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
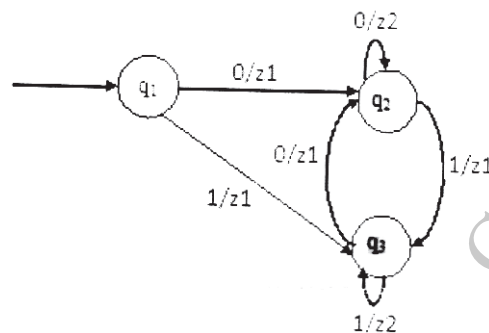
   ii) String

   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]**

OR

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]**

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