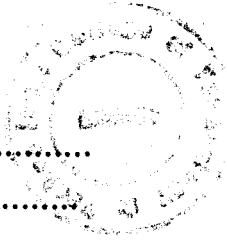


Tiet Lib.



Name :

Roll No. :

Invigilator's Signature :

**CS/B.TECH (CSE)/SEM-7/CS-701/2009-10
2009**

LANGUAGE PROCESSOR

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

10 × 1 = 10

- i) The regular expression $(a | b) * abb$ denotes
 - a) all possible combinations of a 's and b 's
 - b) set of all strings ending with abb
 - c) set of all strings starting with a and ending with abb
 - d) none of these.
- ii) An inherited attributes is the one whose initial value at a parse tree node is defined in terms of
 - a) attributes at the parent and/or siblings of that node
 - b) attributes at children nodes only
 - c) attributes at both children nodes and parent and/or siblings of that node
 - d) none of these.

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- iii) The intersection of a regular language and a context free language is
- a) always a regular language
 - b) always a context free language
 - c) always a context sensitive language
 - d) none of these.
- iv) If I is a set of valid items for a viable prefix γ , then $GOTO (I, X)$ is a set of items that are valid for the viable prefix :
- a) γX
 - b) γ
 - c) prefix of γ
 - d) none of these.
- v) Shift-reduce parsers are
- a) top-down parsers
 - b) bottom-up parsers
 - c) may be top-down or bottom-up parsers
 - d) none of these.
- vi) In a programming language, an identifier is permitted to be a letter followed by any number of letters or digits. If L and D denote the set of letters and digits respectively, which of the following expressions defines an identifier ?
- a) $(L U D) ^ +$
 - b) $L . (L U D) ^ *$
 - c) $(L . D) ^ *$
 - d) $L . (L . D) ^ *$

vii) The following productions of a regular grammar generates a language L.

$$S \rightarrow aS \mid bS \mid a \mid b$$

The regular expression for L is

- a) $a + b$
- b) $(a + b)^*$
- c) $(a + b)(a + b)^*$
- d) $(aa + bb)a^*$

viii) Which of the following is not a loop optimization ?

- a) Induction variable elimination
- b) Loop jamming
- c) Loop unrolling
- d) Loop heading.

ix) Which of the following is not true about dynamic type checking ?

- a) It increases the cost of execution
- b) Type checking is done during the execution
- c) All the type errors are detected
- d) None of these.

x) An annotated parse tree is a parse tree

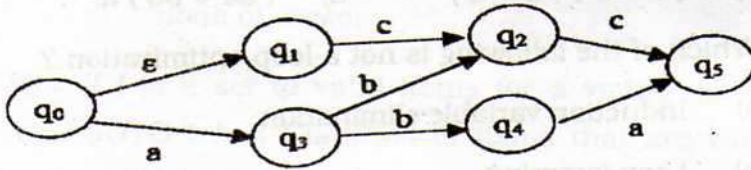
- a) with values of only some attributes shown at parse tree nodes
- b) with attribute values shown at the parse tree node
- c) without attribute values shown at the parse tree nodes
- d) with grammar symbols shown at the parse tree nodes.

GROUP - B

(Short Answer Type Questions)

Answer any three of the following. $3 \times 5 = 15$

2. Convert the non-deterministic FA below to its equivalent DFA.



3. Consider the following lexically nested C code :

```
int a, b ;  
int foo() { int a, c ; }  
int bar() { int a, d ; /* HERE * / }
```

- a) How can symbol tables represent the state of each scope at the point marked HERE ? Draw a diagram.
- b) What symbols are visible/not visible at point HERE ?

3 + 2

4. Consider the context-free grammar

```
S → SS + | SS * | a
```

- a) Show how the string $aa + a^*$ can be generated by this grammar.
- b) Construct a parse tree for this string.
- c) What language does this grammar generate ? Justify your answer.

2 + 1 + 2

5. a) How does Lexical Analyzer help in the process of compilation ? Explain it with an example.

b) Consider the following conditional statement :

if ($x > 3$) then $y = 5$ else $y = 10$;

From the above statement how many tokens are possible and what are that ? 3 + 2

6. What is look ahead operator ? Give an example. With the help of the look ahead concept show how identifiers can be distinguished from keywords. 1 + 1 + 3

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Explain the different phases of a compiler, showing the output of each phase, using the example of the following statement :

position := initial + rate * 60

b) Compare compiler and interpreter. 10 + 5

8. a) Construct SLR parsing table for the following grammar :

$S \rightarrow AS \mid b$

$A \rightarrow SA \mid a$

b) What is an operator grammar ? Give an example. 12 + 3

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9. a) Translate the following expression :

$$a = b * - c + b * - c$$

into

i) Quadruples

ii) Triples

iii) Indirect Triples.

b) What are the differences among Quadruples, Triples and Indirect Triples ?

c) Generate machine code for the following instruction :

$$v = a + (b * c) - d.$$

$$(3 + 3 + 3) + 3 + 3$$

10. a) Construct the DAG for the following basic block :

$$d := b * c$$

$$e := a + b$$

$$b := b * c$$

$$a := e - d$$

b) What is peephole optimization ?

c) Consider some interblock code optimization without any data flow analysis by treating each extended basic block as if it is a basic block. Give algorithms to do the following optimizations within an extended basic block. In each case, indicate what effect on other extended basic blocks a change within one extended basic block can have.

i) Common sub-expression elimination

ii) Constant folding

iii) Copy propagation.

$$4 + 3 + 8$$

11. Write short notes on any *three* of the following : 3 × 5

- a) Loop optimization
- b) Dependency graph
- c) Input buffering
- d) YACC
- e) Symbol Table
- f) L-attributed definitions
- g) LEX.



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