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TCS/TIT–405

B. Tech. (CS & IT) (Fourth Semester)
Mid Semester EXAMINATION, 2017
THEORY OF COMPUTATION

Time : 1:30 Hours] [*Maximum Marks : 50*

Note : (i) This question paper contains two Sections.

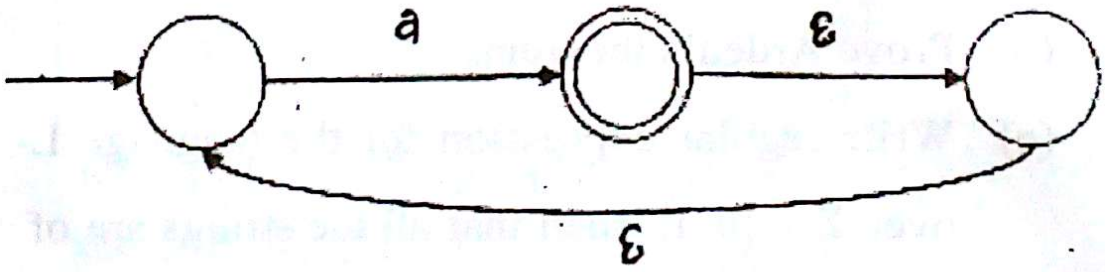
(ii) Both Sections are compulsory.

Section—A

1. Fill in the blanks/True-False : (1×5=5 Marks)

   (a) Consider the language L1 = {ϕ} and L2 = {a}. Value of L1 L2* UL1* is .....

   (b) The complement of the language accepted by the NFA shown below is .....



(c) Given the language L = {ab, aa, baa}. The valid string of length 9 is .....

(d) L = $\{a^{nk} / k > 0$ and n is a positive integer constant$\}$. The minimum number of states needed in DFA to rcognize L is .....

(e) Let w be any string of length n is $\{0, 1\}^*$. Let L be the set of all substring of w. The minimum number of states is NFA that accepts L in terms of n is .....

2. Attempt any *five* parts : (3×5=15 Marks)

(a) Define Finite automata and its types with examples.

(b) Define Mealy and Moore machines with examples.

(c) Define pumping lemma for regular languages.

(d) Prove Arden's theorem.

(e) Write regular expression for the language L over $\Sigma = \{0, 1\}$ such that all the strings are of even length.

(f) Write regular expression for the language L over $\Sigma = \{0, 1\}$ such that all the strings are of odd length.

Section—B

3. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Construct an equivalent DFA for the given NFA :

Q/Σ	0	1
A	A, B	B
B	C	C
C	D	D
D	–	B

where M = ({A, B, C, D}, {0, 1}, A, {c}, δ).

(b) Minimize the following DFA :

Q/Σ	a	b
q0	q1	q2
q1	q3	q4
q2	q4	q3
q3	q5	q5
q4	q5	q5
q5	q5	q5

where M = ({q0, q1, q2, q3, q4, q5}, {a, b}, q0, {q1, q2, q5}, δ).

(c) Write regular expression for the following languages over $\Sigma = \{0,1\}$:

L1 = set of all strings having at least two 0's.

L2 = set of all strings having at least two consecutive 1's.

4. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Convert the following Moore machine to Mealy machine :

Present State	Next State		Output
	a = 0	a = 1	
→ a	d	b	1
b	a	d	0
c	c	c	0
d	b	a	1

(b) Convert the following Mealy machine to Moore machine :

Present State	Next State			
	a = 0		a = 1	
	Next State	Output	Next State	Output
→ a	d	0	b	1
b	a	1	d	0
c	c	1	c	0
d	b	0	a	1

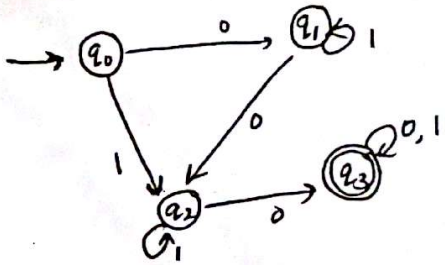
(c) Compare Moore and Mealy machine. Design Moore machine to recognize 2's complement of a given binary number.

5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

(a) Construct equivalent DFA for the following regular expression :

$$101 + 0 * 1 * + (0 + 1) * 0110$$

(b) Derive the regular expression of the following DFA :



(c) Prove that the language $L = \{z^{n\wedge 2} / n >= 0\}$ is not regular.