TE/INSEM./OCT. - 142
T.E. (Information Technology)
THEORY OF COMPUTATION
(2015 Pattern) (Semester - I) (314441)

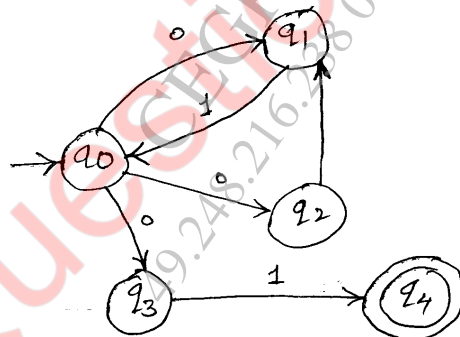*Time : 1 Hour]*   *[Max. Marks : 30*

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]**

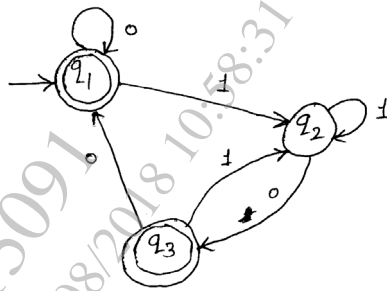b) Convert the following NFA to DFA. **[4]**

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 compliment of a binary number. **[4]**

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 → 0A / 1B

   A → 0C / 1A / 0

   B → 1B / 1A / 1

   C → 0 / 0A

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

   S → A / bb

   A → B / b

   B → S / a

✗   ✗   ✗