Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (CSE)/SEM-2/MCSE-204/2010

2010

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.

GROUP – A

Answer any *five* of the following. 5 × 5 = 25

1. A public telephone (P.C.O) accepts one or two rupee coins. That can be made only when the total amount inserted is rupees two. Suppose the telephone has LED–GREEN and RED. The GREEN LED is set when the call is being made. The RED LED is set when the total amount inserted is rupees three or more. The call is possible only when RED LED is off. Construct a deterministic finite automata corresponding to this machine.

2. Construct the deterministic finite automata that accepts the following language :

   $L = \{ x \in \{ 0, 1 \}^* : |x|_1 = 0 \bmod (5) \}$.

3. Construct a deterministic finite automata that accepts the language L, that consists of string over {0, 1} whose decimal representation is divisible by 5.

4. Construct a deterministic finite automata that accepts the following language :

   $L = \{ x \in \{ a, b \} : |x|_a = \text{Odd and } |x|_b = \text{Even} \}$

5. We define a modulo 3 counter to be a machine that receives a sequence of input symbols from { 0, 1, 2 } and produces a sequence of 0's and 1's and 2's as output, that is, the output is equal to the modulo 3 sum of the digits of the input sequence. Design such a finite state machine.

6. Write a context free grammar (CFG) for structure definition in C. Assume that the only allowable types are char, int, and float (you need not handle pointers, arrays, structure, fields etc.)

7. Assume that characters are stored using 1 byte each, ints and floats are stored using 4 bytes each and are aligned at 4 byte boundaries. Add semantic rules to your grammar to calculate the number of bytes required to store the structure defined by your grammar.

GROUP – B

Answer any *three* of the following. 3 × 15 =45

8. Consider the following grammar for some language L :

   $E \rightarrow TE'$

   $E' \rightarrow +\ TE' / \varepsilon$

   $T \rightarrow FT'$

   $T' \rightarrow *FT' / \in$

   $F \rightarrow (E) / id$

   a) Define FIRST and FOLLOW for the non-terminals and hence compute FIRST and FOLLOW for each non-terminal for the above grammar.

   b) Write down the algorithm for predictive parsing table and hence construct the predictive parsing table for the grammar. 7 + 8

9. a) What is predictive parser ? Explain the working principle of predictive parser.

   b) What is shift reduce parser ? For the language $w = id1 + id2*id3$ the following grammar is satisfied or not by shift reduce parser and draw the corresponding parse tree :

   $E \rightarrow E + E$

   $E \rightarrow E*E$

   $E \rightarrow (E)$

   $E \rightarrow id.$ 7 + 8

10. a) Write down the function of lexical analyzer.

    b) Discuss the different phases of complier with suitable example.

    c) Write down the transition diagram of relational operator in lexical analyzer. 3 + 8 + 4

11. a) Construct a finite state machine that accepts all the binary strings over {0, 1} in which the number of 1's and number of 0's are divisible by 3 and 2, respectively.

b) Describe the language recognized by the following machine.

Fig.

c) Consider the grammar E → E + n | E × n | n. For the sentence $n + n \times n$. Find the handles in the right sentential form of the reductions. 5 + 5 + 5

12. a) Consider the context-free grammar

$G = (\{ S, A \}, \{ a, b \}, P, S)$ where

$P = \{ S \rightarrow AS, S \rightarrow b, A \rightarrow SA, A \rightarrow a \}$. Show that G is left recursive. Write an equivalent grammar G_1 free of left recursion.

b) Consider the grammar $G = (\{ S, T \}, \{ a, \pi, (,), + \}, P, S)$

where $P = \{ S \rightarrow a \mid \pi \mid (T), T \rightarrow T + S \mid S \}$. Find the parse tree for the sentence : ((($a + a$) + π + (a)) + a).

8 + 7