Velammal College of Engineering & Technology
Department of Information Technology

Academic Year 2017-18 (Even)
Assignment 1

Course code/Title: EC6504/Microprocessor & Microcontroller **Year/Sem:** II/IV
Given date: 10.01.18 **Submission date:** 17.01.18
Marks: 10

Course Outcome	Course Outcome Statement	Level
CO1	Explain and implement programs on 8086 microprocessor.	K2

Group 1

1. Explain an ALP to arrange series of five numbers 11H, 05H,46H, 23H, 65H in a descending order**(16IT06)**
2. Explain the architecture of 8086 microprocessor in detail with a neat mind map**(16IT29)**
3. Assume that:
   - The double word named VAR1, the byte array named VAR2, and the NEAR label LAB1 are defined in source module 1 but are used by source modules 2 & 3
   - The word named VAR3 and FAR label LAB2 are defined in source module 2 and VAR 3 is used by source module 1 and LAB2 is used by source module 3
   - The FAR label LAB3 is defined in source module 3 and is used by source module 2

Give the necessary EXTRN and PUBLIC statements for each module and illustrate how the variables and labels are matched by the linker**(16IT06)**
4. Explain an ALP to add two 32 bit numbers with an algorithm and a neat flowchart.**(16IT54)**
5. What is interrupt and summarize the process involved in interrupt processing with a neat mind map?**(16IT02)**
6. Explain an ALP to convert BCD number into hexadecimal number**(16IT52)**

Group 2

1. Explain the various types of addressing modes in 8086 microprocessor **(16IT37)**
2. Explain the assembler directives used for constant and variable definition in detail (16IT40)
3. Explain an ALP to arrange series of five numbers 56H, F4H, 22H, 9AH, A1H in an ascending order (16IT41)
4. Consider the source modules

Source module 1

```
S_SEG SEGMENT STACK
        DW 100 DUP(?)
TOP LABEL WORD
S_SEG ENDS
D_SEG SEGEMENT COMMON
        VAR DB 50 DUP(?)
D_SEG ENDS
E_SEG SEGMENT AT 1000H
        AREA DW 70 DUP(0)
E_SEG ENDS
C_SEG SEGMENT PUBLIC
        .
        .   } 500H BYTES
C_SEG ENDS
```

Source module 2

```
S_SEG SEGMENT STACK
        DW 50 DUP (?)
S_SEG ENDS
D_SEG SEGMENT COMMON
        VECT DW 30
D_SEG ENDS
C_SEG SEGMENT PUBLIC
        .
        .   } 1000H BYTES
C_SEG ENDS
```

Assuming that the linker (or locator) places the segments in the order S_SEG , D_SEG , and C_SEG with the bottom of the stack beginning at address 20000, Explain exactly how the segments will be placed in memory by the loader(16IT63)

5. Explain an ALP to convert 8 bit hexadecimal number to binary number (16IT31)
6. Explain the data transfer instruction set of 8086 microprocessor with a neat mind map **(16IT33)**

Group 3

1. Consider the following sequence of calls:
   - MAIN calls NEAR procedure SUBA – return offset is 0400
   - SUBA calls NEAR procedure SUBB – return offset is 0A00
   - SUBB calls FAR procedure SUBC – return offset is 0100 and return segment address is B200
   - Return from SUBC to SUBB
   - SUBB calls NEAR procedure SUBD-return offset is 0C00
   - Return from SUBD to SUBB
   - Return from SUBB to SUBA
   - Return from SUBA to MAIN
   - MAIN calls procedure SUBC – return offset is 0600 and return segment address is 1000 (16IT17)

Assuming that the only stack activity is due to calls & returns, illustrate the activity by a series of diagrams.
2. Explain an ALP to find out the number of letters in a string (16IT39)
3. Explain the Arithmetic instruction set of 8086 microprocessor with a mind map. (16IT05)
4. Explain the logical instruction set of 8086 microprocessor with a neat mind map (16IT43)
5. Explain an ALP to compare two arrays of 10 elements each. If they are same, store 1 at memory location INDT otherwise store 0. (16IT18)
6. Explain an ALP to subtract two 32 bit numbers with an algorithm and a neat flowchart (16IT12)

