

CS-702

COMPILER DESIGN

Time Allotted: 3 Hours

Full Marks: 70

The questions are of equal value.

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. Answer all questions. 10×1 = 10
- (i) Which of the following translation program converts assembly language program to object program
- (A) assembler (B) compiler
(C) macro-processor (D) linker
- (ii) The grammar $E \rightarrow E + E \mid E * E \mid a$, is
- (A) ambiguous
(B) unambiguous
(C) ambiguous or not depends on the given sentence
(D) none of these
- (iii) Shift reduce parsers are
- (A) top-down parsers (B) bottom –up parsers
(C) predictive parsers (D) none of these
- (iv) The peep-hole optimization
- (A) is applied to a small part of the code
(B) can be used to optimize intermediate code
(C) can be applied to a portion of the code that is not contiguous
(D) all of these

- (v) Which of the following uses only synthesized attributes?
(A) S-attributed grammar (B) L-attributed grammar
(C) Inherited attribute (D) none of these
- (vi) YACC builds up
(A) SLR parsing table (B) LALR parsing table
(C) canonical LR parsing table (D) none of these.
- (vii) Which data structure is mainly used during shift-reduce parsing?
(A) pointers (B) arrays
(C) stacks (D) queues
- (viii) Which of the following expression has no l-value?
(A) $a(I + 1)$ (B) a
(C) 7 (D) $* a$
- (ix) If x is a terminal, the FIRST (x) IS
(A) ϵ (B) $\{x\}$
(C) $x *$ (D) none of these
- (x) The expression wcw where w belongs to $\{a,b\}^*$ is
(A) regular (B) context free
(C) context sensitive (D) none of these

GROUP B
(Short Answer Type Questions)

Answer any *three* questions.

3×5 = 15

2. Using a block diagram indicate the phases of compilation explaining their activities. 5
3. What is a handle? Describe various actions of a shift reduce parser. 2+3

4. Eliminate left recursion from the following grammar: 5
 $E \rightarrow E + T \mid T$
 $T \rightarrow TF \mid F$
 $F \rightarrow F * \mid a \mid b$
5. Explain Left Factoring with suitable example. 5
6. For the input expression $(4 * 7 + 1) * 2$ construct an annotated parse tree. 5

GROUP C
(Long Answer Type Questions)

Answer any *three* questions.

3×15 = 45

7. (a) Consider the grammar: 4×2
 $S \rightarrow aSbS \mid bSaS \mid E$
 (i) Show that this grammar is ambiguous by constructing two different left most derivations for the sentence abab.
 (ii) Construct the corresponding right most derivations for abab.
 (iii) Construct the corresponding parse trees for abab.
 (iv) What language does this grammar generate?
 (b) (i) Show that no left recursive grammar can be LL (1). 2×3.5
 (ii) Show that no LL(1) grammar can be ambiguous.
8. (a) Translate the following expression: (3+3+3)+3
 $a = b * - c + b * - c$ into +3
 (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:
 $V = a + (b * c) - d.$
9. (a) What do you mean by input buffering? 3+4+3.5+
2.5+2
 (b) How is input buffering implemented?

- (c) What problem can arise implementing input buffering? Give a suitable example.
- (d) What is sentinel?
- (e) What is its use?

- 10.(a) What do you understand by L-attributed definition? Give example. (2+3)+5+5
- (b) Describe with diagram the working process of Lexical Analyzer.
 - (e) Describe LR passing with block diagram.

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

- (a) What is activation record? Explain clearly the components of an activation record.
- (b) YACC
- (c) Back patching
- (d) Thompson's construction
- (e) Constant folding and copy propagation.