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15CS63

**Sixth Semester B.E. Degree Examination, Feb./Mar. 2022**  
**System Software and Compiler Design**

Time: 3 hrs.

Max. Marks: 80

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

**Module-1**

- 1 a. Compute the target address for the following machine instructions.  
Given : (x) = 000690 (B) = 006030 (PC) = 003060  
i) 032600 ii) 026030 iii) 0310C303 iv) 010030. (04 Marks)
- b. Explain the registers, instruction formats and addressing modes of an SIC/XE machine. (06 Marks)
- c. Write an algorithm for a one-pass macro processor. (06 Marks)

**OR**

- 2 a. Detail about PASS-1 algorithm of a two-pass assembler. (06 Marks)
- b. Generate the object program for the SIC/XE machine code. Given LDX = 04, LDA = 00, ADD = 18, LDB = 68, TIX = 2C, JLT = 38, STA = 0C, RSUB = 4C.

SUM	START	2000
FIRST	LDX	#100
	LDA	#13
	+LDB	#TABLE 2
	BASE	TABLE 2
LOOP	ADD	TABLE, X
	ADD	TABLE 2, X
	TIX	COUNT
	JLT	LOOP
	+STA	TOTAL
	RSUB	
COUNT	RESW	1
TABLE	RESW	1000
TABLE2	RESW	300
TOTAL	WORD	10
	END	FIRST

(10 Marks)

**Module-2**

- 3 a. Describe the different data structures used for a linking loader. (08 Marks)
- b. What do you understand by the term relocating loaders? Explain the method for relocation as a part of object program. (08 Marks)

**OR**

- 4 a. Write the SIC/XE source code for a simple bootstrap loader. (05 Marks)
- b. Explain dynamic linking with suitable diagram. (05 Marks)
- c. Describe the facilities available in MS-DOS linker for program linking. (06 Marks)

**Module-3**

- 5 a. Contrast between compiler and interpreter. (03 Marks)  
 b. Detail the different phases of a compiler. Show the compilation process for the given input:  
 POS := init + rate \* 40 (10 Marks)  
 c. Define pattern, token and lexeme with an example each. (03 Marks)

OR

- 6 a. What is the need for 2-Buffering technique in lexical analysis? Write an algorithm for lookahead code with sentinels. (07 Marks)  
 b. Build the regular definition and construct the transition diagram to recognize the given tokens :  
 i) Unsigned number  
 ii) identifier  
 iii) relop (<, <=, >, >=, <>, =). (09 Marks)

**Module-4**

- 7 a. Formulate the ruler for constructing FIRST and FOLLOW sets. (06 Marks)  
 b. Construct the predictive parsing table by making necessary changes to the grammar given below and parse the given input string : aa + a \* s → ss +/ss\*/a (10 Marks)

OR

- 8 a. State shift-reduce parsing. Explain the conflicts that may occur during shift-reduce parsing with an example. (06 Marks)  
 b. Find the handler for the given right sentential form and construct the shift-reduce parses.  
 Given :  $E \rightarrow E + T \mid T$  Right sentential form : id + id \* id  
 $T \rightarrow T * F \mid F$   
 $F \rightarrow (E) \mid id$  (06 Marks)  
 c. Discuss errors recovery technique of parser. (04 Marks)

**Module-5**

- 9 a. Define inherited and synthesized attributes. Give example for each. (04 Marks)  
 b. Give the L-attributed SDD for simple desk calculator and draw the annotated parse tree and dependency graph for the expression :  $4 + 6 * 2n$ . (08 Marks)  
 c. Create the syntax tree and dependency graph for the expression :  $a - 4 + c$ . (04 Marks)

OR

- 10 a. Build Directed Acyclic Graph (DAG) and steps for constructing the DAG along with SDD for the given expression :  $a + a * (b - c) + (b - c) * d$ . (06 Marks)  
 b. Explain the issues in the design of code generation. (10 Marks)

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