Code No: 07A70511 **R07** **Set No. 2**

IV B.Tech I Semester Examinations,MAY 2011
AUTOMATA AND COMPILER DESIGN
Electronics And Computer Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the following:
   i. Basic Block
   ii. Local Optimization
   iii. Global Optimization.
   (b) Explain about Algebraic Transformations?
   (c) "Copy propagation Leads to Dead code" - Justify the statement. [6+6+4]

2. Generate code for following instructions and their associated cost, assume 3 registers are available and all variables are static.
   (a) X = a[i] + 1
   (b) a[i] = b[c[i]]
   (c) a[i][j] = b[i][k] * c[k][j]
   (d) a[i] = b[i] + c[j]. [4 × 4]

3. (a) Find ∈-Closure(A) and ∈-Closure(C) for the Finite Automaton as shown in figure 3a.

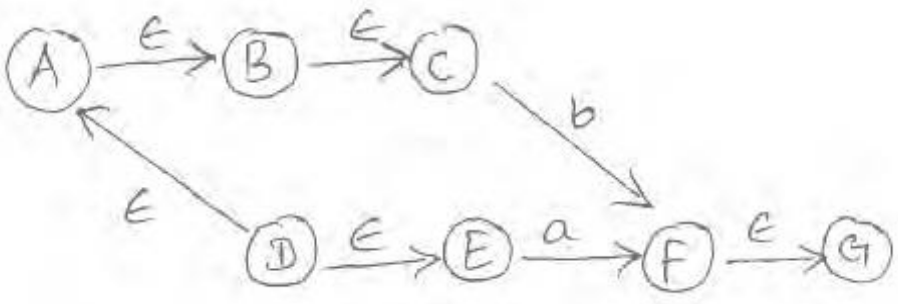

Figure 3a

   (b) Explain the bootstrapping process with a suitable diagram. [6+10]

4. Describe, in detail, an operator precedence parsing with an example. [16]

5. (a) Explain how scope information is represented in the symbol table for block structured language?
   (b) Write and explain about activation record? [10+6]

6. (a) Construct triples of the expressions: a[i] := b and a := b[i]
   (b) Generate the three-address code for the following 'C' program fragment: for(i = 1; i <= 20; i++) if(a < b) x = y + z; [8+8]

7. (a) Distinguish static and dynamic Type checking?
   (b) Discuss in detail about semantic analysis phase? [8+8]

8. (a) Test whether the following grammar is LL(1) or not.
   S → AaAb |BbBa
   A → ∈
   B →∈
   (b) Construct the predictive parse table for the following grammar:
   S → A
   A → aB |Ad
   B → bBC |f
   C → g. [8+8]

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Code No: 07A70511 **R07** **Set No. 4**

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1. (a) Write the algorithm to test structural equivalence of two type expressions s and t.
   (b) Write about type graph. [8+8]
2. (a) Construct a Context Free Grammar(CFG) for generating the balanced parentheses, like ( ), [ ], [( ) ( )], ([ ]), etc.
   (b) Find the moves of the above grammar to derive the string: ([( )] ( ))[10+6]
3. Construct DAG for the following basic block:
   d: = b+c
   e: = a+b
   b: =b*c
   a: = e-d. [16]
4. (a) Which data structure will be used to implement a symbol table in an efficient way? Give reasons.
   (b) Discuss and analyze about all the allocation strategies in run-time storage environment [8+8]
5. (a) Construct an NFA equivalent to the following Regular Expressions:
      i. (0 + 1(01)*)*
      ii. (00 +1)* (10)*
   (b) Compute the equivalent DFA for the NFA as shown in figure 5b.
   [4+4+8]

