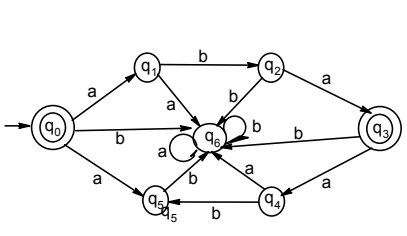
B.Sc. (Honours) Examination, 2019
Semester-VI
Computer Science
Course : BCSC-62
(Formal Language and Automata)

Time : 3 Hours **Full Marks : 40**

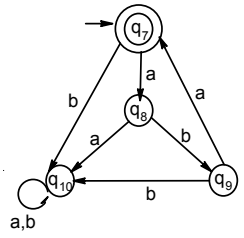
Questions are of value as indicated in the margin

Attempt Question No.**1** and **any four** from the rest.

1. Answer **any four** : 2×4=8
   a) State Arden's Theorem.
   b) Consider the context-free grammar G={S→SS, S→ ab, S→ ba, S→ c}. Which of the following statements is/are true?
      i) G is ambiguous
      ii) G produces all strings with equal number of a's and b's.
      iii) G can be accepted by a deterministic PDA.
   c) Distinguish between initial ID of a PDA initial ID of a Turing Machine.
   d) State the application of Pumping Lemma for context-free grammars.
   e) Find the strings of length less than five for the regular expression (10 + 11)* 01.
2. a) Construct a grammar which generates all positive integers upto 999 which are odd and divisible by 5.
   b) Draw the transition diagram/table for the Mealy machine that can output EVEN or ODD according as the total number of 0's (zero's) encountered is even or odd, the input symbols being 0 and I. 4+4=8
3. a) Consider the following productions :
      S→a |ab Sb| aAb A→ bS | aAAb.
      Check whether the grammar is ambiguous.
   b) Write the algorithm to reduce a grammar to its equivalent language. 2+6=8
4. a) Check whether the following two DFA's are equivalent or not



M1



M2

   b) Let G be a grammar with the productions S→aB |bA A→a |aS |bAA B→b|bS|aBB.
      Find the leftmost and rightmost derivations for the string aabbabab. Is the grammar ambiguous? 4+4=8
5. a) Write the algorithm to reduce any context-free grammar to its equivalent grammar in Chomsky Normal Form.
   b) Write the following grammar in Chomsky Normal Form :
      S→aSa | bSb | aa | bb. 4+4=8

P.T.O.

6. a) Design a Turing Machine M to remove blank in between two strings of I's.
   b) Remove useless productions and symbols from the following grammar
   $S \rightarrow aS \mid A \mid C$, $A \rightarrow a$, $B \rightarrow aa$, $C \rightarrow aCb$. 4+4=8
7. Write short notes on (**any two**) : 4+4=8
   a) Chomsky classification of languages.
   b) Elimination of null production.
   c) Conversion from Mealy Machine to Moore Machine.

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