GBCS SCHEME

USN | | | | | | | | | | |

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
System Software and Compiler 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 the various instruction formats used in SIC/XE machine. **(04 Marks)**

b. Write a SIC/XE program to copy the string "COMPUTER SCIENCE ENGINEERING" from STR1 to another string STR2. **(06 Marks)**

c. List the functions of Pass-1 and Pass-2 of a two pass assembler. **(06 Marks)**

OR

2 a. Write an algorithm of the Pass-1 of a two pass assembler. **(08 Marks)**

b. List the various machine independent assembler features. Explain the control-sections, how the assembler converter them into object code. **(08 Marks)**

Module-2

3 a. Define Macro. Explain how Macros are defined and expanded. **(07 Marks)**

b. What are the basic functions of a loader? Explain two ways of program relocation in loaders. **(09 Marks)**

OR

4 a. Explain the functions of dynamic linking with a diagram. **(08 Marks)**

b. Write a note on MS-DOS linker. **(08 Marks)**

Module-3

5 a. Explain the different phases of a compiler, with an example. **(09 Marks)**

b. What is input buffering in lexical analysis? List the different methods of input buffering explain any one of them. **(07 Marks)**

OR

6 a. List and explain the reasons for separating the analysis portion of a compiler into lexical and syntax analysis phases. **(06 Marks)**

b. Construct the transition diagram to recognize the tokens of
i) Identifier ii) Relational operators iii) Unsigned numbers. **(06 Marks)**

c. Define Token, patterns, lexemes. **(04 Marks)**

Module-4

7 a. What is the role of parser? Explain the different error recovery strategies. **(08 Marks)**

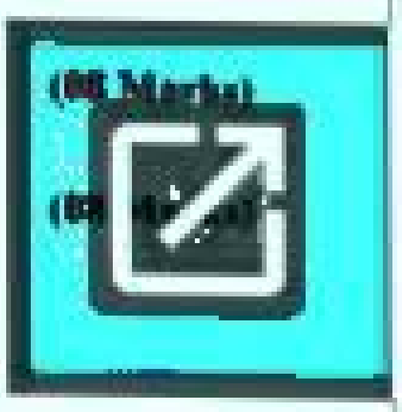
b. Construct the LL(1) parsing table for the following productions:
$E \rightarrow E + T/T$; $T \rightarrow T * F/F$; $F \rightarrow (E)/id$ **(08 Marks)**

Important Note : 1. [illegible]
2. [illegible]

Module-4

7 a. What is the role of parser? Explain the different error recovery strategies. (08 Marks)

b. Construct the LL(1) parsing table for the following productions: (08 Marks)
$E \rightarrow E + T/T$; $T \rightarrow T * F/F$; $F \rightarrow (E)/id$



OR

8 a. Using operator-precedence parsing algorithm, construct the table and parse the input string id + id * id. (12 Marks)

b. Define Handle, viable prefixes. (04 Marks)

Module-5

9 a. Discuss S-attributed and L-attributed SDD. (06 Marks)

b. Write 3-address code syntax tree and DAG for the expression a + a * (b – c) + (b – c) * d. (10 Marks)

OR

10 a. Obtain the SDD and construct annotated parse tree for the input string 6 * 5 + 3, for the grammar
$S \rightarrow EN$
$E \rightarrow E + T/T$
$T \rightarrow T * F/F$
$F \rightarrow (E)/digit$
$N \rightarrow ;$ (10 Marks)

b. Discuss the issues in the design of code generator. (06 Marks)

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CS63

Sixth Semester B.E. Degree Examination, June/July 2019
System Software and Compiler 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 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 labels
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
<	relop	LT
<=	relop	LE
=	relop	EQ
< >	relop	NE
>	relop	GT
>=	relop	GE

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

Module-4

7 a. Define left recursive 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 (, [,),]

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

$T \rightarrow (x)$

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

i) Construct first and follow sets
ii) Construct an 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 hon 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 $S \rightarrow 0S0 \mid 1S1 \mid 2$. **(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 goto L. **(05 Marks)**

* * * * *

CBCS SCHEME

1

USN

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019

System Software and Compiler 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 in detail SIC/XE machine architecture. **(08 Marks)**

b. Write an SIC/XE program to calculate DELTA = ALPHA + BETA * GAMMA – 10 **(08 Marks)**

