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Sixth Semester B.E. Degree Examination, June/July 2023 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. With reference to SIC/XE machine architectures explain instruction formats and addressing modes, clearly indicating the settings of different flag bits. (10 Marks)
- b. With an illustrate example, explain the need for a two pass assembler. Explain the data structures used in 2-pass assembler. Mention their functions clearly during pass 1 and pass 2. (10 Marks)

OR

- 2 a. Generate the complete object program for the following SIC/XE assembly language programs. Assume : CLEAR = B4, LDT = 74, TD = EO, JEQ = 30, TIXR = B8, JLT = 38, RSUB = 4C, LDCH = 50, WD = DC, X = 1, T = 5.

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WRREC  START      105D
        CLEAR      X
        LDT        LENGTH
WLOOP  TD         OUTPUT
        JEQ        WLOOP
        LDCH       BUFFER, X
        WD         OUTPUT
        TIXR       T
        JLT        WLOOP
        RSUB
OUTPUT BYTE      X'05'
BUFFER RESB      400
LENGTH RESB      2
        END        WRREC
    
```

- (10 Marks)
- b. Explain the absolute loader and Bootstrap loader with algorithm/source code. (10 Marks)

Module-2

- 3 a. What is a Compiler? Explain the various phases of a compiler with a neat diagram and show the output of each phase for the expression $a = b + c * 25$. Assume all variable are a type float. (10 Marks)
- b. Write a note on the commonly used compiler – construction tools. (04 Marks)
- c. Describe Input Buffering mechanism with an algorithm for lookahead code with sentinels. (06 Marks)

OR

- 4 a. Construct the transition diagrams to recognize the tokens given below and explain the same.
 - i) relop ii) Identifier iii) unsigned numbers (10 Marks)
- b. With example, define the operations on languages. (04 Marks)
- c. Discuss the issues/errors of lexical analysis and the error recovery actions that can be performed. (06 Marks)

Module-3

- 5 a. What is recursive-decent parsing? Explain with a pseudocode. Take the grammar $S \rightarrow cAd$, $A \rightarrow ab|a$ as an example and trace it for input string $w = cad$. Explain how backtracking can be used for tracing. (10 Marks)
- b. Consider the context free grammar :
 $S \rightarrow SS + | SS * | a$ and string $w = aa + a*$
- Give the leftmost and rightmost derivation and parse tree for the string
 - Is the grammar ambiguous or unambiguous? Justify your answer
 - Eliminate left Recursion (10 Marks)

OR

- 6 a. With a neat diagram, explain the model of a table driven predictive parser. Write and explain the predictive parsing algorithm. (10 Marks)
- b. Consider the following grammar with terminals $(, [,),]$.
 $S \rightarrow TS | [S] S |)S | \epsilon$
 $T \rightarrow (X)$
 $X \rightarrow TX | [X] X | \epsilon$
- Construct FIRST and FOLLOW sets
 - Construct its LL(1) parsing table
 - Is this grammar LL(1)? (10 Marks)

Module-4

- 7 a. Explain the meta – characters used in regular expression with examples. (10 Marks)
- b. Write a LEX program to recognize and count the number of identifiers in a given input file. Show how the program is compiled and executed. (10 Marks)

OR

- 8 a. What are the ambiguities that arise while evaluating a regular expression? Explain with example. (10 Marks)
- b. Write a YACC program to recognize a valid arithmetic expression that uses operators $+$, $-$, $*$ and $/$. (10 Marks)

Module-5

- 9 a. What is a dependency graph? Give a syntax directed definition for simple type declaration including int and float type. Construct annotated parse tree and dependency graph for the input, float a, b, c. (10 Marks)
- b. Explain synthesized attribute, inherited attribute, S – attributed definition and L- attributed definitions with examples. (10 Marks)

OR

- 10 a. What is a three – address code? explain the different ways of representing three – address codes with examples. (10 Marks)
- b. What is target computer model? Explain the different kinds of instructions and addressing modes available in assembly language or a target machine. (10 Marks)