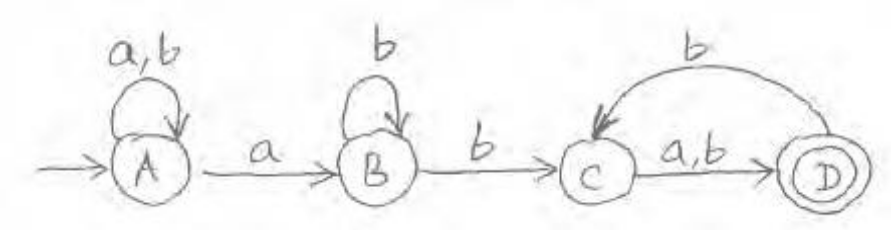

Figure 5b

6. What is the limit flow graph? Is the flow graph shown in figure 6 reducible? Explain. [16]

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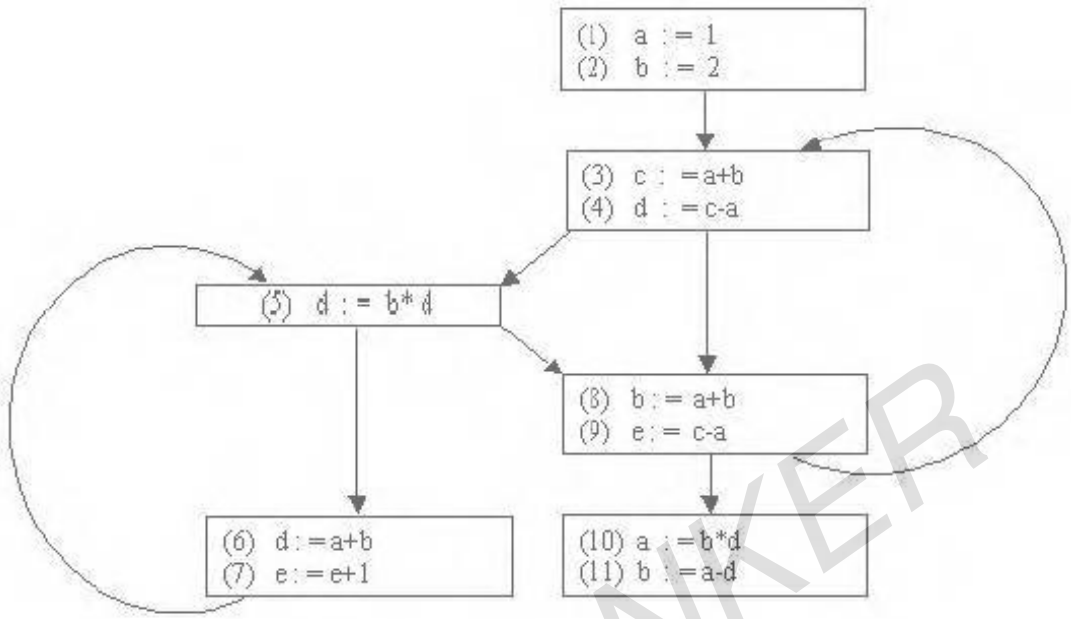

Figure 6

7. Generate the three-address code for the following executable statements of the 'C?' program fragment by assuming ?a? and ?b? are arrays of size 20 × 20 and there are 4 bytes per word. [16]

```
void main()
{
        int i = 1, j = 1, add=0;
        do
        {
                add = add + a[i][j] * b[j][i];
                i = i + 1;
                j = j + 1;
        }
        while(i <= 20 && j <= 20);
}
```

8. Consider the following grammar:
   $E \rightarrow E + T \,|T$
   $T \rightarrow T * F \,|F$
   $F \rightarrow (E) \,|a$

   (a) Construct the SLR parse table.

   (b) Find the moves made by the parser on the input string: a + a * a. [10+6]

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1. (a) What is an LL(1) parse table? Explain.
   (b) Build an LL(1) parse table for the following production grammar:
   S → CC
   C → cC | d. [6+10]

2. (a) What is a Syntax Directed Definition? Give an example.
   (b) Explain the Dependency Graph with an example. [6+10]

3. (a) Explain scope and lifetime of variable with some suitable examples.
   (b) What is meant by dangling references? Explain. [8+8]

4. Explain in detail various type of Grammars, Languages and its equivalent recognizers? [16]

5. (a) Construct a DFA accepting the set of strings with an odd number of 0's and an odd number of 1's over the alphabet Σ = {0, 1}.
   (b) Find the Regular expression for the Finite Automaton as shown in figure 5b. [16]

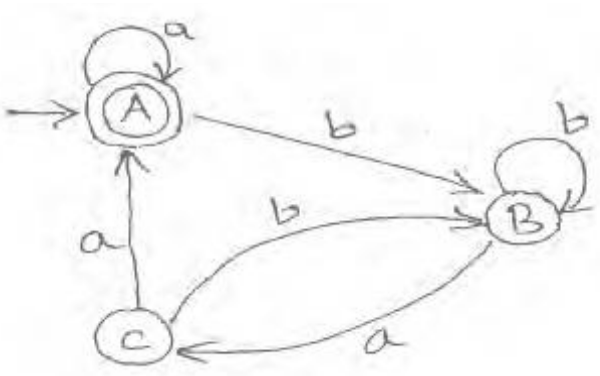

Figure 5b

6. Build the SLR(1) parsing table for the following grammar:
   E → E + T |T
   T → TF |F [16]
   F → F∗ |a| b.

7. (a) Write and explain about Data-Flow Analysis of Structured Programs.
   (b) Write about Conservative Estimation of Data-Flow Information. [8+8]

8. Generate optimal code for following assignment statements
   x = a + b + c
   x = (a * -b) + (c - (d + e))
   x = (a / b - c) / d
   x = a + (b + c / d * e) / (f * g = h * i). [4×4]

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1. Explain the machines to accept context free language and recursively enumerable sets with examples. [16]

2. (a) Explain the Dynamic storage allocation facilities provided by C language?
   (b) What is dangling reference in storage allocation? Explain with an example. [8+8]

3. Explain about macros and their features? [16]

4. Consider the following Syntax Directed Translation Schema:
   E→E + E { print '+'}
   E → E*E { print '*'}
   E → (E) { . }
   E →i { print 'id.name'}
   An LR parser executes the actions specified within braces immediately after reducing with the corresponding production. Draw the decorated parse tree and find the translation of a string: (a + b) * (c + d) into another string using Syntax Directed Translation Schemes. [8+8]

5. Explain in detail the procedure that eliminating global common sub expression? [16]

6. (a) What is the time complexity of a parser to parse a string of 'n' tokens?
   (b) Consider the Grammar: G = ({S, A}, {a, b}, {S → aAa |bAb| |A, A → SS}, S) Find the leftmost derivation, rightmost derivation, and parse tree for the string: baabbb. [6+10]

7. Consider the grammar: S → (S) |a
   Construct the DFA for SLR(1), CLR(1), and LALR(1) parsers and find the number of states in each of the parser. [16]

8. (a) Design a DFA that accepts the language over the alphabet, Σ = {0, 1, 2} where the decimal equivalent of the language is divisible by 3.
   (b) Compare compiler and an interpreter with the help of suitable examples. [8+8]

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