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Sixth Semester B.E. Degree Examination, June/July 2015
Compiler Design

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
atleast TWO questions from each part.**

PART – A

- 1
 - a. Explain with a diagram, the phases of compiler. (08 Marks)
 - b. Write regular definitions for the following using extended regular expression notation :
 - i) identifier
 - ii) unsigned number. (06 Marks)
 - c. Write a program for look ahead code with sentinels. (06 Marks)

- 2
 - a. Define left – recursive grammar. Eliminate left recursion from the following grammar :

$$E \rightarrow E + T \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow (E) \mid \text{id.}$$
(05 Marks)
 - b. Given the grammar :

$$S \rightarrow AaAb \mid BbBa$$

$$A \rightarrow \epsilon$$

$$B \rightarrow \epsilon$$
 - i) compute FIRST() and FOLLOW() functions
 - ii) construct predictive parsing table
 - iii) parse the input string $w = ab$. (09 Marks)
 - c. Show that the following grammar is ambiguous $E \rightarrow E + E \mid E * E \mid (E) \mid \text{id}$, write an equivalent unambiguous grammar for the same. (06 Marks)

- 3
 - a. What is meant by handle pruning? construct Bottom – up parse tree for the input string $w = aaa * a ++$. Using the grammar :

$$S \rightarrow SS + \mid SS * \mid a.$$
(06 Marks)
 - b. Explain the working of shift reduce parser. Parse the input string $\text{id} * \text{id}$. Using the grammar of question no, 2(a). (08 Marks)
 - c. With a diagram, explain the model of an LR parser. (06 Marks)

- 4
 - a. Write an algorithm to construct LALR parsing table. (06 Marks)
 - b. Construct the parsing table for LALR(1) parser using the grammar :

$$S \rightarrow CC$$

$$C \rightarrow aC$$

$$C \rightarrow d.$$
(10 Marks)
 - c. Compare LALR and canonical LR parsers. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – B

- 5 a. Explain the concept of syntax directed definition. (04 Marks)
- b. Consider the context free grammar given below :
 $S \rightarrow EN$
 $E \rightarrow E + T \mid E - T \mid T$
 $T \rightarrow T * F \mid T / F \mid F$
 $F \rightarrow (E) \mid \text{digit}$
 $N \rightarrow ;$
 i) Obtain SDD for the above grammar
 ii) Annotated parse tree for the input string $5 * 6 + 7$. (10 Marks)
- c. Define :
 i) Synthesized attribute
 ii) Inherited attribute. (06 Marks)
- 6 a. Construct DAG and three address code for the following expression :
 $a + a * (b - c) + (b - c) * d$. (08 Marks)
- b. Explain the following with an example : i) quadruples ii) triples. (08 Marks)
- c. Generate three address code for the following statement :
 switch (ch)
 { case 1 : $c = a + b$; break ;
 case 2 : $c = a - b$; break ;
 } (04 Marks)
- 7 a. With a neat diagram, describe the general structure of an activation record. (06 Marks)
- b. Explain in the strategy for reducing fragmentation in heap memory. (08 Marks)
- c. Explain briefly the performance metrics to be considered while designing a garbage collector. (06 Marks)
- 8 a. Discuss the various issues in the design of a code generator. (10 Marks)
- b. What are basic blocks and flow graphs? Write an algorithm to partition the three address instructions into basic blocks. (06 Marks)
- c. List the characteristics of a peephole optimization. (04 Marks)

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