PANDIT DEENDAYAL PETROLEUM UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
MID SEMESTER EXAMINATION SEPTEMBER 2018

B.Tech Computer Engineering

Semester V

Course Name : Theory of Computation **Course Code : 18CP 302** **Max. Marks: 50**

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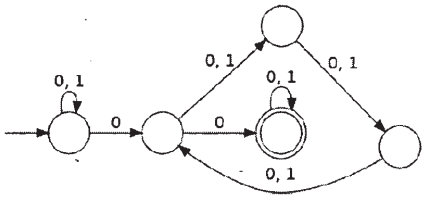
1. (a) Compare DFA and NFA (2)

(b) Design a DFA to accept a set of strings over {a,b} such that the string starts and ends with different symbols. (3)

(c) Consider the following NFA over the alphabet {0 ,1}. What language does this NFA recognize? Use state elimination method to obtain the regular expression from the NFA. (5)



2. (a) Consider the following state transition table of a NFA. (5)

	ε	0	1
→A	B	A	Ø
B	D	C	Ø
C	Ø	Ø	B
*D	Ø	D	D

Obtain an equivalent NFA without ε-transitions.

(b) Show that the Regular languages are closed under (i) Intersection (ii) Set difference (iii) Complement (5)

3. (a) State pumping lemma for regular languages. Prove that the language $L = \{a^p | \ p \ is \ prime\}$ is not regular using pumping lemma. Give an example for non-regular language for which pumping lemma holds true. (6)

(b) What languages the following grammars generate? (4)

(i) $S_0 \rightarrow 0S_1 | \ 1S_1; \qquad S_1 \rightarrow 00S_1 | \ 01S_1 \ | \ 10S_1 | \ 11S_1 | \ \varepsilon$

(ii) $S_0 \rightarrow aS_1bS_2 \ | \ S_1bS_2c \ | \varepsilon; \qquad S_1 \rightarrow aS_1b \ | \ \varepsilon; \qquad S_2 \rightarrow bS_2c \ | \ \varepsilon$

4. Write context free grammar for the Language $L = \{a^i b^j c^k \ | \ i = j \ or \ j = k\}$. (10)
Design a push down automata for recognizing the same. Whether this language is inherently ambiguous? Justify your answer.

5. Design a pushdown automata for the following languages. (10)

(a) $L = \{ww^R \ | w \in \{a, b\}^+ \}$. Also trace the input *abaaba* in the automata.

(b) $L = \{ \ a^n b^m a^{2n} \ | m, n \geq 1\}$. Also write transition function.