INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR
Mid-Autumn Semester 2018-19

Date of Examination: _____ Session (FN/AN) _____ Duration __2 hrs__ Full Marks __30__
Subject No.: __MA40003/MA60003__   Subject: __SYSTEMS PROGRAMMING_____
Department/Center/School __Mathematics_____ .
Specific charts, graph paper, log book etc. required __No__
Special Instructions (if any): __Answer ALL TEN Questions. This Question paper consists of TWO pages__

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1. Discuss the function of all registers of 8086 microprocessor. Explain the special function of each register and instruction support for these functions.   **(3M)**

   AX,BX,CX,DX, SI,DI,BP,SP,CS,DS,ES,SS,IP,Flag

2. Write instructions in ALP (Assembly language programming) to implement the following high-level construct. Assume all comparisons are made on signed numbers.

   ```
   IF ((AX<3) OR (BX<2)) THEN
       CX=1
   ELSE
       CX=0
   ENDIF
   ```
                                                                                        (3M)

3. Assume AL contains the hex value C5.
   (a) Provide a value of BL in hex which will cause the sign flag to be set when processor executes the instruction ADD AL, BL.
   (b) Provide a value of BL in hex which will cause the overflow flag to be set when processor executes the instruction ADD AL, BL.   **(3M)**

4. Write a procedure in ALP to find the length of a string. Write the corresponding main program.   **(3M)**

5. Write a fragment of assembly code that implements the following high-level-language loop:
   ```
   for (i=0; i<num-1; i++)
       list[i]=list[i+1];
   ```

   You may assume that list (an array of 16-bit integers) and num (an integer that contains the number of elements currently in list) are defined in the data section of the program.   **(3M)**

6. What are the various addressing modes available in 8086 microprocessor? Explain them with examples.   Register, Direct and Immediate   **(3M)**

   In register mode, Directly calls a register MOV AX,5 AX is in register mode
   In Direct Mode, Calls a Variabe MOV Name,'Ganesh' Name is in direct mode
   In Immediate mode, Calls a constant MOV AX,4. 4 is in immediate mode

   P.T.O.

   Register Indirect Mode: use register to point to location LEA SI,W. [SI] would have the value of W
   Base and Index Mode: Operand Offset address is obtained by adding displacement to the contents of the register

7. Write an ALP to count the number of 1's in DL register.

(3M)

8. Define a 3×5 matrix. Read the elements of the matrix from keyboard. Now call a procedure to find and display the largest element of 2nd row and smallest element of 4th column. Write the corresponding ALP.

(3M)

9. With reference to 8086 processor, explain any three rotation instructions with example. (3M)

10. Consider a C function **prime** with the following function prototype:

    int prime (int n, int m);

Write an ALP which calls the function **prime** to find the first prime number between 50 and 100 and stores the number in CX register. Note that integer value returned from the function will be stored in AX register.

(3M)

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