



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  $(a \mid b)^*abb$  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.



- 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  $\gamma$ , then  $GOTO ( I, X )$  is a set of items that are valid for the viable prefix :
- a)  $\gamma X$
  - b)  $\gamma$
  - c) prefix of  $\gamma$
  - 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)  $L . ( L . D ) ^ * .$





**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.

dia

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

$S \rightarrow SS + \mid SS^* \mid a$

- 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



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 :

$$d := b * c$$

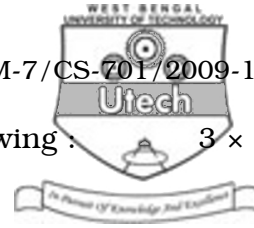
$$e := a + b$$

$$b := b * c$$

$$a := e - d$$

- 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 :  $3 \times 5$

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

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