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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Compiler Design

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Discuss the various phases of a compiler, show the translation for an assignment statement position = initial + rate * 60 clearly indicate the output of each phase. (12 Marks)
- b. Write regular definition for an unsigned number, also draw transition diagrams for the same. (06 Marks)
- c. Write a brief note on science involved in building a compiler. (02 Marks)
- 2 a. What is left recursion? Eliminate left recursion from the following grammar :
 $A \rightarrow AB \mid Aa \mid a$
 $B \rightarrow Be \mid b$. (05 Marks)
- b. What is left factoring? What is its advantage? (05 Marks)
- c. Explain the rules/steps to calculate FIRST and FOLLOW. (06 Marks)
- d. Explain error recovery stages in syntax analysis. (04 Marks)
- 3 a. Write an algorithm to construct predictive parser table. Construct a predictive parser table for grammar given in Fig. Q2 (c), and parse the string $w = \text{int}$. (12 Marks)
- b. Define handle, handle pruning with example. (03 Marks)
- c. What are the actions a shift-reduce parser makes? Write the parse tree and shift-reduce configurations for the derivation $S \Rightarrow \alpha BxAz \Rightarrow \alpha Bxyz \Rightarrow \alpha rxyz$. (05 Marks)
- 4 Consider the following grammar
 $S \rightarrow AA$
 $A \rightarrow aA \mid b$
- a. Determine if the grammar is LR(1) or not. (10 Marks)
- b. Determine if the grammar is LALR or not. (10 Marks)

PART - B

- 5 a. Define synthesized attribute, inherited attributes and attribute grammar. (03 Marks)
- b. Write a SDD and annotated parse tree for u^*s for below grammar suitable for top-down parser.
 $T \rightarrow T * F / F$
 $F \rightarrow \text{digits}$ (07 Marks)
- c. Construct a syntax tree for expression $a+b-c$ using the grammar
 $E \rightarrow E + T / E - T / T$
 $T \rightarrow (E) / \text{id} / \text{num}$ (06 Marks)
- d. What is the need for eliminating left-recursion? Eliminate left recursion from SDT
 $E \rightarrow E + T \{ \text{print}('+') \}$
 $E \rightarrow T$ (04 Marks)

- 6 a. Write syntax directed definition for flow of control statements
i) $S \rightarrow \text{if (B) S1}$
ii) $S \rightarrow \text{while (B) S1}$ (06 Marks)
- b. Explain the following with an example:
i) Quadraples
ii) Triples
iii) Indirect triples. (09 Marks)
- c. Translate the given, assignment statement into three-address-code,
 $n = f(a[i]);$ (05 Marks)
- 7 a. What is an activation record? Explain the purpose of each item in the activation record with example. (10 Marks)
- b. Explain desirable properties of memory manager. (05 Marks)
- c. Explain briefly the performance metrics to be considered while designing a garbage collector. (05 Marks)
- 8 a. Explain issues of design of code generator. (10 Marks)
- b. Discuss the methods of optimization of basic blocks. (10 Marks)
