CBCS SCHEME

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18CS61

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
System Software and Compilers

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain registers, instruction formats and addressing modes of SIC/XE architecture. **(08 Marks)**

b. Explain the following records with their formats:
i) Header Record ii) Text Record iii) End Record **(06 Marks)**

c. What are the various data structures used by assembler? Explain. **(06 Marks)**

OR

2 a. Write the Pass 1 algorithms for two pass assembler. **(08 Marks)**

b. List the various machine independent assembler features? Explain any one feature in detail. **(06 Marks)**

c. What are the basic functions of the loader? Write an algorithm for design of an absolute loader. **(06 Marks)**

Module-2

3 a. Explain the various phases of the compiler? Clearly specify the output at each phase for the input A = B * C + 369 **(10 Marks)**

b. List and explain the reasons for separating analysis phase into lexical and syntax. **(04 Marks)**

c. What are the applications of compiler technology? Discuss any two. **(06 Marks)**

OR

4 a. Explain various input buffering schemes used in lexical analysis? Write the look ahead code for sentinel. **(08 Marks)**

b. Enlist the algebraic laws for regular expressions. **(04 Marks)**

c. Give the Regular definition and draw the transition diagram for
i) Relational operator in C
ii) Unsigned number
iii) Indentifier and keyword **(08 Marks)**

Module-3

5 a. Define ambiguity. Show that the grammar $E \rightarrow E + E \mid E * E \mid id$ is ambiguous? Eliminate the ambiguity and rewrite the grammar. **(08 Marks)**

b. For the following grammar eliminate the left recursion and for the resultant grammar construct the LL(1) parsing table and parse the input string (a, a)

$S \rightarrow (L) \mid a$

$L \rightarrow L, S \mid S$ **(08 Marks)**

c. Give an algorithm for recursive descent parsing? What are its limitation and how to overcome it? **(04 Marks)**

OR

6 a. Consider the following grammar

$E \rightarrow 1 + T \mid 2 - T$

$T \rightarrow V \mid V * V \mid V + V \mid V - V$

$V \rightarrow a \mid b$

i) Do the left factoring

ii) Write an algorithm for FIRST and follow and obtain it for the left factored grammar

iii) Construct it for the above left factored grammar. **(10 Marks)**

b. What is shift reduce parsing? Explain the conflicts that may occur during shift reduce parsing? Show the working of shift reduce parser for the following grammar and input string id * id

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid id$ **(10 Marks)**

Module-4

7 a. What is lex? With an example explain the structure of lex program. **(06 Marks)**

b. Write the regular compression to identify the following :

i) Identifier ii) Decimal number iii) –ve integer iv) +ve fraction **(08 Marks)**

c. Write a yacc program to evaluate an arithmetic expression. **(06 Marks)**

OR

8 a. Explain the yacc tool with a sample program. **(08 Marks)**

b. Write a short note on parser-lexer communication. **(06 Marks)**

c. Discuss how to compile a yacc file. **(06 Marks)**

Module-5

9 a. Give the SDD for a simple desk calculator and show the annotated parse tree for $(3 + 4) * (5 + 6)$ n **(08 Marks)**

b. Give the SDD for simple type declaration construct a dependency graph for the declaration int sum, num1, num2; **(06 Marks)**

c. Explain how DAG helps in intermediate code generation? Construct a DAG for the following :

(i) $a + b + (a + b)$

(ii) $a + b + a + b$ **(06 Marks)**

OR

10 a. What are the different three address code instructions? Translate the arithmetic expression $a + (-(b + c))$ into quadruples, triples and indirect triples. **(08 Marks)**

b. Explain the issues in design of code generator. **(08 Marks)**

c. Generate the assembly code for the following address statements.

(i) $x = b * c$ (ii) $y = a + x$ **(04 Marks)**

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