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V 4127

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Eighth Semester

Information Technology

CS 1352 — PRINCIPLES OF COMPILER DESIGN

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is Data-flow analysis?
2. Write a regular expression to denote all the binary strings consisting of exactly three a's.
3. State the essential requirements for a grammar that can be parsed using Operator-Precedence parsing.
4. Given the expression grammar, trace the actions a Shift-Reduce parser performs, on parsing the input string $id * id + id$.
5. Write the semantic rules for generating code for a 'while' statement given the following : $S \rightarrow \text{while } E \text{ do } S 1$.
6. What is back patching?
7. Draw the flow graph for the following program

```
Begin
    prod 0;
    i := 0;
    do begin
        prod := prod + a[i] + b[i];
        i := i + 1;
    End
    while i <= 20
End
```

8. What is a DAG? State its use.
9. When do you call a node as dominating node?
10. What is Copy-restore?

14.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the phases of the compiler with a neat diagram and describe how the following statement would be translated after each phase

$$\text{position} = \text{initial} + \text{rate} * 60 \quad (10)$$
- (ii) Mention any four compiler construction tools and briefly explain about each. (6)

15.

Or

- (b) (i) What are the issues in lexical analysis? (4)
- (ii) Construct an NFA using Thompson's construction for the expression $a(a/b)^* ab$ and from the constructed NFA construct a DFA. (12)
12. (a) (i) Show that the following grammar is not LL (1) (10)
- $$S \rightarrow iEtS | iEtSeS | a$$
- $$E \rightarrow b$$
- (ii) Explain Error recovery in predictive parsing. (6)

Or

- (b) (i) For the grammar given below construct the CALR parsing table and verify whether the string "cdd" is a valid one or not
- $$S \rightarrow CC$$
- $$C \rightarrow cC | d \quad (12)$$
- (ii) Explain error recovery in LR parsing. (4)
13. (a) (i) What are the types of three address statements? (8)
- (ii) What are the various implementation techniques for three address statements? (8)

Or

- (b) (i) What is an assignment statement? How are assignment statements converted into three address code, during the translation from the data that is available in the symbol table, temporary names, array elements? (8)
- (ii) Explain the translation scheme of the assignment statement involving array elements. (8)

14. (a) (i) What are the issues in the design of code generator? (8)
(ii) What are the structure preserving transformations on basic blocks? (8)

Or

- (b) (i) Explain peephole optimization in detail. (10)
(ii) Explain the allocation of registers to variable in a program using the graph coloring algorithm. (6)
15. (a) Explain the principal sources of optimization in detail. (16)

Or

- (b) (i) Explain the various storage allocation strategies in detail. (10)
(ii) Discuss the source language issues during run-time. (6)
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