

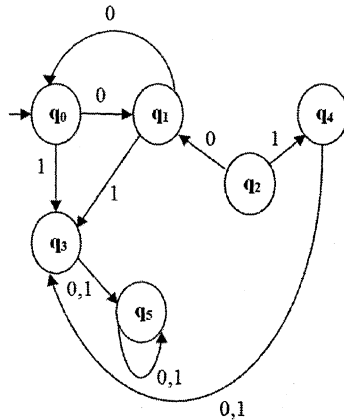
(2 ½ Hours)

[Total Marks: 60]

- N.B:** (1) All questions are compulsory.  
 (2) Figures to the **right** indicate full marks.  
 (3) **Assume additional data if necessary** but state the same clearly.  
 (4) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.

Q.1 Attempt any two of the following (12)

- (a) Draw a block diagram of compiler and explain front phases of compiler. 6
- (b) Explain various notations used in regular expression. Draw the following regular expressions. 6
1.  $(a^* b)^+ a^* b^* b$
  2.  $b^* a + a^* + a b b^*$
- (c) Define Grammar. Briefly describe various types of grammar. 6
- (d) Define minimum DFA and construct a minimum automata for the given diagram. 6



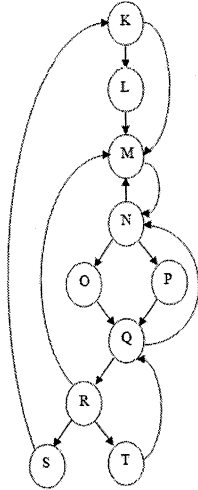
Q.2 Attempt any two of the following (12)

- (a) Consider following CFG: 6
- $S \rightarrow xBy$   
 $B \rightarrow xB \mid Cy$   
 $C \rightarrow y$
- Show actions taken by shift reduce parser for the string “xyyy” and explain shift, reduce, accept and reject actions performed by parser.
- (b) Define and Compute FIRST & FOLLOW for the following production 6
- $E \rightarrow TE$   
 $E' \rightarrow +TE'$   
 $E' \rightarrow \lambda$   
 $T \rightarrow FT'$   
 $T' \rightarrow *FT'$   
 $T' \rightarrow \lambda$   
 $F \rightarrow (E)$   
 $F \rightarrow id$

Turn Over

(c) Consider the following Flow graph

6



Compute: (1) Dominator (2) Dominator tree (3) Back edges and Natural Loop

(d) Consider the following grammar

6

- (1)  $F \rightarrow F * C$
- (2)  $F \rightarrow F + C$
- (3)  $F \rightarrow C$
- (4)  $C \rightarrow a$
- (5)  $C \rightarrow b$

Using the below parsing table Parse the string  $b+b *b$ .

state	action					goto	
	*	+	a	b	\$	F	C
0			s1	s2		3	4
1	r4	r4	r4	r4	r4		
2	r5	r5	r5	r5	r5		
3	s5	s6			acc		
4	r3	r3	r3	r3	r3		
5			s1	s2			7
6			s1	s2			8
7	r1	r1	r1	r1	r1		
8	r2	r2	r2	r2	r2		

Q.3 Attempt any two of the following

(12)

(a) Discuss leftmost and rightmost derivation with respect to following grammar.

6

- $A \rightarrow iCtA$
- $A \rightarrow iCtAdA$
- $A \rightarrow b$
- $C \rightarrow c$
- String : ictictbdb

(b)  $A \rightarrow A+P$

6

- $A \rightarrow P$
- $P \rightarrow P * F$
- $P \rightarrow F$
- $F \rightarrow (A)$
- $F \rightarrow a$
- Find LR (0) items.

Turn Over

- (c) Compare between top-down and bottom-up approach of parsing. Give example of each. 6
- (d) What is intermediate code? Explain various types of intermediate codes used by the compiler 6

Q.4 Attempt **any two** of the following (12)

- (a) Consider the simple precedence functions relation matrix below for the grammar 6
- $S \rightarrow b \mid \wedge \mid (R)$   
 $T \rightarrow S, T \mid S$   
 $R \rightarrow T$

	R	S	T	b	$\wedge$	,	(	)	\$
R								=	
S						=		>	
T								>	
b						>		>	>
$\wedge$						>		>	>
,		<	=	<	<		<		
(	=	<	<	<	<		<		
)						>		>	>
\$				<	<		<		

Using the above simple precedence relation parse the strings

1.  $((b, b), \wedge, (b)), b)$
2.  $(b \wedge b)$
3.  $(b, b)$

- (b) Discuss loop unrolling and loop jamming with suitable example. 6
- (c) Explain the role of frames in tiger compiler. 6
- (d) What are dominators? State properties of dominators. 6

Q.5 Attempt **any two** of the following (12)

- (a) Consider the following statement 6
- $$A * B + f * (A * B) - C - A * B$$
- Perform following
- 1) Convert into three address code.
  - 2) Create DAG
- (b) What is a need of symbol table in tiger compiler? How tiger compiler maintains the same? Give suitable example. 6
- (c) Define Register Descriptor and Address descriptor. Consider the following expression  $X = (B - C) * (B - D) * (B - D)$ . Translate the above expression into three address code sequences assuming only two registers available with the current architecture of the machine generate code. Also show the contents of Register Descriptor and Address Descriptor. 6
- (d) Define the terms : (1) Induction variable (2) Ambiguous grammar (3) Parse tree 6