Set-B (Odd Enroll No.)

Mid Term Examination 2024
System Software (CSN-252)

MM 60 Time 1.5 Hrs.

Note: 1. Answer all parts of a question at the same place.
2. Make suitable assumptions wherever needed and state them clearly.
3. Students are allowed to use SIC/XE instruction sheet during the examination.

1. [12 Marks] Write a SIC/XE program that reads an integer from the input device F1. If the integer is greater than 1024 and is odd then it stores a one at location EVODD otherwise stores zero at location EVODD. Your marks will be inversely proportional to the number of memory references (data + instruction) made by your program (i.e. lesser the number of memory references more will be the marks).

2. [9 Marks] **Clearly write valid / invalid** for each of the following SIC or SIC/XE instructions. If instruction is valid write valid (no justification is needed). If it is invalid write Invalid followed by the reason / justification.

(i) 27301000
(ii) 9A2700
(iii) 03901000
(iv) 281010
(v) 6A8003
(vi) 9047

3. [2 + 8 + 4 Marks] (i) Write two commonly used approaches discussed in class to design a disassembler.
(ii) Disassemble the following SIC/XE program.
(iii) What will be the contents of data area and register A (in hex) when the instruction RSUB is executed?

```
HGUESS 000000000001E
T000000 1B 010001 050001 69200F 98100F 40032F 1000 183B2F F44F 0000 000008
E000000
```

4. (a) [2 Marks] Why address is stored both in header and end records of the object program?

(b) [2 Marks] What are the different design alternatives for storing the operands in the internal storage of a processor (i.e. classification of instruction set architectures based on where operands are stored in the internal storage of a processor).

(c) [3 Marks] Write largest and smallest (non-zero) positive floating-point numbers (both in hex and decimal) that can be stored using SIC/XE floating point data format.

(d) [4 Marks] Consider MIPS data addressing modes discussed in class. Write two addressing modes that are directly supported by MIPS. Two more data addressing modes can be used by properly setting displacement field or by using MIPS register 0. Write these two additional data addressing modes and explain them using an example.

5. [14 Marks] SIC/XE program given below initializes the data area and the registers by the values needed by an application. Write **object program** of the SIC/XE assembly language program given below and write (in hex) the values that will be in memory labeled as VALA and in register A just before the program terminates.

```
COPY      START   0
FIRST     STL     RETADR
          +JSUB   READ
          COMP    =X'00000A'
          JGT     SETA
          STA     VALA
          J       @RETADR
SETA      LDA     #10
          LDS     #16
          STS     VALA
          RSUB
RETADR    RESW    1
VALA      RESW    1
          LTORG

. Subroutine READ
READ      LDA     DATA
          RSUB
DATA      WORD    16
          END     FIRST
```

SIC/XE Register Numbers

A	0
X	1
L	2
PC	8
SW	9
B	3
S	4
T	5
F	6