MOV AX, [BX+10]

4. Is it possible to use two memory operands in the ADD and SUB instructions?

5. What is the difference between SUB and CMP instructions?

6. Consider the following pair of partial programs :

   (i)
   ```
   MOV AX, 4000H
   ADD AX, AX
   ADC AX, AX
   JC DOWN
   ```

   (ii)
   ```
   MOV AX, 4000H
   ADD AX, AX
   RCL AX, 1
   JC DOWN
   ```

   For each case what is the data in AX after the execution of third instruction and from where does the processor fetch the next instruction after execution of the fourth instruction?

7. Determine which of the following instructions are illegal, and state why.

MOV AL, CX	MOV 1234H, AX	MOV DX, AL
MOV CS, 1234H	MOV [1234H],[5678h]	MOV [CX], AX
MOV AX, [BP+BX]	MOV [SI+DI], CX	MOV 1234H,[BX]
MOV CS, [SI]		

8. Store the number 5678h in memory location DS:2000H using indirect addressing only.

9. Store the number 1234h in absolute memory address 60000h.

10. Move the number at absolute memory address 60000h to DX.

11. Convert an 8B07H from machine language to assembly language.

12. Convert an 8B1E004CH from machine language to assembly language.

13. If a MOV SI, [BX+2] instruction appears in a program, what is its machine language equivalent?

14. What is wrong with a MOV CS, AX instruction?

15. Form a short sequence of instructions that load the data segment register with a 1000H.

16. Describe the operation of the following instructions:

(i) PUSH AX (ii) POP SI (iii) PUSH [BX]
(iv) PUSHF (v) POP DS (vi) PUSH 4

17. What values appear in SP and SS if the stack is addressed at memory location 02200H?

18. Compare the operation of a MOV DI, NUMB instruction with an LEA DI, NUMB instruction.

19. Develop a sequence of instructions that move the contents of data segment memory locations NUMB and NUMB+1 into BX, DX, and SI.

20. What is the purpose of the direction flag?

21. Explain the operation of the LODSB instruction.

22. Explain the operation of the STOSW instruction.

23. Explain the operation of the OUTSB instruction.

Programming Exercise

24. Write an 8086 ALP to find the sum of 100 words present in an array stored from the address 3000H: 1000H in the data segment and store the result from the address 3000H: 2000H.

25. Write an 8086 ALP to find the prime numbers in a list of 100 bytes of data in an array stored from the address 4000H: 1000H in the data segment and store the result from the address 4000H: 3000H.

26. Write an 8086 ALP to find the number of occurrences of the character 'A' among 50 characters of a string type data stored from the address 5000H:1000H in the data segment and store the result in the address 2000H:5000H.

27. Write an 8086 ALP to add two matrices having word-type data in each element of the matrix. Assume that each element of the result after addition of the corresponding elements of the matrix is also word-type data. The data for one matrix is present in an array stored from the address 8000H: 1000H in the data segment and the corresponding data for another matrix is present in an array stored from the address 8000H: 2000H in the data segment. The result is to be stored from the address 7000H: 1000H.

28. Write an 8086 ALP to multiply two square matrices having word-type data in each element of the matrix. Assume that each element of the resultant matrix is of double word type. The data for one matrix is present in an array stored from the address 8000H:1000H in the data segment and the corresponding data for another matrix is present in an array stored from the address 8000H:1000H in the data segment. The result is to be stored from the address 7000H: 1000H.

29. Select an OR instruction that will :

    i. OR BL with AH and save the result in AH.
    ii. OR 88H with ECX.
    iii. OR DX with SI and save the result in SI
    iv. OR 1122H with BP
    v. OR the data addressed by BX with CX and save the result in memory.
    vi. OR the data stored 40 bytes after the location addressed by BP with AL and save the result in AL
    vii. OR AH with memory location WHEN and save the result in WHEN

30. Select the XOR instruction that will:
    i. XOR BH with AH and save the result in AH.
    ii. XOR 99H with CL.
    iii. XOR DX with DI and save the result in DX.
    iv. XOR the data stored 30 words after the location addressed by BP with DI and save the result in DI.

v. XOR DI with memory location WELL and save the result in DI.

31. Select an add instruction that will:
    i. add BX to AX
    ii. add 12H to AL
    iii. add 22H to CX
    iv. add the data addressed by SI to AL
    v. add CX to the data stored at memory location FROG

32. If AX=100H and DX=20FFH, list the sum and contents of flag of each flag register bit(C,A,S,Z and O) after the add AX,DX instruction executes.

33. Develop a short sequence of that adds AL,BL,CL,DL,and AH.Save the sum in the DH register.

34. Select a SUB instruction that will:
    i. subtract BX from CX
    ii. subtract 0EEH from DH
    iii. subtract DI from SI
    iv. subtract 3322H from EBP
    v. subtract the data address by SI from CH
    vi. subtract the data stored 10 words after the location addressed by SI from DX
    vii. subtract AL from memory location FROG

35. Develope a sequence of instruction that converts the unsigned numbe r in AX (values of 0-65535) into a 5-digit BCD number stored in memory, beginning at location addressed by the BX register in the data segment. Note that the most-significant character is stored first and no attempt is made to blank leading zeros.

36. Select an AND instruction that will:
    i. AND BX with DX and save the result in BX
    ii. AND 0EAH with DH
    iii. AND DI with BP and save the result in DI
    iv. AND the data addressed by BP with CX and save the result in memory
    v. AND the data stored in four words before the location addressed by SI with DX and save the result in DX
    vi. AND AL with memory location WHAT and save the result at location WHAT