

THEORY OF COMPUTATION

(2015 Course) (Semester - I)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Attempt questions Q1 or Q2, Q3 or Q4, and Q5 or Q6.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

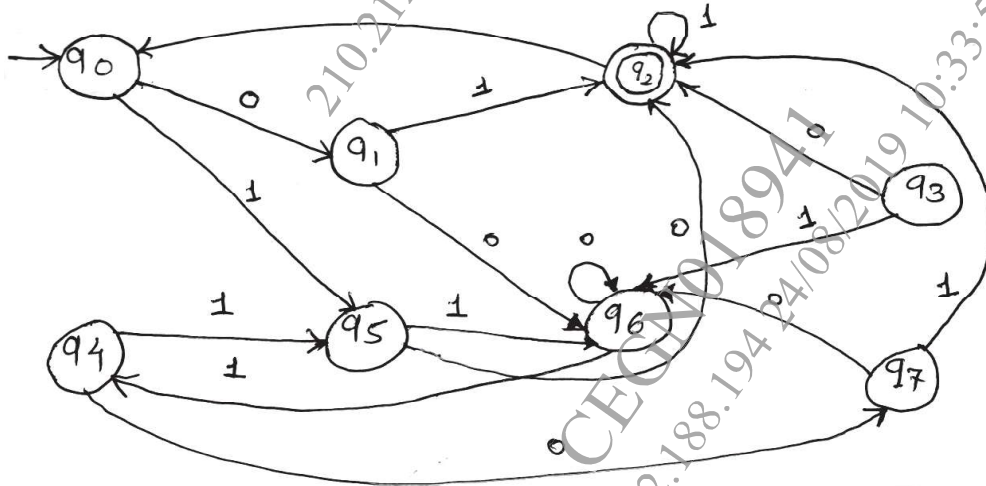
Q1) a) Construct Mealy machine to find 2's complement of any binary number & convert it into Moore machine. [8]

b) Define following:- [2]

- i) ϵ -closure of a state
- ii) NFA

OR

Q2) a) Construct the minimum state automation equivalent to the transition diagram given below. [8]



b) State what do you mean by FSM & state limitations of FSM. [2]

P.T.O.

- Q3) a)** Determine the regular expression over the $\Sigma = \{a, b\}$ for the following [6]
- Set of all strings containing exactly 2 a's
 - Set of all strings containing at least 2 a's
 - Set of all strings that do not consist of two consecutive 0's
- b)** Convert the given Right-linear Grammar into its equivalent Left-linear Grammar. [4]
- $$S \rightarrow 0A|1B$$
- $$A \rightarrow 0C|1A|0$$
- $$B \rightarrow 1B|1A|1$$
- $$C \rightarrow 0|0A$$
- OR
- Q4) a)** Define Pumping Lemma & Apply it to prove the following [6]
- $$L = \{0^{i^2} \mid i \text{ is an integer, } i \geq 1\}$$
- is not regular.
- b)** Describe in simple english the language defined by the following regular expressions:- [4]
- $(a+b)^* \cdot aa \cdot (a+b)^*$
 - $a+b^* \cdot c+\epsilon$
- Q5) a)** Check whether or not the following Grammar is ambiguous; if it is remove the ambiguity and write an equivalent unambiguous grammar. [6]
- $$S \rightarrow i C t S \mid i c t S \epsilon S \mid a$$
- $$C \rightarrow b$$
- b)** Write note on: Chomsky Hierarchy. [4]
- OR
- Q6) a)** Simplify the following Grammar [6]
- $S \rightarrow aA|bS|\epsilon$
 $A \rightarrow aA|bB|\epsilon$
 $B \rightarrow aA|bc|\epsilon$
 $C \rightarrow aC|bc$
 - $S \rightarrow A|bb$
 $A \rightarrow B|b$
 $B \rightarrow S|a$
- b)** Find the CNF for the given CFG $S \rightarrow 0S1S|1S0S|\epsilon$ [4]

