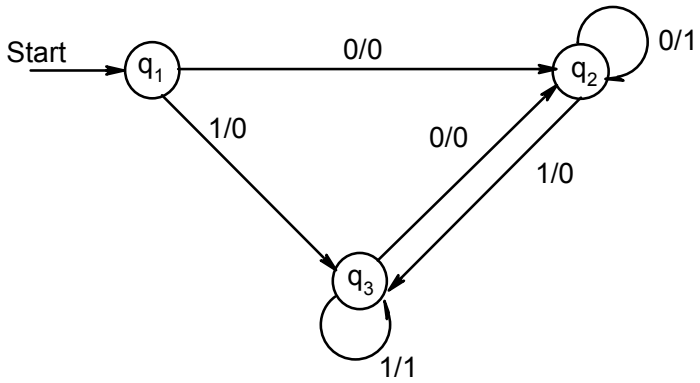
B.Sc. (Honours) Examination 2018
Semester-VI
Computer Science
Course : BCSC-62
(Formal Language and Automata)

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

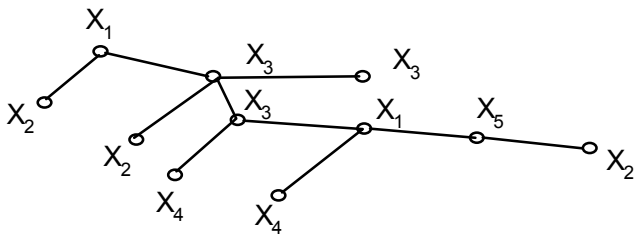
Questions are of value as indicated in the margin

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

1. a) Distinguish between Mealy and Moore machines. 2×4=8
   b) Write down the Pumping Lamma for conrtext-free languages.
   c) Find all strings of length 4 or less in the regular set represented by $a^* + (ab + a)^*$.
   d) What is Greibach Normal Form?
2. a) Convert the following Mealy machine to its equivalent Moore machine. 4+4=8



   b) Construct a transition system which can accept strings over the alphabets a, b, ... containing either ‘tom’or ‘pom’.
3. (a) Find the language generated by 3+2+3=8
   $S \to OA \mid 1S \mid 0 \mid 1, A \to 1A \mid 1S \mid 1$.
   b) Construct the grammar accepting $\{0^n 1^{2m} \mid m, n \geq 0\}$.
   c) Reduce the following grammar to Chomsky normal form
   $G = (\{S, A\}, \{a, b\}, \{S \to absb \mid a \mid aAb, A \to bS \mid aAAb\}$.
4. a) A derivation tree of a sentential form of a grammar G is given below. (1+1+3)+3=8



P.T.O.

What are the symbols necessarily in V_N?
What are the symbols likely to be in Σ ?
Determine if the following strings are
Sentential forms (i) X_4X_2, (ii) $X_2X_2X_3X_2X_3X_3$ and (iii) $X_2X_4X_4X_2$.

b) State and prove Arden's Theorem.

5. a) What are the advantages of pushdam automata over finite automata? 3+5=8

b) Design a Turing Machine M to recognize the language $\{1^n2^n3^n \mid n \geq 1\}$. Check if your design accepts the string 112233 or not.

6. a) Consider the following productions :
$S \rightarrow aB \mid bA \quad A \rightarrow aS \mid bAA \mid a \quad B \rightarrow bS \mid aBB \mid b$
Find the leftmost and rightmost derivation for the string aaabbabbba. Also draw a derivation tree. (2+2+1)+3=8

b) What do you mean by an ambiguous grammar? Give an example.

7. Write short notes on **any two** of the following : 4×2=8

a) Removal of variables not deriving any terminal strings
b) Removal of symbols not appearing is sentential form
c) Elimination of unit productions
d) Elimination of null production.

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