Roll Number: _____

Thapar Institute of Engineering & Technology, Patiala

Department of Computer Science & Engineering

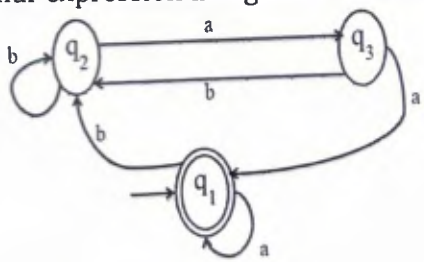
MID SEMESTER EXAMINATION (Sep 2018)

B. E. - III Year, Semester V | Course Code: UCS701

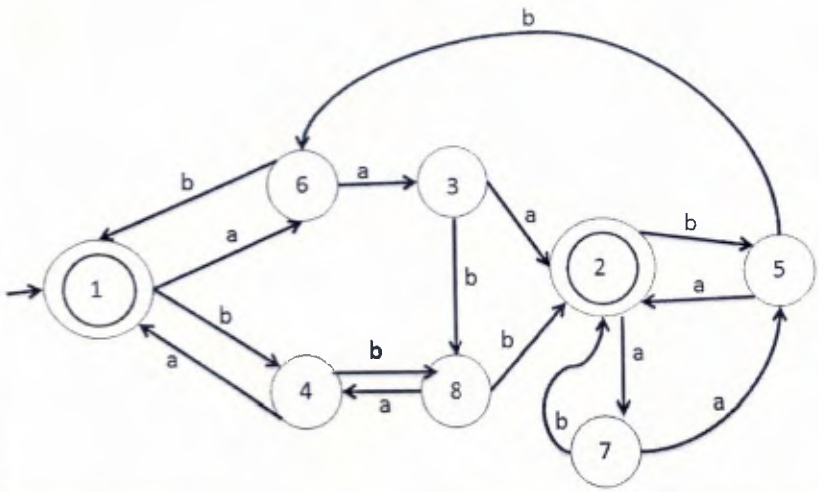
Sep 22, 2018, Saturday, 8:00 – 10:00 AM | Course Name: Theory of Computation

Time: 2 Hours, M. Marks: 30 | Name of Faculty: AKU, NKA, NS, RAH

Note: Attempt all questions. Assume missing data, if any, suitably.

Q1(a)	Design a deterministic finite automaton over $\Sigma = \{a, b\}$ for the following languages. Give a description for your answer. n_a and n_b denote the number of a and number of b respectively. $$L_1 = \{w \mid n_a(w) \bmod 3 > n_b(w) \bmod 3\}$$	(3)
Q1(b)	Design a minimized deterministic finite automaton for the set of string defined over $\Sigma = \{0, 1\}$. Every *00* is followed by one *1*. For example, the strings 101, 0010, 0010011001 are accepted strings, but 0001 and 00100 are rejected string.	(3)
Q2	Write down regular expression for the following languages over alphabet {a, b} that accept all strings having: i) Two substring *aa* and *bb*. ii) Every *a* is followed by at least one *b*. iii) All string except *aa* and *aaa*.	(6)
Q3.	Regular Languages are closed under union, intersection, concatenation, Kleene closure and Complement. Given two languages, L and M, define the exclusive-or of L and M as the set of all strings w such that w is in L and not in M or w is in M and not in L. Show that the exclusive-or of two regular languages is regular using **the above mentioned closed properties.**	(3)
Q.4	Convert DFA into regular expression using state elimination method. 	(3)
Q5	Using pumping lemma, prove that $L = \{a^{2^n} \mid n \geq 0\}$ is not a regular language.	(4)
Q6	Construct regular grammar for the following languages and derive one string using the generated grammar: i) $aa^*(ab+a)^*$ ii) $(aa)^*(ba^*)^*$	(4)

Q7	Minimized the following DFA:	(4)



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