Group 4

1. Illustrate a macro LINE that performs the double word computation Y = AX+B. By calling a macro DMULT for executing the multiply and a macro DADD for executing the addition (16IT53)
2. Explain an ALP to find out a number of occurences of a number 74H in an array of numbers stored in memory. Store the number of occurrences in memory locations N-OCCUR.(16IT42)
3. Explain in detail about macros with a neat mind map (16IT07)
4. Explain the control transfer instruction set of 8086 in detail with a neat mind map (16IT30)
5. Explain an ALP to find out the number of even and odd numbers in a series of signed numbers (16IT36)

Group 5

1. Illustrate a set of procedures that will perform the unsigned binary arithmetic operations on double word operands. The procedure are to assume that the operands have been pushed onto the stack just prior to their being called and are return the results in concatenation DX:AX. They are to be:
   - ADDITION - Adds the two operands
   - SUBTRACT – subtracts the two operands. The minuend is to be pushed onto the stack last (16IT10)
2. Explain an ALP to find out the number of positive numbers and negative numbers in a series of signed numbers (16IT01)
3. Explain about string instructions in detail with a neat mind map (16IT11)
4. Explain the concept of linking & Relocation in detail with a neat mind map (16IT28)
5. Explain about the process involved in interrupts handling with a neat mind map (16IT20)

Group 6

1. Explain a procedure EVALUATE that will use the procedure ADD & MULTIPLY to evaluate the expressions: A*X+B (16IT14)
2. Explain an ALP to convert 8 bit binary number to decimal number with an algorithm & neat flowchart (16IT24)
3. A two dimensional 3X3 array of numbers is stored in memory starting from 2000H. Find whether a particular number 76H is present in the array. If yes, then the memory variables ROW and COLUMN should store the row number and column number of the element, otherwise both variables should be zero. Show this logic using 8086 ALP. (16IT48)
4. Explain the internal architecture of 8086 microprocessor in detail with a neat mind map (16IT20)
5. Explain the addressing modes of 8086 microprocessor in detail with a neat mind map (16IT26)
6. Explain the Arithmetic instruction set of 8086 microprocessor with a neat mind map (16IT51)

Group 7

1. Explain a set of procedures that will perform the unsigned binary arithmetic operations on double word operands. The procedure are to assume that the operands have been pushed onto the stack just prior to their being called and are return the results in concatenation DX:AX. They are to be:
   - MULTIPLY – Multiplies the two operands and returns only lower 32 bits
   - DIVIDE – Divides the two operands and return only the quotient. The dividend is to be pushed onto the stack first. (16IT09)
2. Two 8 bit numbers X and Y are stored in memory. Calculate Z based on the following equation and store it in a memory as a 16 bit number. Discard the remainder in division operation. Write an ALP in 8086 to perform this $Z=(X^2+Y^2)/(X^2-Y^2)$ (16IT13)
3. Consider the following sequence of calls:
   - MAIN calls NEAR procedure DIVA – return offset is 0850
   - Return from DIVA to MAIN
   - MAIN calls NEAR procedure DIVB – return offset is 0880
   - DIVB calls NEAR procedure SUBB – return offset is 0B00
   - SUBB calls FAR procedure SUBC – return offset is 0200 and return segment address is A200
   - SUBC calls NEAR procedure SUBD – return offset is 0550
   - Return from SUBD to SUBC
   - SUBC calls FAR procedure SUBE - return offset is 0800 and return segment address is C320
   - Return from SUBE to SUBC
   - Return from SUBC to SUBB
   - Return from SUBB to DIVB
   - Return from DIVB to MAIN

