TE/INSEM./OCT.-137
T. E. (Computer Engineering)
THEORY OF COMPUTATION
(310241) (Semester - I) (2015 Course)

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

Instructions to the candidates:

    1)   *Attempt questions Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6.*

    2)   *Neat diagrams must be drawn wherever necessary.*

    3)   *Assume suitable data, if necessary.*

Q1) a)   Define the following terms with example -   **[3]**

        i)   Alphabet

        ii)   String

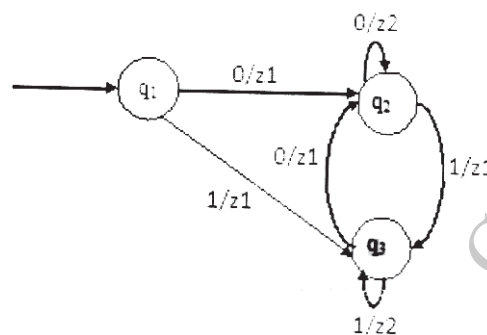   iii)   Regular Language

    b)   Explain the extended transition function of NFA-ε.   **[3]**

    c)   Design FA that accepts set of all strings over the alphabet {0,1} such that the third symbol from the right is 1.   **[4]**

<div align="center">OR</div>

Q2) a)   Compare Moore machine and Mealy machine.   **[3]**

    b)   Consider the following Mealy machine, construct a Moore machine equivalent to it.   **[3]**

    c)   Construct a DFA to accept strings ending with 10.   **[4]**

Q3) a) Define the following with suitable example **[3]**

   i) Regular Expression & Operations

   ii) Prove or disprove the following

   $(rs+r)^* \, r = r \, (sr + r)^*$

b) Construct the finite Automata defined over $\Sigma = \{0,1\}$ for the following R.E. **[3]**

   $1 \, (01 + 10)^* + 0(11 + 10)^*$

c) Using the pumping lemma for the regular set, prove that $L=\{a^{i \, square}|i \geq 1\}$ is not regular. **[4]**

OR

Q4) a) Give the Regular expression for the following languages. **[3]**

   i) The set of strings over the alphabet $\{a,b\}$ starting with b and ending with odd number of a's or even number of b's.

   ii) The set $\{10,1010\}$

b) For the following Regular Expression defined over $\Sigma = \{a,b\}$, draw ε-NFA recognizing the corresponding language $(ab + ba)^* \, aa \, (ab + ba)$. **[4]**

c) Prove that "Regular language is closed under complementation". **[3]**

Q5) a) Write the CFG for following language. **[4]**

   $L=\{a^{m+n}b^m c^n|n,m>=0\}$

b) Write the grammar generating all strings consisting of a's and b's with at least two a's. **[2]**

c) Convert following CFG to CNF. **[4]**

   $S \rightarrow AACD$

   $A \rightarrow aAb|\in$

   $C \rightarrow aC|a$

   $D \rightarrow aDa|bDb|\in$

OR

Q6) a) Write CFG for following Language. **[4]**

L=$\{a^n b^m a^n | n >= 0, m >= 1\}$

b) Consider the grammar G=$\{(A,B), (a,b), P, A\}$ where P consists of **[3]**

$A \rightarrow B$

$B \rightarrow a|b$

Eliminate unit productions

c) Write an equivalent right linear grammar for following left linear grammar
$S \rightarrow S10|0$. **[3]**

ΩΩΩΩ