



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.Tech(SE, CSE)/SEM-2/PGSE-203, PGCSE-204A/2013  
2013**

**PRINCIPLES OF LANGUAGE TRANSLATION**

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.*

Answer any five questions.

5 × 14 = 70

1. a) What are meant by 'lexeme' and 'token' ?  
b) Give regular expressions for the following languages on  $\Sigma = \{ a, b \}$  :
    - i) All strings containing at least one 'b'
    - ii) All strings containing at least two 'a'.
  - c) Convert the following regular expression to NFA :  
 $(a|b)a^*b^*$
  - d) Convert the NFA to DFA and minimize the DFA.  
 $2 + 2 + 2 + 8$
2. a) What is meant by 'terminal' and 'non-terminal' in a context free grammar ?



- b) Eliminate Left Recursion in the following grammar :

$$S \rightarrow a | \uparrow | (T) | T$$

$$T \rightarrow T, S | a | \uparrow | (T)$$

- c) Test ambiguity in the following grammar :

$$S \rightarrow +SS | -SS | a$$

- d) Consider the following grammar :

$$S \rightarrow L = R | R$$

$$L \rightarrow *R | id$$

$$R \rightarrow L$$

- i) Construct a predictive parse table for the above mentioned grammar.

- ii) Show the actions of the parser for the input string  
"id = \*id" 2 + 2 + 2 + 8

3. a) Show the shift-reduce conflict in SLR parsing table for the following grammar :

$$S \rightarrow iCtS$$

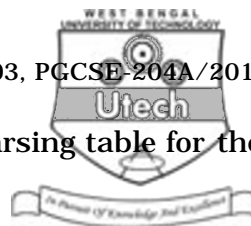
$$S \rightarrow iCtSeS$$

$$S \rightarrow a$$

$$C \rightarrow e$$

- b) Test whether the CLR parser can resolve the conflict.

$$6 + 8$$



4. a) Construct the operator precedence parsing table for the following grammar :

$$\text{exp} \rightarrow \text{exp} + \text{exp} \mid \text{exp} * \text{exp} \mid (\text{exp}) \mid \text{id} \mid \text{a}$$

- b) Consider the sentence  $\text{id} * \text{id} + \text{id}$  for parsing and show the parsing action. 9 + 5

5. a) What is the type expression for  $\text{"int [2] [3]"}$  ?  
 b) Write SDD for the following grammar and show the dependency graph for  $\text{"int [2] [3]"}$  :

$$T \rightarrow BC$$

$$B \rightarrow \text{int}$$

$$B \rightarrow \text{float}$$

$$C \rightarrow [\text{num}]C_1$$

$$C \rightarrow E$$

- c) Write SDD for the following grammar and show the dependency graph for  $\text{"a - b + 5"}$

$$E \rightarrow TE'$$

$$E' \rightarrow + TE'$$

$$E' \rightarrow - TE'_1$$

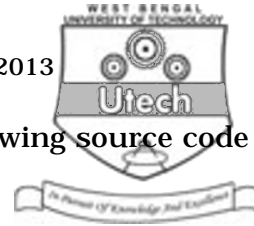
$$E' \rightarrow - E$$

$$T \rightarrow (E)$$

$$T \rightarrow \text{id}$$

$$T \rightarrow \text{num}$$

2 + 6 + 6



6. a) Write three address code for the following source code

```
while ( x < y ) {  
    z = 5;  
    for ( a = 0; a < = 10; a++ ) {  
        if ( c < d ) k = 1;  
        else k = 2;  
    }  
}
```

b) Generate code for the following expression using labelled tree DAG.

$(a - b) * (a - c - b) + (a - b - c)$       7 + 7

7. Write short notes on any *two* of the following :      7 + 7

- a) Symbol table
- b) LALR parsing
- c) Register allocation problem
- d) Predictive parsing.

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