B. TECH.

SIXTH SEMESTER EXAMINATION, 2002-2003

COMPILER CONSTRUCTION

Time : 3 Hours   *Total Marks : 100*

Note : (1) Attempt **ALL** the questions.

(2) All questions carry equal marks.

1. Attempt any FOUR of the following :—   (5×4=20)

(*a*) What is a cross compiler ? How is bootstrapping of a compiler done to a second machine ?

(*b*) What are phases of a compiler ? Explain the function of each phase in brief.

(*c*) State the algorithm to construct an NFA from a given regular expression. Construct NFA for the regular expression

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

(*d*) How will you determine, with the help of a parse tree, that the given grammar is ambiguous ? Explain with example.

(*e*) Construct NFA to DFA for the regular expression $(a|b)^*ab^*a$. First show the construction of NFA, then demonstrate DFA construction.

(*f*) What do you mean by a regular expression ? Write some properties of a regular expression. Write a regular expression over alphabet $\Sigma = (a, b, c)$ that represents all strings of length three.

2. Attempt any TWO of the following :— (10×2=20)

   (a) State the problems associated with Top-Down parsing. State and eliminate the problem associated with following grammar for Top-Down parsing :—

   $$E \rightarrow E + T \,|\, T$$
   $$T \rightarrow T * F \,|\, F$$
   $$F \rightarrow (E) \,|\, id$$

   (b) After computing FIRST and FOLLOW functions, construct predictive parsing table for the following grammar :—

   (i) $E \rightarrow TE'$ (ii) $E' \rightarrow + TE' \,|\, \varepsilon$

   (iii) $T \rightarrow FT'$ (iv) $T' \rightarrow * FT' \,|\, \varepsilon$

   (v) $F \rightarrow (E) \,|\, id$

   (c) Define CLOSURE (I) and GOTO (I, X) functions. Construct the sets of LR(O) items for the following grammar :—

   $$E \rightarrow E + E \,|\, E * E \,|\, (E) \,|\, id$$

3. Attempt any TWO of the following :— (10×2=20)

   (a) Explain the following categories of intermediate codes :—

   (i)   Three-address codes

   (ii) Quadruples

   (iii) Triples

   (b) Translate the expression :
   $$A := - B * (c + d) \,|\, E$$
   into Quadruples and Triples representations.

(c) What is a basic block ? How can a sequence of three-address statements be transformed into a list of basic blocks ? Show it with examples.

4. Attempt any TWO of the following :— (10×2=20)

(a) Discuss the following parameter passing techniques with suitable example :—

   (i) call by value

   (ii) call by reference

   (iii) call by name.

(b) What are the various storage management techniques available ? What are their importance in compiler design ?

(c) What are the various types of errors that may appear in compilation process ? Explain the function of Error Handling phase of a compiler.

5. Attempt any TWO of the following :— (10×2=20)

(a) Explain the need of code optimization. With example, illustrate loop optimization.

(b) What is global data flow analysis ? What is its use in code optimization ?

(c) What is DAG ? What are its advantages in context of optimization ? How does it help in elimination of common-subexpression ?

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