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CS/B.TECH(CSE)/SEP.SUPPLE/SEM-7/CS-701/2012 2012 LANGUAGE PROCESSOR

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) If in a syntax tree for the regular expression $(a \mid b)^*$ abb# the leaf nodes are numbered as 1, 2, 36 from left to right, then the firstpos (root) function returns
 - a) $\{1, 2, 3, 4\}$
 - b) $\{1, 2, 3\}$
 - c) { 1, 2 }
 - d) None of these.

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- ii) Which of the following is not a loop optimization technique?
 - a) Induction variable elimination
 - b) Loop unrolling
 - c) Loop jamming
 - d) Loop heading.
- iii) The edges in a flow graph whose heads dominate their tails are called
 - a) Back edges
 - b) Flow edges
 - c) Front edges
 - d) None of these.
- iv) Consider the statement :" ft(X>=12)", where if has been misspelled. The error is detected by the compiler in the phase
 - a) Lexical analysis
 - b) Syntax analysis
 - c) Semantic Analysis
 - d) None of these.
- v) YACC builds up
 - a) SLR parsing table
 - b) Canonical parsing table
 - c) LALR parsing table
 - d) None of these.

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- vi) Lex is a tool which is used to specify
 - a) Syntax directed translation
 - b) Syntax analysis
 - c) Lexical analysis
 - d) None of these.
- vii) Given a grammar $G = (\{S, T\}, \{, , (,), \uparrow, a\}, S, P);$ where P is given by $S \rightarrow \uparrow$, $S \rightarrow a$, $S \rightarrow (T)$, $T \rightarrow T$, S, $T \rightarrow S$. Then FOLLOW (S) will contain
 - a) {\$,), , }
 - b) {\$, (,)}
 - c) {\$,(}
 - d) None of these.
- viii) An annotated parse tree is
 - a) A parse tree with attribute values shown at the parse tree nodes
 - b) A parse tree with values of only some attributes shown at the parse tree nodes
 - c) A parse tree without attribute values shown at the parse tree nodes
 - d) A parse tree with grammar symbols shown at the parse tree nodes.

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- ix) A dangling reference is a
 - a) pointer pointing to storage which is still in use
 - b) pointer pointing to storage which is freed
 - c) pointer pointing to nothing
 - d) pointer pointing to uninitialized storage
- x) The role of preprocessor is
 - a) produce output data
 - b) produce output to compilers
 - c) produce input to compilers
 - d) none of these.

GROUP - B

(Short Answer Type Questions)

Answer any three of the following.

 $3 \times 5 = 15$

2. Generate machine code for the following instruction :

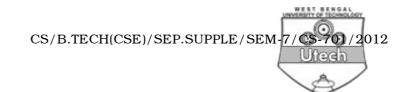
$$X = a / - (b * c) - d$$

Assume 3 registers are available.

- 3. a) What is syntax directed translation? Explain with examples.
 - b) What is Peephole optimization?

3 + 2

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- 4. Translate the arithmetic expression $a = b^* c + b^* c$ into :
 - (i) A syntax tree
 - (ii) Post-fix notation
 - (iii) Quadruples
 - (iv) triples
 - (v) indirect triples.
- With the help of a block diagram and an example, show each phase including symbol table and error handler of a compiler.
- 6. What is an activation record ? Explain clearly the components of an activation record. 2+3

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Transform the following grammar so that it will be LL(1), without changing the language :

 $S \rightarrow aAc \mid bB$

 $A \rightarrow Abc |Abd|$

 $B \rightarrow f \mid g$

 $C \rightarrow h | i$



6 + 9

b) Construct LL(1)parse table for the following grammar

$$S \rightarrow aAC \mid bB$$
 $A \rightarrow eD$
 $D \rightarrow bE \mid \epsilon$
 $E \rightarrow eD \mid dD$
 $B \rightarrow f \mid g$

Figure 1. is a simple matrix-multiplication program.

 $C \rightarrow h|i$

8.

- a) Translate the program into three-address statements.

 Assume the matrix entries as numbers that require
 8 bytes, and that matrices are stored in row-major order.
- b) Construct the flow graph for the code from (a).
- c) Identify the loops in the flow graph from (b). 5 + 5 + 5

$$for(i = 0; i < n; i ++)$$

$$for(j = 0; j < n; j++)$$

$$c[i][j] = 0.0;$$

$$for(i = 0; i < n; i ++)$$

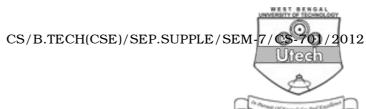
$$for(j = 0; j < n; j ++)$$

$$for(k = 0; k < n; k ++)$$

$$c[i][j] = c[i][j] + a[i][k] * b[k][j]$$

Figure 1. A matrix-multiplication Algorithm.

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- 9. a) Define an operator grammar.
 - b) Given a grammar $G = (\{E, T, F\}, \{id, +, *, (,)\}, P, E);$ where, P is given by $E \rightarrow E + T \mid T, T \rightarrow T*F \mid F, F \rightarrow (E) \mid id.$

Construct the SLR (1) parsing table for G. 2 + 13

- 10. a) What do you understand by L-attributed definition? Give example.
 - b) Describe with diagram the working process of Lexical Analyser.
 - c) Describe LR passing with block diagram. (2 + 3) + 5 + 5
- 11. Write short notes on any *three* of the following: 3×5
 - a) YACC
 - b) Symbol table management
 - c) Back patching
 - d) Thompson's construction
 - e) Lex
 - f) Constant folding and copy propagation.