

December, 2019

B.Tech. (IT/CE/CSE) 5th SEMESTER

Formal Languages Automata &amp; Compiler Design PCC-CS-502

Time: 3 Hours

Max. Marks: 75

**Instructions:**

1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
2. Answer any four questions from Part -B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.

### PART -A

Q1 (a) Represent the following set by a regular expression  $\{1^{2n+1} | n \geq 0\}$  and describe the (1.5) following regular expression  $a(a + b)^*b$  in a set. [CO1]

(b) Find all strings of length 4 or less for the following regular expression (1.5)  $(a^*b + b^*a)^*$  and Design a DFA for the regular expression  $(10 + 01)^*0(001 + 011)^*$ . [CO1]

(c) Define DFA, NDFA and write application of Finite Automata. [CO1] (1.5)

(d) Consider a grammar  $G$  whose productions are (1.5)  $S \rightarrow 0B|1A, A \rightarrow 0|0S|1AA, B \rightarrow 1|1S|0BB$ , find the left most and right most derivation for the string 00110101 in this grammar. [CO2]

(e) Justify that the some of the infinite sets are countable. [CO2] (1.5)

(f) What do you mean by bootstrapping and define cross compiler. [CO3] (1.5)

(g) What do you mean by Ambiguity in the grammar explain in the example (1.5) given:-  

$$E \rightarrow E+E/E^*E/(E)/a \quad [CO4]$$

(h) What do you mean by Parser? What are the various types of parsers available? (1.5) [CO4]

(i) Differentiate between syntax and semantic. What do you mean by semantic (1.5) actions? [CO4]

(j) What do you mean by optimization and why this is an optional phase in the (1.5) compiler design. [CO4]

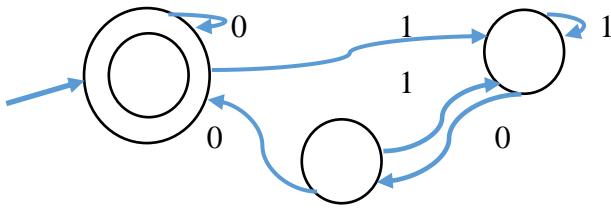
### PART -B

Q2 (a) Prove that  $L = \{0^n 1^n | n \text{ is an integer}\}$  is not regular. [CO1] (5)

(b) Design a DFA for the following regular expression  $P = (11)^*(00)^*$ . Afterwards, (10) convert that DFA in a way that it would accept reverse of given regular expression  $(P^R)$ . [CO1]

Q3 (a) Briefly discuss the functions of all the phases of a compiler. [CO3] (5)

(b) Find the regular expression corresponding to given DFA in the Figure using (10) Arden's Theorem. [CO2]



Q4 Construct the predictive parsing table for the following grammar G:- [CO4] (15)

$E \rightarrow T E'$

$E' \rightarrow + T E'$

$E' \rightarrow ^$

$T \rightarrow F T'$

$T' \rightarrow * F T'$

$T' \rightarrow ^$

$F \rightarrow (E)$

$F \rightarrow id$

Q5 (a) Design a TM for deciding the language  $M = \{w\#w \mid w \in (a+b)^*\}$  [CO2] (7.5)

(b) Design a PDA which will recognize the elements of following set [7.5]  $\{ww^r \mid w \in (a+b)^*\}$  [CO2]

Q6 (a) Explain LR-Parsing Algorithm in detail. [CO3] (7.5)

(b) Show the moves of LR parser on  $id^*id+id$  for the following parsing table for expression grammar:- [CO3]

STATE	ACTION						GOTO		
	Id	+	*	(	)	\$	E	T	F
0	S5			S4			1	2	3
1		S6				Acc			
2		R2	S7		R2	R2			
3		R4	R4		R4	R4			
4	S5			S4			8	2	3
5		R6	R6		R6	R6			
6	S5			S4				9	3
7	S5			S4					10
8		S6			S11				
9		R1	S7		R1	R1			
10		R3	R3		R3	R3			
11		R5	R5		R5	R5			

Q7 Write short note on [CO4] (5)

(a) Symbol Table (5)

(b) Intermediate Code Generation (5)

(c) Machine Code Generation and Optimization (5)

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