

Unique Paper Code : 32347501  
 Name of Course : B.Sc. Hons. Computer Science  
 Name of the Paper : Systems Programming  
 Semester : V  
 Duration of Examination : 3 Hours  
 Maximum Marks : 75 Marks  
 Students admitted in the year : 2015-2018

**Instructions for Candidates:**

1. Answer any **FOUR** questions.
2. All questions carry equal marks.

1. Consider a hypothetical machine with three general purpose registers and an accumulator register. The machine supports load, store, move, arithmetic, and logical operations with two operands. All the arithmetic and logical instructions require both its operands to be in registers.

Generate the machine code for the following quadruples representing intermediate code. Determine the cost of each machine instruction. Clearly, state the assumptions, if any.

Operation	Operand1	Operand2	Result
-	p	q	T1
*	r	s	T2
*	t		T3
/	T1	T2	T4
+	T4	T3	T5
=	T5		a

2. Write the syntax directed translation (SDT) to convert the following statement to three-address instructions. Also, generate the corresponding three-address instructions.

$$if(x < 10 || x > 20 || x! = y) \{x = 0;\}$$

3. Consider the following section and symbol tables for the three object files, namely, file1.obj, file2.obj and file3.obj. Construct the combined section table (CST) and public definition table (PDT) generated during Pass I of linking process showing all intermediate steps. Also draw the layout of final executable file generated after pass II of linking process (show all the intermediate steps in CST).

Name	Size	Align
.text	700	4
.code	80	16
.data	33	4

**Section table for file1.obj**

Name	Location	Section-id
L1	5	2

**Symbol table for file1.obj**

Name	Size	Align
.code	300	16
.data	120	4
.data1	43	16

**Section table for file2.obj**

Name	Location	Section-id
L2	13	3

**Symbol table for file2.obj**

Name	Size	Align
.data	200	4
.data1	220	16
.stack	8	4

**Section table for file3.obj**

Name	Location	Section-id
L4	7	2

**Symbol table for file3.obj**

4. In structured query language (SQL), keywords and identifiers are case insensitive. Write a Lex program that recognizes SELECT, FROM, and WHERE, identifiers may be considered to be a sequence of letters and digits, beginning with a letter, and the numbers in the form of roman numbers with values less than or equal to 100.
5. Consider the following two grammars G1 and G2:

$$G1: S \rightarrow CD | ccD \quad G2: S \rightarrow cSdS | dScS | \epsilon$$

$$C \rightarrow c | Cc$$

$$D \rightarrow d$$

For each grammar, identify two strings that can be parsed. Are the grammars G1 and G2 ambiguous? Justify your answer.

6. Consider the following grammar with set of non-terminals as  $\{S, D, L\}$  and set of terminals as  $\{d, ;, \{, \}, \times\}$ . S is the start symbol.

$$S \rightarrow \{D; L\}$$

$$D \rightarrow d; D|d$$

$$L \rightarrow x; L|x$$

Construct LR (0) set of items and GOTO graph (DFA). Is it possible to construct LR (0) parsing table for above grammar? If yes, construct it. If no, justify by identifying the conflicts and states in which they occur.