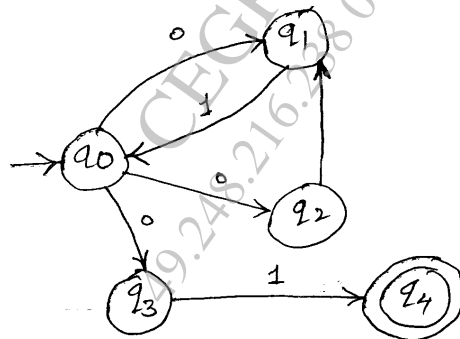


TE/INSEM./OCT. - 142**T.E. (Information Technology)****THEORY OF COMPUTATION****(2015 Pattern) (Semester - I) (314441)***Time : 1 Hour]**[Max. Marks : 30**Instructions to the candidates:*

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

Q1) a) Design FSM for divisibility by 3 tester for binary number. [6]

b) Convert the following NFA to DFA. [4]



OR

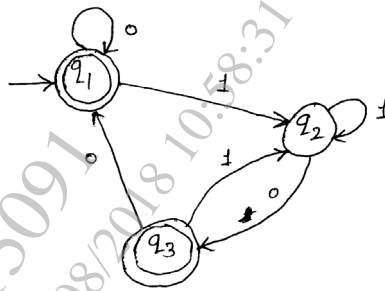
Q2) a) Design FA for accepting strings over $\Sigma = \{a, b\}$ [6]

- i) Strings containing at least one 'a' & at least one 'b'
- ii) Set of all strings that do not contain three or more consecutive a's

b) Design Mealy machine to find 2's complement of a binary number. [4]

P.T.O.

- Q3) a)** Obtain RE corresponding to following Transition Diagram using Arden's Theorem. [6]



- b) Write Regular Language for the following regular expressions. [4]

i) $r_1 = (0+1)^* \cdot 11 (0+1)^*$

ii) $r_2 = (1+10)^*$

OR

- Q4) a)** Prove that

$L = \{a^p / p \text{ is a prime}\}$ is not regular using pumping Lemma. [5]

- b) Construct DFA using Direct Method for the following regular expression

$r = 0^* \cdot 1^* \cdot 2^*$ [5]

- Q5) a)** Check whether the following grammar is ambiguous & if yes then remove ambiguity [6]

$$S \rightarrow i C t S / i C t S e S / a$$

$$C \rightarrow b$$

- b) Write the CFG for (letter) (letter + digit)* [2]

- c) Find CFL for [2]

$$S \rightarrow aB / bA$$

$$A \rightarrow a / aS / bAA$$

$$B \rightarrow b / bS / aBB$$

OR

Q6) a) Write equivalent Left Linear Grammar for the Right Linear Grammar. **[6]**

$$S \rightarrow 0A / 1B$$

$$A \rightarrow 0C / 1A / 0$$

$$B \rightarrow 1B / 1A / 1$$

$$C \rightarrow 0 / 0A$$

b) Simplify the following grammar G, **[4]**

$$S \rightarrow A / bb$$

$$A \rightarrow B / b$$

$$B \rightarrow S / a$$

x

x

x