

NIRMA UNIVERSITY

INSTITUTE OF TECHNOLOGY

Semester End Examination (IR/RPR), December 2022
B.Tech. in Computer Science & Engineering, Semester – VII
2CS701 – COMPILER CONSTRUCTION

Roll /
Exam No.

Supervisor's Initial
with Date

Time: 3 Hours

Max Marks :100

Instructions: 1. Attempt all questions.

2. Figure to right indicate full marks

3. Use section-wise separate answer book.

4. Draw neat sketches wherever necessary.

5. Assume necessary data wherever required, and indicate clearly.

SECTION-I

Q.1 Do as directed [18]

CO1

A) What are advantages and disadvantages of following terms related to (06)
BL2 compiler construction:

i) single pass compiler

ii) multi-pass compiler

iii) code optimization after intermediate code generation and before code generation

B) "Scanners use double-buffering to minimize the overheads associated with (06)
BL2 scanning the input in lexical analysis." State true/false about this statement with proper justification.

OR

B) Apply firstpos() and followpos() method to convert following RE to DFA. (06)
BL3 $0(0/1)^*0$

C) Why left recursion is removed in top-down parsing? Eliminate left (06)
BL3 recursion from following grammar.

$A \rightarrow BC \mid a$

$B \rightarrow CA \mid Ab$

$C \rightarrow AB \mid CC \mid a$

Q.2 Do as directed [16]

CO4

A) Design a recursive descent parser for following grammar: (06)
BL6 $E \rightarrow TE_R$

$E_R \rightarrow +TE_R \mid -TE_R \mid \epsilon$

$T \rightarrow (E) \mid Num \mid Id$

OR

- A) What is operator grammar? Construct an operator precedence table for the following grammar : (06)

BL6

$$S \rightarrow S + S \mid S - S \mid S * S \mid S / S \mid ID$$

- B) Check whether the following grammar is LL(1) grammar or not using parsing table. Trace parsing of input string: abcba with proper remarks. (10)

BL5

$$S \rightarrow A B c$$

$$A \rightarrow b A$$

$$A \rightarrow \epsilon$$

$$B \rightarrow c$$

Q.3 Do as directed

[16]

CO4

- A) Trace LR Parsing for input string “hxe” using below given LR parse table. (08)

BL5

Does input string match the Grammar? Why?

LR Parse Table

Grammar:

$$1. S \rightarrow hBe$$

$$2. B \rightarrow BA$$

$$3. B \rightarrow \epsilon$$

$$4. A \rightarrow x$$

$$5. A \rightarrow t$$

State	Action					Goto		
	h	x	t	e	\$	S	B	A
0	S2					1		
1					acc			
2		r3	r3	r3			3	
3		S6	S7	S4				5
4					r1			
5		r2	r2	r2				
6		r4	r4	r4				
7		r5	r5	r5				

- B) Check whether the following grammar is SLR or not using LR parse table. (08)

BL5

$$S \rightarrow aABb$$

$$A \rightarrow c \mid \epsilon$$

$$B \rightarrow d \mid \epsilon$$

SECTION -II

Q.4 Do as directed

[18]

CO2

- A) What are the issues in designing code generation phase? (06)

BL1

OR

- A) Write and explain Code Generation algorithm with help of suitable example. (06)

BL3

$$t1 = b + c$$

$$t2 = t1 * d$$

$$z = t1 + t2$$

- B) Write a syntax directed definition to translate binary number to decimal number. Draw an annotation tree to illustrate implementation of syntax directed definition (06)

BL6

- C) Define synthesis attribute and inherited attribute. List attributes of each non-terminal from following syntax directed definition and check whether it is synthesis attribute or inherited attribute. (06)

BL4

$S \rightarrow 2 A B M C \{ M.v1 = f1(A.y, B.b), C.a = f3(A.y), S.v2 = M.v2 + C.b \}$

$M \rightarrow B A \{ A.x = B.b, M.v2 = f2(M.v1, B.b) \}$

$C \rightarrow \varepsilon \{ C.b = f3(C.a) \}$

$A \rightarrow \varepsilon \{ A.y = f4(A.x, 5) \}$

$B \rightarrow \varepsilon \{ B.b = 5 \}$

Q.5

Do as directed

[16]

CO2

- A) What are different representations of three address code? Compare merits and demerits of all these representations of three address code. (08)

BL2

- B) What is difference between syntax directed definition and translation scheme? Construct translation scheme for following syntax directed definition: (08)

BL6

$E \rightarrow T E' \quad \{ E'.ival = T.sval, E.sval = E'.sval \}$

$E' \rightarrow + T E_1' \quad \{ E_1'.ival = E'.ival + T.sval, E'.sval = E_1'.sval \}$

$E' \rightarrow \varepsilon \quad \{ E'.sval = E'.ival \}$

Q.6

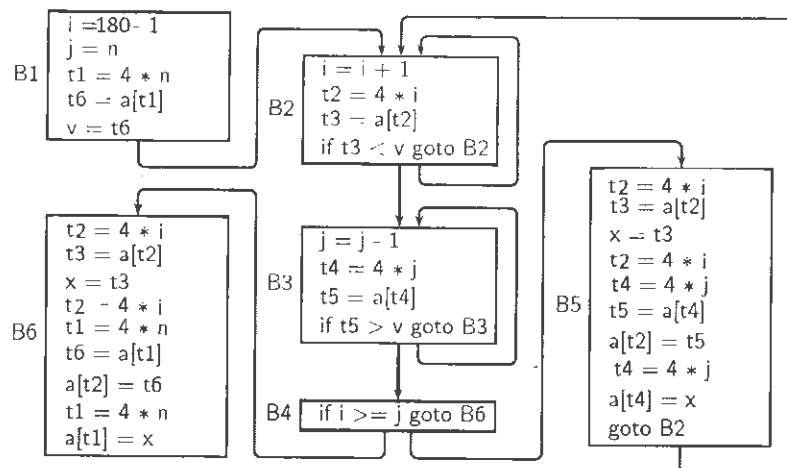
Do as directed

[16]

CO3

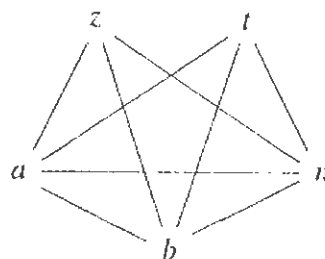
- A) Explain any two code optimization techniques and apply them on below given intermediate code (10)

BL3



- B) Perform register allocation using Graph coloring for variables shown in given interference graph. Show mapping of register to each variable. (06)

BL6



OR

B) Create a control flow graph for following code fragment (06)
BL6

```
a=4
b=2
c=3
n=c*2
L1: if(a>n) goto L2
    a=a+1
    goto L1
L2: if (a>=12) got L3
    t1=a + b
    a = t1 +c
L3: return a;
```