Charotar University of Science and Technology [CHARUSAT]
Faculty of Technology and Engineering
U & P U. Patel Department of Computer Engineering

Subject: CE 349 Theory of Computation
Unit Test-I

Semester: 6th B.Tech. (CE) **Maximum Marks: 30**
Date: 21/01/2020 (Tuesday) **Time: 09:10 to 10:10 a.m.**

Q:1 Answer following questions **[10]**

1 Why Theory of Computation is included as one of the core subjects of Bachelors of Computer Engineering under any university?

2 Power of DFA, NFA and NFA-^ is same, justify the statement.

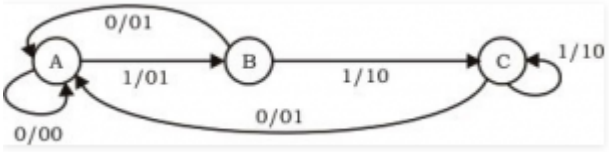
3 Complement of NFA is not necessarily complement of that language, justify the statement.

4 Define finite automata. List out the practical applications of finite automata.

5 What is the usefulness of NFA with ϵ move? Why is minimization of finite automata necessary?

Q:2 Answer following questions **[10]**

(a) The Finite state machine described by the following state diagram with A as starting state, where an arc label is x / y and x stands for 1-bit input and y stands for 2- bit output. What is the output generated by following mealy machine and also give justification for the same? **[02]**



(b) Attempt Any TWO Questions. **[08]**

1 Assume that $\epsilon \in \{a, b\}^*$.Write down regular expression (RE) for the string that

(i) contains almost two a's.
(ii) begin or end with aa or bb.
(iii) contains even number of a's.
(iv) a is immediately followed by bb.

2 Prove with PMI that for every $n \geq 1$,
7 + 13 + 19 + ...+ (6n + 1) = n(3n + 4)

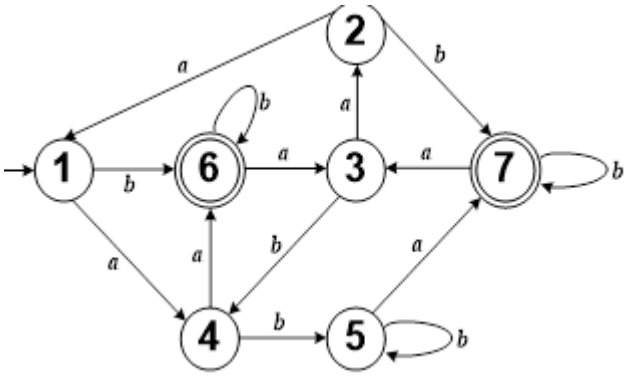
3 Draw the minimal DFA for the language $L = \{a^n b^m \mid n \geq 2, m \geq 1\}$

4 Design an equivalent DFA corresponding to the following NFA.
NFA M $=<\{q_0, q_1, q_2, q_3, q_4\}, \{0,1\}, \delta, q_0, \{q_2, q_4\}>$ where δ is as follows.

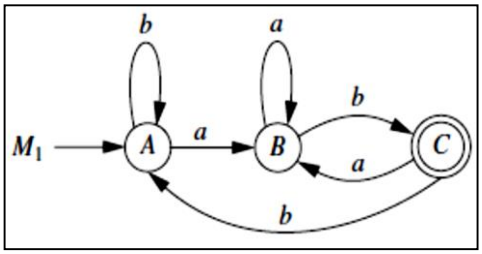
	Next State	
Present State	**0**	**1**
q_0	$\{q_0, q_3\}$	$\{q_0, q_1\}$
q_1	$\emptyset$	q_2
q_2	q_2	q_2
q_3	q_4	$\emptyset$
q_4	q_4	q_4

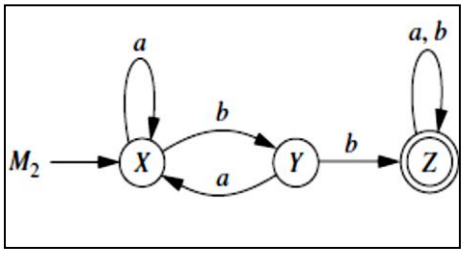
Q:3 Answer following questions [Any Two] **[10]**

1 Apply Minimization method of DFA on the following DFA.



2 Let M_1 and M_2 are the FA recognizing the languages L_1 and L_2 respectively , shown in following figure: Draw FAs accepting $L_1 \cup L_2$ and $L_1 - L_2$.





3 Using Kleene's Theorem, Convert $(00 + 1)^*(10)^*(110)^*$ regular expression into NFA- ^.