

Total No. of Questions : 4]

SEAT No. :

PC-54

[Total No. of Pages : 2

[6360]-55

**T.E. (Information Technology) (Insem)**  
**THEORY OF COMPUTATION**  
**(2019 Pattern) (Semester - I) (314441)**

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4.
- 2) Neat Diagrams must be drawn wherever necessary.
- 3) Figure to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Design a Moore machine to find 2's complement of any binary number. Write the definition of a Moore Machine. [4]
- b) Find the final DFA (Deterministic Finite Automata) by performing the DFA minimization process. [5]

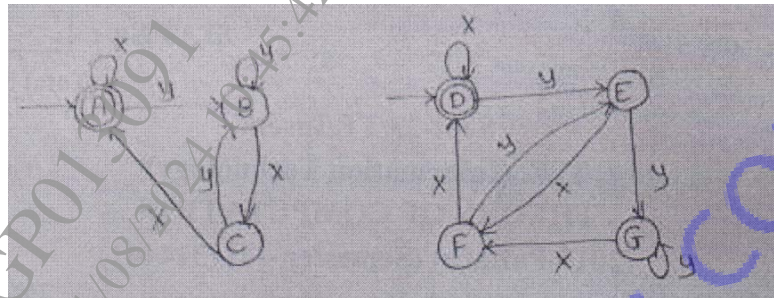
State/input	0	1
$\rightarrow q_0$	$q_1$	$q_0$
$q_1$	$q_0$	$q_2$
$q_2$	$q_3$	$q_1$
$q_3^*$	$q_3$	$q_0$
$q_4$	$q_3$	$q_5$
$q_5$	$q_6$	$q_4$
$q_6$	$q_5$	$q_6$
$q_7$	$q_6$	$q_3$

- c) Write the formal definitions for the following : [6]
- i) DFA (Deterministic Finite Automata)
  - ii) Finite State Machine
  - iii) NFA (Non- Deterministic Finite Automata) with  $\epsilon$  moves

OR

P.T.O.

- Q2) a)** Construct a Moore machine for a binary input sequence such that if it has a substring '110', the machine outputs A; if it has a substring '101', the machine outputs B, otherwise machine outputs C. [5]
- b)** Show that following DFAs (Deterministic Finite Automata) are equivalent or not. [5]

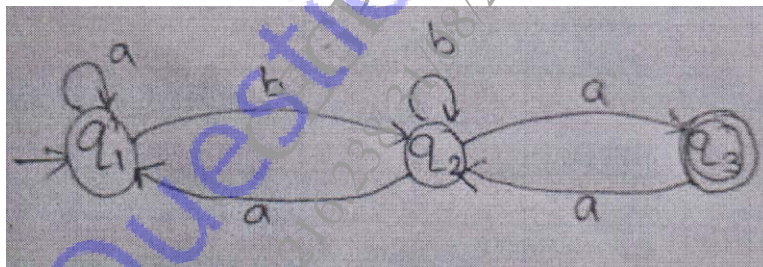


- c)** Justify that there can be the equivalent Mealy machine for any Moore machine by suitable example. [5]

- Q3) a)** For the following regular expressions, draw the FA (Finite Automata) recognizing the corresponding language. [5]

- i)  $ab^* + ba^* + b^*a + (a^*b)^*$   
 ii)  $b^*a(a+b)^*ab^*$

- b)** State and explain Pumping Lemma for a regular language. [5]
- c)** Find the regular Expression for the FA (Finite Automata) using Arden's Theorem. [5]



OR

- Q4) a)** Use pumping lemma to check whether the language  $L = \{0^n 1^n \mid n \geq 0\}$  is regular or not. [5]
- b)** Represent the following language using regular expression over  $\Sigma = \{0,1,2\}$  for the following [5]
- i) At least one occurrence of 0 followed by at least one occurrence of 1 followed by at least one occurrence of 2.  
 ii) Any number of 0's followed by at least one occurrence of 1 followed by at least one occurrence of 2.
- c)** Prove that if  $R = P + RQ$  or  $R = RQ + P$  then  $R = PQ^*$  (Arden's Theorem) Where, P,Q and R are regular expressions. [5]

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