Sixth Semester B.E. Degree Examination, June/July 2019
System Software and Complier Design

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain SIC/XE architecture. **(08 Marks)**

b. Generate the complete object program for the following SIC/XE assembly program.

```
WRREC   START   405D
        CLEAR   X
        LDT     LENGTH
WLOOP   TD      OUTPUT
        JEQ     WLOOP
        LDCH    BUFFER, X
        WD      OUTPUT
        TIXR    T
        JLT     WLOOP
        RSUB
OUTPUT  BYTE    X '05'
        END
```

Address of BUFFER 4033
Address of LENGTH 4036

Op Codes :
CLEAR – B4 ; JEQ – 30; WD – DC; JLT – 38;
LDT – 74; LDCH – 50; TIXR – B8; RSUB – 4C. **(08 Marks)**

OR

2 a. List all assembler independent and dependant features and explain program relocation. **(05 Marks)**

b. Explain the data structures used in macro processor with example. **(03 Marks)**

c. Explain the following macroprocessor independent features.
i) Generation of unique lables
ii) Keyword macro parameter. **(08 Marks)**

Module-2

3 a. What is loader? What are the basic functions the loader has to perform? **(04 marks)**

b. Develop an algorithm for bootstrap loader. **(07 marks)**

c. Explain dynamic linking with suitable diagram. **(05 Marks)**

OR

4 a. Differentiate between a linking loader and linkage editor, with the help of suitable diagram. **(08 marks)**

b. Explain different loader option commands with examples. **(04 marks)**

c. Illustrate MS – DOS object module with its record types. **(04 Marks)**

Module-3

5 a. With the help of a diagram, explain the various phases of complier. **(08 Marks)**

b. Explain the concept of input buffering in the lexical analysis. **(04 Marks)**

c. What design objectives, complier optimizations must meet. **(04 Marks)**

OR

6 a. Write a LEX program for the tokens given below : **(08 Marks)**

LEXEMES	TOKEN NAME	ATTRIBUTE VALUE
Any WS	—	—
if	if	—
then	then	—
else	else	—
Any id	id	ptr to table entry
Any number	number	ptr to table entry
<	reloop	LT
<=	reloop	LE
=	reloop	EQ
<>	reloop	NE
>	reloop	GT
>=	reloop	GE

b. Write regular definitions for unsigned numbers and draw the transition diagram for the same. **(08 Marks)**

Module-4

7 a. Define left recursion grammer, eliminate left recursion from the following grammer :

$S \rightarrow aB \mid ac \mid sd \mid se$

$B \rightarrow b\,Bc \mid f$

$C \rightarrow g.$ **(03 Marks)**

b. Consider the following context free grammer $S \rightarrow SS + \mid SS * \mid a$ and the input string $aa + a*$

i) Give LMD and RMD

ii) Parse tree

iii) Is the grammer ambiguous? Why

iv) Describe the language generated by the grammer

v) Left factor the grammer. **(05 Marks)**

c. Consider the following grammer with terminals (, [,),]

$S \rightarrow TS \mid [S]\,S \mid)S \mid \in$

$T \rightarrow (x)$

$X \rightarrow TX \mid [X]\,X \mid \in$

i) Construct first and follow sets

ii) Construct its LL(1) parsing table

iii) Is this grammer LL(1)? **(08 marks)**

OR

8 a. The following is ambiguous grammer

$S \rightarrow AS \mid b$

$A \rightarrow SA \mid a$

Construct for this grammer its collection of sets of LR(0) items. IF we try to build an LR – parsing table for the grammer, there are certain conflicting actions what are they? Suppose we tried to use the parsing table by non deterministically choosing a possible action whenever there is a conflict, show all the possible sequences of actions on input abab$. **(10 Marks)**

b. What are the actions of a shift – reduce parser. Design shift – reduce parser for the following grammer on the input 10201 $S \rightarrow 0\ S\ 0 \mid 1\ S\ 1 \mid 2$. **(06 Marks)**

Module-5

9 a. Consider the context free grammer given below :

$S \rightarrow EN$

$E \rightarrow E + T \mid E - T \mid T$

$T \rightarrow T * F \mid T / F \mid F$

$F \rightarrow (E) \mid digit$

$N \rightarrow ;$

i) Obtain the SDD for the above grammer

ii) Construct annotated parse tree for the input string $5 * 6 + 7$. **(08 Marks)**

b. Obtain the DAG for the expression, show the steps $a + a * (b - c) + (b - c) * d$. **(04 Marks)**

c. Translate the assignment

$a = b * - c + b * - c$ into

i) Three address code

ii) Quadruples. **(04 Marks)**

OR

10 a. Explain the issues in the design of a code generator. **(11 marks)**

b. Write the machine instructions for the following three address instructions :

i) $b = a[i]$

ii) $a[j] = c$

iii) $x = *p$

iv) $*p = y$

v) if $x < y$ got L. **(05 Marks)**