MCA-102: Systems Programming
Master of Computer Applications
Semester I, Nov-2017

Max. Marks: 70

Time: Three Hours
Note: Answer all parts of a question together.

(7x2=14)

1. Answer the following questions briefly.
   (a) Discuss the physical memory organization of the 8086 microprocessor.
   (b) Give the sum and the flag settings for PSW register after hexadecimally adding 62A0 to CFA0.
   (c) What is the use of directive WORD PTR? Give an example.
   (d) Why there are no instructions for performing packed BCD multiplication & division?
   (e) Design a data structure named FIELDS that has five fields of one word each named F1, F2, F3, F4 and F5. Show how field F3 of data structure is addressed in a program.
   (f) What is the difference between an inter-segment and intra-segment jump?
   (g) What is the purpose of allowing an expression to be included in the operand field of a RET instruction?

2. Suppose that (DS) = 2120H, (CS) = 0200H, (BX) = 1200H, (DI) = 5119H, and LIST = 0250H. For each of the following instructions, indicate the addressing mode and determine the physical memory address accessed with respect to source operand. (6)
   SI = 5119H
   (a) MOV AL, [BX+DI]
   (b) MOV AL, LIST[BX+DI]
   (c) MOV AL, [BX+SI]

3. Write a complete assembly language program that will add two square matrices (double word operands) of size N x M. The two matrices are stored beginning at MAT1 and MAT2 respectively. The result is stored beginning at MAT3. (6)

4. What is the use of PUBLIC and EXTRN directives in a program module? Write the code needed to permit the word variables NUM1, NUM2 and a FAR label LAB1, defined in source module 2 to be accessed in source module 1 as if they were defined in source module 1. (6)

5. Consider the following sequence of calls:
   - MAIN calls NEAR procedure SUBA – return offset is 0400.
   - SUBA calls FAR procedure SUBB – return offset is 0100 and return segment address is B200.
   - Return from SUBB to SUBA.
   - SUBA calls NEAR procedure SUBC – return offset is 0C00.
   - Return from SUBC to SUBA.
   - Return from SUBA to MAIN.

   Assuming that the only stack activity is due to the calls and returns, illustrate this activity (stack action) by a series of diagrams. (6)

6. Explain the difference in the interrupts caused by the INT, INT Type, and single-step trap. (6)

7. Write a FAR procedure COMPUTE for performing the following computation

$$R = X + Y - 3$$

where X, Y, and R are contained in words. In the calling program, show the definition of the data segment D_SEG that contains X and Y, the data segment E_SEG that contained R and a call being made to COMPUTE. Assume that a parameter table is used for communication. (8)

8. How is the LOCAL directive used within a macro sequence? Define a macro (definition nesting) that produces code for performing Logical OR and Logical AND operation on two binary N-byte operands and storing the N-byte result beginning at an arbitrary location. N is the name of a constant and is to appear as the fourth dummy parameter. (8)

9. Explain the design of a two-pass assembler. Show the construction of symbol table for the program given in **Question 7** above. (10)