Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-5/MCAE-504A/2010-11

2010-11

COMPILER DESIGN

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 : $10 \times 1 = 10$

i) Given below are the regular expressions :

I. $(a | b)^*$

II. $(a^* b^*)^*$

III. $(ab)^*$

Of these :

a) I alone is correct

b) I and II are correct

c) I, II and III are correct

d) II and III are correct.

ii) A synthesized attribute is the one whose value at a parse tree node is defined in terms of

a) attributes at the siblings only

b) attributes at parent node only

c) attributes at children nodes only

d) none of these.

iii) LR grammar is a

a) context free grammar

b) context sensitive grammar

c) regular grammar

d) none of these.

iv) Cross-compiler is a compiler

a) which is written in a language that is different from the source language

b) that generates object code for its host machine

c) which is written in a language that is same as the source language

d) that runs on one machine but produces object code for another machine.

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

a) Induction variable elimination

b) Loop unrolling

c) Loop jamming

d) Loop heading.

vi) If $G = (V, T, P, S)$ is a context free grammar, then $L (G)$ will be infinite if and only if

a) at least one production in P is recursive

b) no production is recursive

c) all production are recursive

d) none of these.

vii) Given a grammar $G = \{ \{ E \}, \{ id, + \} P, E$ where P is given by $E \varnothing E + E, E \varnothing id$. Then FOLLOW (E) will contain

a) { $ }

b) { + }

c) { $, + }

d) { $, *id*, + } .

viii) Given two DFA's M1 and M2. They are equivalent if

a) M1 and M2 has the same number of states

b) M1 and M2 has the same number of final states

c) M1 and M2 accepts the same language
L (M1) = L (M2)

d) none of these.

ix) If a grammar is LALR(1) then which one is necessary ?

a) SLR(1) b) LR(1)

c) LL(1) d) None of these.

x) A pictorial representation of the value computed by each statement in the basic block is

a) tree b) DAG

c) graph d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What is a context sensitive grammar ? What are regular expression and regular grammar ?

3. Write quadruples for the expression

(a + b)* (c + d) – (a + b + c). Explain the advantage of indirection in symbol table.

4. Draw transition diagrams to recognize unsigned numbers.

5. Describe the language denoted by the following regular expressions :

a) $a\ (\ a|b\ )^*\ a$

b) $a|a^*\ b$

c) $(\ a|b\ )^*\ a(\ a|b\ )\ (\ a|b\ )$

6. What is ambiguity ? Explain how ambiguity can be removed in the following grammar :

statm ∅ if cond then statm

| if cond then statm else statm

| other

GROUP – C

(Long Answer Type Questions)

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

7. What are the different phases of a compilation process ? Describe briefly each phase and illustrate each phase with a suitable example.

8. Consider the grammar

$S \varnothing iEtSS' / a$

$S' \varnothing eS / \lambda$

$E \varnothing b$

a) Compute FIRST and FOLLOW for the non-terminals of the grammar.

b) Construct a predictive parsing table for the given grammar. Is it an LL(1) grammar ? Justify. 7 + 8

9. a) Consider the grammar

$i \varnothing i + d / i - d / i * d / d$

$d \varnothing 0 / 1 / 2 / \ldots\ldots / 9$

Show the parse tree for the expression $8 + 3 \infty 5 - 4$.

b) Construct an NFA and hence DFA for ab^* / ba^*

c) Define formal grammars and classify them. 5 + 5 + 5

10. a) When is a grammar said to be ambiguous ? Show that the following grammar is ambiguous

$S \varnothing A / B \quad A \varnothing Ac / Bc / b \quad B \varnothing bA / bB /$ c.

b) What is a 'Left Recursive Grammar' ? Illustrate with example.

c) Define 'Deterministic Finite Automata (DFA) and Context Free Grammar (CFG)'.

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

a) DAG

b) Symbol table

c) LEX

d) YACC

e) Syntax directed translation.