

III B.Tech I Semester Supplementary Examinations, February 2008
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

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) Test whether the following grammar is LL(1) or not.
 $S \rightarrow AaAb | BbBa$
 $A \rightarrow \epsilon$
 $B \rightarrow \epsilon$
 (b) Construct the predictive parse table for the following grammar:
 $S \rightarrow A$
 $A \rightarrow aB | Ad$
 $B \rightarrow bBC | f$
 $C \rightarrow g$. [8+8]
3. (a) What is LR parser? Compare and contrast the different types of LR parsers.
 (b) Construct the CLR parse table for the following augmented grammar:
 $A' \rightarrow A$
 $A \rightarrow (A) | a$ [8+8]
4. (a) Compare Inherited attributes and Synthesized attributes with an example.
 (b) Construct triples of an expression: $a * - (b + c)$. [8+8]
5. (a) List out various typical semantic errors .Explain the procedure to rectify them?
 (b) What is Static Checking? List out some examples of static checks? [8+8]
6. (a) Write a notes on the static storage allocation strategy with example and discuss its limitations?
 (b) Discuss about the stack allocation strategy of runtime environment with an example? [8+8]
7. Write about the following Algorithms
 (a) Detection of Loop Invariant Computation
 (b) Code Motion. [8+8]
8. Explain about Generic code generation algorithm? [16]

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1. (a) Obtain the Kleen Closure and Positive Closure of the language {ba, bb}, where the alphabet $\Sigma = \{a, b\}$.
 (b) Give a finite state diagram that accepts all the floating-point numbers. [6+10]
2. (a) What is the time complexity of a parser to parse a string of 'n' tokens?
 (b) Consider the Grammar: $G = (\{S, A\}, \{a, b\}, \{S \rightarrow aAa | bAb | A, A \rightarrow SS\}, S)$
 Find the leftmost derivation, rightmost derivation, and parse tree for the string: baabbb. [6+10]
3. Construct the collection of non-empty sets of LR(0) items for the following augmented grammar:
 $S \rightarrow E_1$
 $E_1 \rightarrow T_3E_1 | T_1$
 $E_2 \rightarrow T_3E_2 | T_2$
 $T_1 \rightarrow a\$ | (E_2\$$
 $T_2 \rightarrow a) | (E_2)$
 $T_3 \rightarrow a+ | (E_2+$ [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. Explain the following:
 (a) Type checking of Expressions
 (b) Translation scheme for checking the type of statements. [8+8]
6. (a) Explain the concept of implicit deallocation of memory.
 (b) Give an example of creating dangling references and explain how garbage is created. [8+8]
7. Explain about Data-Flow analysis of structured flow graphs. [16]

Code No: R05311201

Set No. 2

8. What are legal evolution orders and names for the values at the nodes for the DAG for following?

$d := b + c$

$e := a + b$

$b := b * c$

$a := e - d.$

[16]

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1. (a) Explain Regular Expressions with suitable examples.
 (b) Design a DFA that accepts the language over $\Sigma = \{a, b\}$ of all strings that contain the sub-string either aa or bb. [6+10]

2. (a) Write a procedure to combine two NFA's into a single NFA. The operations to be performed are those of concatenation, union and closure.
 (b) Obtain the Non-deterministic Finite Automaton (NFA) corresponds to the Grammar,
 $G = (\{S, X, Y\}, \{a, b\}, P, S)$, where P is defined as follows:
 $P \rightarrow aS \mid bS \mid bX$
 $X \rightarrow bY \mid b$
 $Y \rightarrow aY \mid bY \mid a \mid b.$ [8+8]

3. (a) What is meant by a parser generator? Illustrate with examples using YACC.
 (b) How are ambiguities resolved in YACC? [10+6]

4. Generate the three-address code for the following 'C' program fragment: [16]

```
while(a > b)
{
    if (c < d) x = y + z;
    else x = y - z;
}
```

5. (a) What is Type Expression? Write type Expressions for the following type
 i. A Two dimensional array integers (i.e. an array of arrays) whose rows are indexed from 0 to 9 and whose columns are indexed from -10 to 10.
 (b) What is Type System? Discuss static and dynamic Checking of types? [8+8]

6. (a) Write a notes on the static storage allocation strategy with example and discuss its limitations?
 (b) Discuss about the stack allocation strategy of runtime environment with an example? [8+8]

7. Explain the following
 (a) Copy Propagation
 (b) Dead-Code Elimination

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Set No. 3

(c) Code Motion

(d) Reduction in Strength.

[4×4]

8. Construct DAG for the following basic block:

d: = b+c

e: = a+b

b: =b*c

a: = e-d.

[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. Write a Context Free Grammar(CFG) for the while statement in 'C' language. [16]
3. (a) What is meant by a parser generator? Illustrate with examples using YACC.
(b) How are ambiguities resolved in YACC? [10+6]
4. (a) What are L-attributed definitions? Explain with an example.
(b) Draw the syntax tree for the following Boolean expression:
(P < Q AND R < S) OR (T < U AND R < Q). [8+8]
5. (a) Distinguish static and dynamic Type checking ?
(b) Discuss in detail about semantic analysis phase? [8+8]
6. (a) Explain how scope information is represented in the symbol table for block structured language?
(b) Write and explain about activation record? [10+6]
7. Explain in detail the procedure that eliminating global common sub expression? [16]
8. Write and explain about object code forms? [16]
