Hall Ticket Number:

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III/IV B.Tech(Regular) DEGREE EXAMINATION

February, 2021 — **Computer Science and Engineering**

Fifth Semester — **Automata Theory and Formal Languages**

Time: Three Hours — **Maximum:50 Marks**

Answer ALL Questions from PART-A. (1X10 = 10 Marks)

*Answer **ANY FOUR** questions from PART-B.* (4X10=40 Marks)

Part - A

1.	a)	Give formal definition of DFA.	CLO-1	
	b)	Define epsilon closure of the state.	CLO-1	
	c)	What is the use of epsilon moves?	CLO-1	
	d)	Define regular language and regular expression.	CLO-2	
	e)	List out closure properties of regular languages.	CLO-2	
	f)	State pumping lemma for regular languages.	CLO-3	
	g)	Give formal definition of CFG.	CLO-3	
	h)	Give formal definition of PDA.	CLO-4	
	i)	Define CNF.	CLO-4	
	j)	Give formal definition of Turing machines.	CLO-4	

Part - B

2.	a)	Construct DFA that accepts the language which contains any number of a's followed by at least 2 b's followed by exactly 3 c's followed by at most 2 d's.	CLO-1	5M
	b)	Prove that if L is accepted by NFA then there is DFA that accepts same language L.	CLO-1	5M
3.	a)	Convert the following NFA to DFA	CLO-1	

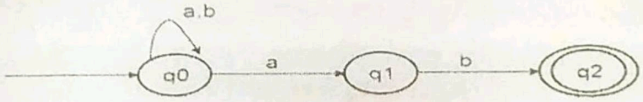
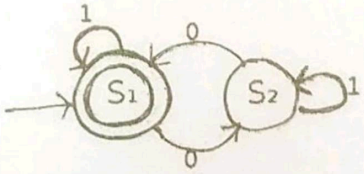


Figure 1

6M

	b)	Construct NFA that accepts the language which contains set of strings with 10^{th} symbol from the left end is 1 and 8^{th} symbol from the left end is 0.	CLO-1	4M
4.	a)	Find out the regular expression represented by the following DFA by using transitive closure method.	CLO-2	



5M

	b)	Give epsilon NFA for the regular expression **(abb+ba)(a+b)***.	CLO-2	5M
5.	a)	Prove that **L={a^n b^n | n≥0 }** is not regular.	CLO-2	4M
	b)	Give regular expressions for the following languages.	CLO-2	
		i. Set of strings contains any number of a's followed by at least one b followed by exactly 2 c's.		
		ii. Set of strings contains even number of a's followed by odd number of b's		
		iii. Set of strings end with 10.		6M

Give left most and right most derivations of the string "aabbabba" to the following grammar

6.	a)	S → aB | bA A→ a | aS | bAA B → b | bS | aBB	CLO-3	5M
	b)	Convert the following grammar to PDA. I → a | b | Ia | Ib | I0 | I1 E → E+E | E*E | (E) | I	CLO-3	5M

P.T.O.

7. a) Construct CFG for the language $L = \{ a^i b^j c^k \mid i=j \text{ or } j=k \}$
   b) Construct PDA to accept the language $L = \{ wcw^R \mid w \in \{a,b\}^* \}$

8. Convert the following grammar into CNF.

$S \rightarrow AACD$

$A \rightarrow aAb \mid \in$

$C \rightarrow aC \mid a$

$D \rightarrow aDa \mid bDb \mid \in$

a) Write short notes on closure properties and decision properties of CFLs.

b) Construct Turing machine to the language $L = \{ a^n b^n c^n \mid n>0 \}$