

**III B.Tech I Semester Regular Examinations, November 2007**  
**AUTOMATA AND COMPILER DESIGN**  
 ( Common to Information Technology and Computer Science & Systems  
 Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
 All Questions carry equal marks

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1. (a) What is Finite Automaton? Give an example.
- (b) Find the number of tokens presented in the following 'FORTRAN' statements:
  - i. DO 100 I = 1.625
  - ii. IF ( MIN .EQ. MAX ) GOTO 1000
- (c) Find the Regular Expression for the DFA as shown in figure 1c. [2+2+12]

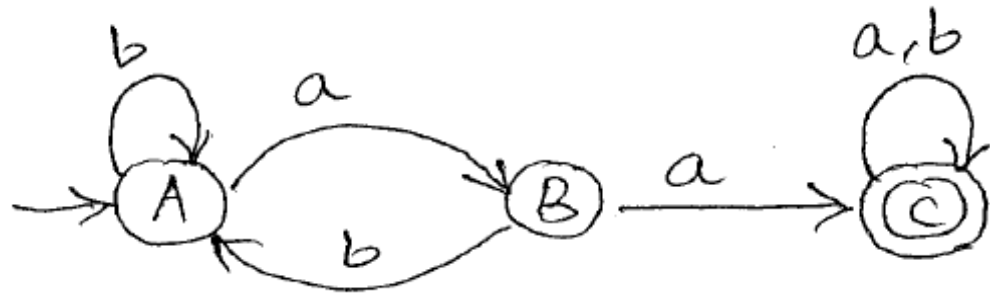


Figure 1c

2. (a) Construct a Context Free Grammar(CFG) for possible sequences of if and else in 'C'
- (b) Find the moves of the above grammar to derive the if - else sequence of the string: iieie. [10+6]
3. Consider the following augmented grammar:
 
$$S \rightarrow A$$

$$A \rightarrow BA | \epsilon$$

$$B \rightarrow aB | b$$
  - (a) Construct the LR(1) parser.
  - (b) Find the moves made by the LR(1) parser on the input string: a a b b. [10+6]
4. (a) Compare Inherited attributes and Synthesized attributes with an example.
- (b) Construct triples of an expression:  $a * - (b + c)$ . [8+8]
5. Explain Linear bounded automaton with an Example? [16]
6. (a) Write a notes on the static storage allocation strategy with example and discuss its limitations?

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**Set No. 1**

- (b) Discuss about the stack allocation strategy of runtime environment with an example? [8+8]
7. Write explain about Organization for an Optimizing Compiler? [16]
8. Write differences between single pass and two pass translation? [16]

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1. (a) Define Alphabets, Strings, and Languages. Give two examples of each.  
 (b) Consider the line number 4 of the following 'C' program:

```
int main()           /* Line 1 */
{                  /* Line 2 */
    int i, n;       /* Line 3 */
    fro(i=0, i<n, i++); /* Line 4 */
}                  /* Line 5 */
```

What is the compiler's response about this line while creating the object module? Explain. [9+7]

2. Write a Context Free Grammar(CFG) for the while statement in 'C' language. [16]

3. Consider the following augmented grammar:

$$S \rightarrow E$$

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

$$T \rightarrow a \mid (E)$$

- (a) Construct the DFA whose states are the canonical collection of LR(0) items.  
 (b) Construct the SLR(1) parse table. [8+8]

4. (a) Construct triples of the expressions:  $a[i] := b$  and  $a := b[i]$   
 (b) Generate the three-address code for the following 'C' program fragment:  
 for( i = 1; i <= 20; i++) if( a < b) x = y + z; [8+8]

5. (a) Write a short notes on context sensitive language with suitable example.  
 (b) Write about Linear Bounded Automata. [8+8]

6. Write and Explain about Symbol Table Organization? [16]

7. Explain the following:

- (a) Dominators  
 (b) Algorithm for Constructing the Natural Loops  
 (c) Reducible Flow Graphs. [4 × 4]

8. Explain the concept of label tree for code generation. [16]

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1. (a) Design a DFA that accepts the language over the alphabet,  $\Sigma = \{0, 1, 2\}$  where the decimal equivalent of the language is divisible by 3.  
 (b) Compare compiler and an interpreter with the help of suitable examples. [8+8]
2. (a) What is left factoring? Explain with a suitable example.  
 (b) What is the language, L generated by the following grammar, G:  
 $G = (\{S\}, \{a, b\}, \{S \rightarrow aSb \mid ab\}, S)$   
 (c) Identify the language, L generated by the following grammar, G:  
 $G = (\{S, A, B\}, \{a, b\}, \{S \rightarrow Aa, A \rightarrow a \mid B, B \rightarrow bB \mid b\}, S)$ . [6+5+5]
3. Construct the collection of non-empty sets of LR(0) items for the following augmented grammar:  
 $S \rightarrow E_1$   
 $E_1 \rightarrow T_3E_1 \mid T_1$   
 $E_2 \rightarrow T_3E_2 \mid T_2$   
 $T_1 \rightarrow a\$ \mid (E_2\$$  [16]  
 $T_2 \rightarrow a) \mid (E_2)$   
 $T_3 \rightarrow a+ \mid (E_2+.$
4. Translate the executable statements of the following 'C' program into a three-address code by assuming each element of an array 'a' takes 4 bytes. [16]  

```
void main()
{
    int i = 1, a[10];
    while(i++ <= 10)a[i] = 0;
}
```
5. (a) Distinguish static and dynamic Type checking?  
 (b) Explain about on Polymorphic functions? [8+8]
6. Write and Explain about algorithm for construction of equivalence trees? [16]
7. (a) Define the following:
  - i. Basic Block
  - ii. Local Optimization
  - iii. Global Optimization.

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**Set No. 3**

(b) Explain about Algebraic Transformations?

(c) “Copy propagation Leads to Dead code” - Justify the statement. [6+6+4]

8. Write and explain an algorithm for building a DAG from a basic Block . [16]

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}                   /* Line 5 */
```

What is the compiler's response about this line while creating the object module? Explain. [9+7]

2. Construct the predictive parse table for the following grammar:

$$S \rightarrow iEtSS' | a$$

$$S' \rightarrow eS | \epsilon$$

$$E \rightarrow b.$$

[16]

3. Consider the grammar:  $S \rightarrow (S) | a$

Construct the DFA for SLR(1), CLR(1), and LALR(1) parsers and find the number of states in each of the parser. [16]

4. Let synthesized attribute, Val give the value of the binary number generated by S in the following grammar. For example, on input 101.101, S.Val = 5.625.

$$S \rightarrow L \bullet L | L$$

$$L \rightarrow LB | B$$

$$B \rightarrow 0 | 1$$

Write synthesized attribute values corresponding to each of the productions to determine the S.Val. [16]

5. (a) what is type Checker? How does it work?

(b) Write short notes on Dynamic and Static type checking? [8+8]

6. Write and Explain about Runtime storage administration? [16]

7. (a) Explain Briefly about the Global Optimization?

(b) Distinguish machine dependent and machine independent optimization. [8+8]

8. Explain all the data structures used for designing the macro pre-processor? [16]

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