   Assuming that the only stack activity is due to calls & returns, illustrate the activity by a series of diagrams. (16IT21)
4. Explain the control transfer instruction set of 8086 in detail with a neat mind map (16IT04)
5. Explain the internal architecture of 8086 microprocessor in detail with a neat mind map (16IT27)
6. Explain about the procedures used in Assembly level programming in detail with a neat mind map (16IT16)

Group 8

1. Two numbers C1 and C2 are stored in memory. The operation between these numbers is dictated by the bits 5 and 6 of another number C3 as follows:

   If bit 5 of C3 =1 and bit 6 =0, then
   - C1=(C1 AND C2) OR F0H
   - C2=(C2 XOR C2) AND F0H

   If bit 5 =0 and bit 6 = 0, then
   - C1= (C1 AND 07H) OR C2
   - C2= (C2 OR 90H) XOR 50H

   Otherwise – No operation. Extend this to 8086 assembly language program. (16IT49)
2. Explain a procedure EVALUATE that will use the procedure ADD, MULTIPLY & SUBTRACT to evaluate the expressions: X*(X+Y-B) (16IT45)
3. Two memory locations R1 and R2 store 07H and 3FH respectively. Explain an ALP to Exchange the values in these memory locations without using XCHG instruction and by indirect addressing (16IT23)
4. Explain a procedure COMPUTE for performing the computation R= X+Y-3

   Where X,Y and R are contained in words and COMPUTE is in the same code segment as the calling program. Also show the definition of the data segment D_SEG that contains X, Y , the data segment E_SEG that contains R, the beginning part of calling program, and a call being made to COMPUTE. Modify the code assuming COMPUTE is in the same source module but it is in a different code segment from the calling program. Modify the code again assuming that the COMPUTE is in a different source module and in a different segment from the calling program. (16IT46)
5. Explain the Assembler directives of 8086 in detail with a neat mind map. (16IT15)
6. Explain the various addressing modes of 8086 in detail with a neat mind map. (16IT32)

Group 9

1. Explain an ALP to find out transpose of a 3*3 matrix. (16IT22)
2. Explain the macros used in 8086 Assembly language programming in detail with a neat mind map.
3. Explain the data transfer instruction set of 8086 microprocessor with a neat mind map (16IT34)
4. Explain the internal architecture of 8086 microprocessor with a neat mind map (16IT44)
5. In a factory, the ages of workers are paid at the end of the week. To calculate wages, a matrix consisting of the worker code number, the age and the number of hours worked every day. i.e.,day 1 (Monday) to day 7 (Sunday) is maintained. Thus a matrix having 10 columns is created. The number of rows will be the number of workers employed. The last column will be the total wages payable for the work in the week.

   The wages are paid in three slabs: - Wage1 for those who are less than 20 years, wage 2 for those who are 20 years or more than 20 years but less than 40 years, and wage 3 for those who are 40 years or more than 40 years.

   Considering that the factory has 20 workers, Explain an ALP to calculate the wages payable to workers at the end of the week, and total wages payable in the week(column 10). Assume that matrix is already stored in memory with all data and wage 1, wage 2 and wage 3 are stored in memory. (16IT25)
6. Explain an ALP to find the word MALAYALAM is palindrome or not (16IT05)

Group 10

1. A string "MY NAME IS" is stored in memory as MES. The name in memory location NAME1 is to be stored along with MES , to make it a whole sentence to look like:

   MY NAME IS PRANSATH RISHI

   Explain an ALP in 8086 for this. (16IT60)
2. Two numbers X1 and X2 are stored in memory. Explain an ALP to perform the following operation and store the result in X3.

   X3=((X1) AND 0FH) XOR (X2) (16IT59)
3. Explain the internal architecture of 8086 microprocessor in detail with a neat mind map. (16IT55)
4. Explain the various addressing modes of 8086 microprocessor in detail with a neat mind map. (16IT62)
5. Summarize the operations involved in various data transfer instructions in detail with a neat mind map. (16IT56)

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