OR

2 a. Write an algorithm for Pass – 1 of an assembler. **(08 Marks)**

b. Generate the object code for the following SIC/XE source program.

```
SUM     START   0
FIRST   CLEAR   X
        LDA     #0
        +LDB    #TOTAL
        BASE    TOTAL
LOOP    ADD     TABLE, X
        TIX     COUNT
        JLT     LOOP
        STA     TOTAL
COUNT   RESW    1
TABLE   RESW    2000
TOTAL   RESW    1
        END     FIRST
```

Mnemonic	ADD	JLT	LDA	LDB	LDX	RSUB	STA	TIX	JSUB	J	LDT	CLEAR
opcode	18	38	00	68	04	4C	0C	2C	48	3C	74	B4

(08 Marks)

Module-2

3 a. Write PASS-1 and PASS-2 algorithm for a linking loader. **(08 Marks)**

b. Explain dynamic linking, automatic library search, loader design options with suitable examples. **(08 Marks)**

OR

4 a. Write the SIC/XE program for a bootstrap loader with suitable comments. Explain in brief the algorithm of a bootstrap loader. **(08 Marks)**

b. Explain in brief (i) MS-DOS linker and (ii) CRAY MPP linker. **(08 Marks)**

Module-3

5 a. List and explain the various phases of a compiler and show the output of each phase for the expression a := b + c * 25 **(08 Marks)**

b. Construct transition diagram for recognizing relational operators. Sketch the program segment to implement it, showing the first state and one in final state. **(08 Marks)**

OR

6 a. Explain input buffering strategy used in lexical analysis phase. **(06 Marks)**

b. Write the regular definition for unsigned number, also write the transition diagram. **(06 Marks)**

Important Note :

Module-3

5 a. List and explain the various phases of a compiler and show the output of each phase for the expression a := b + c * 25 **(08 Marks)**

b. Construct transition diagram for recognizing relational operators. Sketch the program segment to implement it, showing the first state and one in final state. **(08 Marks)**

OR

6 a. Explain input buffering strategy used in lexical analysis phase. **(06 Marks)**

b. Write the regular definition for unsigned number, also write the transition diagram. **(06 Marks)**

c. Construct the transition diagrams for a set of keywords like begin, end, if then and else and identifiers and constants along with a minimum set of relational operators. **(04 Marks)**

Module-4

7 a. What is shift reduce parser? Explain the conflicts that may occur during shift reduce parsing. **(04 Marks)**

b. Construct LALR parsing tables for the grammar shown below using LR(1) items. **(08 Marks)**

$S' \rightarrow S$

$S \rightarrow Cc$

$C \rightarrow cC \mid d$

c. How left recursion can be eliminated from grammars? Write down the simple arithmetic expression grammar and rewrite the grammar after removing left recursion. **(04 Marks)**

OR

8 a. What is left factoring? Rewrite the following grammar after "left factored" **(04 Marks)**

$S \rightarrow iEts \mid iEtSeS \mid a$

$E \rightarrow b$

b. Write a note on the parser generator – yacc. **(04 Marks)**

c. Construct canonical LR(1) items for the augmented grammar **(08 Marks)**

$S' \rightarrow S;$

$S \rightarrow Cc$

$C \rightarrow cC \mid d$

Module-5

9 a. Define synthesized and inherited attributes with examples. **(04 Marks)**

b. Briefly explain the main issues in code generation. **(08 Marks)**

c. Explain in brief dead code elimination. **(04 Marks)**

OR

10 a. Construct DAG for the expression **(04 Marks)**

$a + b * (a + b) + c + d$

b. Give SDD of a simple calculator. **(04 Marks)**

c. Write a note on common sub expression. **(04 Marks)**

d. What are the steps involved in optimization of basic blocks. Explain any 2 steps in brief. **(04 Marks)**

* * * * *

USN | | | | | | | | | | |

1

C BYREGOWDA INSTITUTE OF TECHNOLOGY

Department: Computer Science and Engineering

Model Question paper 2

System Software & Compiler Design (15CS63)

Duration: **03 hrs** Max Marks: **80**

Note: ***Answer five full questions, choosing one full question from each module***

