

December, 2019

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

Formal Languages Automata & Compiler Design PCC-CS-502

Time: 3 Hours

Max. Marks:75

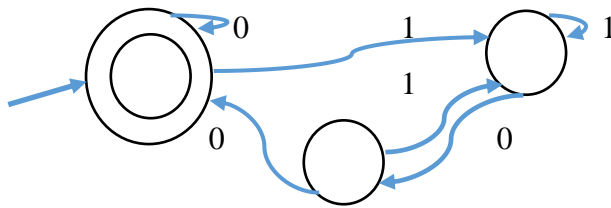
- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
 2. Answer any four questions from Part -B in detail.
 3. Different sub-parts of a question are to be attempted adjacent to each other.

PART -A

- Q1 (a) Represent the following set by a regular expression $\{1^{2n+1} | n \geq 0\}$ and describe the following regular expression $a(a+b)^*b$ in a set. [CO1] (1.5)
- (b) Find all strings of length 4 or less for the following regular expression $(a^*b + b^*a)^*$ and Design a DFA for the regular expression $(10 + 01)^*0(001 + 011)^*$. [CO1] (1.5)
- (c) Define DFA, NDFA and write application of Finite Automata. [CO1] (1.5)
- (d) Consider a grammar G whose productions are $S \rightarrow 0B|1A, A \rightarrow 0|0S|1AA, B \rightarrow 1|1S|0BB$, find the left most and right most derivation for the string 00110101 in this grammar. [CO2] (1.5)
- (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 given:-
 $E \rightarrow E+E/E^*E/(E)/a$ [CO4] (1.5)
- (h) What do you mean by Parser? What are the various types of parsers available? [CO4] (1.5)
- (i) Differentiate between syntax and semantic. What do you mean by semantic actions? [CO4] (1.5)
- (j) What do you mean by optimization and why this is an optional phase in the compiler design. [CO4] (1.5)

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, convert that DFA in a way that it would accept reverse of given regular expression (P^R) . [CO1] (10)
- 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 Arden's Theorem. [CO2] (10)



Q4 Construct the predictive parsing table for the following grammar G:- [C04] (15)

$E \rightarrow T E'$
 $E' \rightarrow + T E'$
 $E' \rightarrow \wedge$
 $T \rightarrow F T'$
 $T' \rightarrow * F T'$
 $T' \rightarrow \wedge$
 $F \rightarrow (E)$
 $F \rightarrow \text{id}$

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. [C03] (7.5)

(b) Show the moves of LR parser on $\text{id}*\text{id}+\text{id}$ for the following parsing table for expression grammar:- [C03] (7.5)

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

[C04]

(a) Symbol Table (5)

(b) Intermediate Code Generation (5)

(c) Machine Code Generation and Optimization (5)
