

Oct-22/TE/Insem-557

T.E. (Information Technology)

THEORY OF COMPUTATION

(2019 Pattern) (Semester - I) (314441)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates :

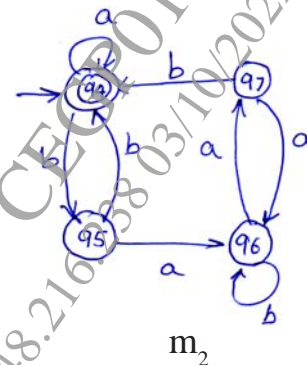
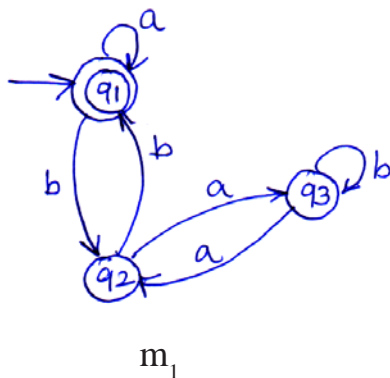
- 1) Answer Q.1 or Q.2, Q.3 or Q.4.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1) a) Design a DFA which accepts a binary number divisible by 4. [5]
- b) Design a Mealy machine to increment binary number by 1. Write down transition table. [4]
- c) Convert the following NFA with  $\epsilon$  moves to DFA. [6]

| State/input     | $\delta$   |        |        |        |
|-----------------|------------|--------|--------|--------|
|                 | $\epsilon$ | a      | b      | c      |
| $\rightarrow p$ | {q}        | {p}    | $\phi$ | $\phi$ |
| q               | {r}        | $\phi$ | {q}    | $\phi$ |
| $r^x$           | $\phi$     | $\phi$ | $\phi$ | {r}    |

OR

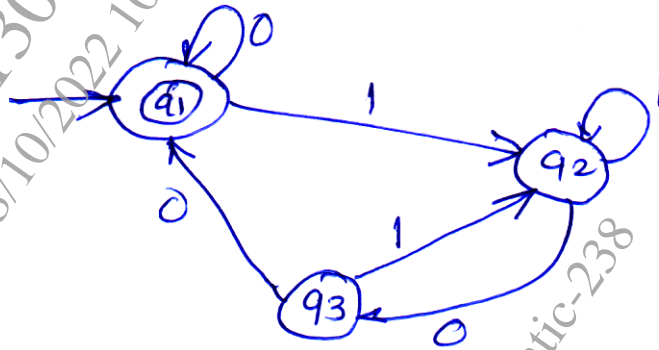
- Q2) a) Define the following terms with proper examples. [6]
- i) Alphabets
  - ii) String
  - iii) Natural language
- b) Show whether the following automata  $m_1$  &  $m_2$  are equivalent or not. [5]



P.T.O.

- c) Construct a DFA over the alphabet  $\{a, b\}$  for accepting the strings ending with "ab". [4]

- Q3)** a) Find the regular expression for the set of strings recognized by the given FA using Arden's theorem. [5]



- b) Determine the regular expression over the alphabet  $\{0, 1\}$  for the following : [6]

- All the string containing exactly two 0's
- All the string that do not end with 01
- All the string containing 1 as a third character from end.

- c) Explain the following terms : [4]

- Kleene closure
- Positive closure

OR

- Q4)** a) Explain any three closure properties of Regular language. [6]

- b) What is a Regular expression? Explain in brief the applications of regular expressions. [5]

- c) Construct a NFA for the following RE using direct method [4]

RE =  $(ab + ba)^*aa$

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