Question number	Module-1	Marks
1	a) Explain the SIC/XE machine architecture in detail.	8
	b) Explain the following: SYMTABLE,LOCCTR,OPTAB	4
	c) Give the format of the following: header, text, end and modification record	4
	[OR]	
2	a) Define MACRO Briefly explain the various data structures used in the design of MACRO PROCESSOR	10
	b) Write a SIC/XE program to copy array A of 100 words to array of B of same size	6
3	**Module-2**	
	a) With source code, explain the working of boot-strap loader	8
	b) Explain various data structures used for a linking loader.	8
	[OR]	
4	a) With the help of an example show how relocation and linking operations are performed.	8
	b) Explain briefly the design options of loaders	8
	Module-3	
5	a) Write the look ahead code with sentinels for input buffering used in lexical analysis	6
	b) Construct a transition diagram for recognizing relational operators. Sketch the program segment to implement it showing the first and one final state	10
	[OR]	
6	a) What is token, pattern and lexeme? Give example for each	3
	b) Write a regular definitions for i) identifier ii) unsigned number	5
	c)Explain input buffering strategy used in lexical analysis phase	8
	Module-4	
7	a) Give rules for constructing FIRST and FOLLOW sets. Find FIRST and FOLLOW for the grammar E->E+E|T T->T*F|F F->(E)|id	10
	b) What is recursive decent parser? Trace and explain working of the recursive descent parser for the input "bcd" and grammar: A->bCd C->ce|e	6
	[OR]	
8	a)Construct SLR(1) parsing table for the following grammar. **S->CC** **C->eC | d** And also show the sequence of moves made by the parser on the input **ecdd**	8

	b) Show that following grammar S-> Aa | bAc | dc | bda A->d is LALR(1) but not SLR(1)	8
	Module-5	
9	a) List and explain the different common three address instruction forms	6
	b) Explain the following with example i) quadruples ii) triples iii)indirect triples iv) Static single assignment form	5
	c)What is SDD and SDT give examples	5
	[OR]	

10	a) Generate intermediate code for the following statements and identify the basic blocks(given w=8 bytes)
	for i from 0 to 10 do
	for j from 0 to 10 do
	result=c[i,j]*d[i,j];
	for i from 0 to 9 do
	a[i,i]=1.0
		10

	b) Write an algorithm to partition three address instruction into basic blocks	6

USN | | | | | | | | | | |

1

C BYREGOWDA INSTITUTE OF TECHNOLOGY

Department: Computer Science and Engineering

Model Question paper 1

System Software & Compiler Design (15CS63)

Duration: **03 hrs** Max Marks: **80**

Note: ***Answer five full questions, choosing one full question from each module***

Question number	Module-1	Marks
1	a) Explain the SIC machine architecture in detail.	8
	b) What are the Different types of assemblers and Explain the features used in assemblers	8
	[OR]	
2	a) What is Program Relocation? Explain the problem associated with it and there solution	6
	b) Give the algorithm for pass1 of and 2 pass assembler	10
	Module-2	
3	a) Explain machine dependent features of loader	8
	b)Explain the absolute loader and Write its algorithm.	8
	[OR]	
4	a) With an algorithm, explain pass1 of a linking loader	8
	b) What is dynamic binding? explain the process of loading and calling a subroutine using dynamic binding	8
	Module-3	
5	a) Explain with a neat diagram phases of a compiler by taking an example A=B+C*50.	10
	b) Construct a transition diagram for identifier and unsigned numbers	6
	[OR]	
6	a) Discuss the various applications of compiler technology	10
	b) What is regular expression? Write the algebraic laws of regular expression	6
	Module-4	
7	a) Define left recursion. Write an algorithm to eliminate left recursion. Eliminate left recursion from the following grammar E->E+E|T T->T*F|F F->(E)|id	6
	b) Consider the below grammar S->(L)|a L->L,S|S Make the grammar suitable for top down parsing. Construct predictive parsing table and parse the input string (())	10
	[OR]	
8	a) Consider the following grammar **S->L=R|R** **L->*R|id** **R->L** i). Construct set of LR(1) items ii).Construct LR(1) canonical parsing table	10
	b) What is Handle pruning? Give Bottom up parses for the input string **aaa*a++** using the grammar **S->SS+ | SS* | a**	6
	Module-5	
9	a)Write an SDD for simple desk calculator and show annotated parse tree for the expression **3*5+4n**	6
	b) Construct a dependency graph for the declaration float id1,id2,id3	5
	c) Define i) synthesized attribute ii) inherited attribute	5
	[OR]	
10	a) Obtain DAG for the expression **a+a*(b-c)+(b-c)*d**	6
	b) Discuss the various issues in the code generation phase	10