Reg. No. ☐☐☐☐☐☐☐☐☐☐

CSH 401

First Semester M.Sc. Degree Examination, December 2018/January 2019
COMPUTER SCIENCE
Foundations of Computer Science

Time : 3 Hours
Max. Marks : 70

*Note : Answer **any five** questions. **All** questions carry **equal** marks.*

1. a) Define :

   i) Probability of an event.

   ii) Discrete random variable.

   iii) Independent events.

   b) The probability that India wins a cricket test match against West Indies is known to be 2/5. If India and West Indies play 3 test matches, what is the probability that

   i) India will loose all the three matches.

   ii) India will win at most one match.

   c) Are the following statements logically equivalent ?

   a) $p \rightarrow q \vee r$

   b) $p \wedge \sim q \rightarrow r$. **(6+4+4)**

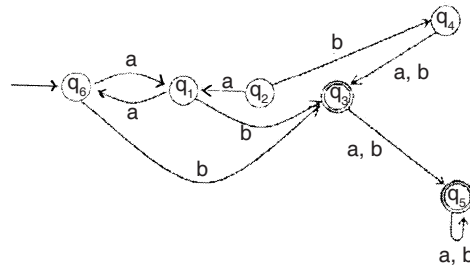2. a) Describe $\in$-NFA, language acceptance of a $\in$-NFA and explain its representations.

   b) Construct $\in$-NFA for the regular expression a.(a*|b*).b and convert it to equivalent DFA. **(6+8)**

P.T.O.

3. a) Show that regular expressions are closed under union and concatenation.

   b) Minimize the following DFA. **(7+7)**

4. a) Define pumping lemma for regular languages and show that and show that $L = \{ww^R | w \in \{0, 1\}^*\}$ where w^R is the reverse of w, is not regular.

   b) Convert the following DFA to a regular expression and describe the language accepted by the regular expression. **(6+8)**

	0	1
$\to q_0$	q_0	q_1
q_1	q_2	q_1
$^*q_2$	q_0	q_1

5. a) Construct a DFA accepted by the language generated by the following grammar and show that the DFA accepts the string generated by the given grammar :

   $S \to 01A$

   $A \to 10B$

   $B \to 0A | 11$

   b) Construct a PDA to accept the language of balanced parenthesis. Illustrate the working of the PDA on a string of length ≥ 4. **(6+8)**

6. a) Convert the following grammar G to a PDA that accepts the language by empty stack :

   $S \to aAA$

   $A \to aS | bs | a$

   Consider any string of length greater than 5 belonging to L(G) and show that the string is accepted by PDA.

b) Convert the following grammar into GNF : **(8+6)**

S → AB1 | 0

A → 00A | B

B → 1A1 | 1

7. a) Design a Turing machine that accepts L = {ww^r | w is in {0, 1}* and w^r is the reverse of w and illustrate the behavior of the Turing machine on a string of length greater than 6.

b) What are the applications of finite automata and context free grammars ? **(8+6)**

8. a) Describe the Chomsky hierarchy of languages with examples.

b) Define the terms intractability and decidability.

c) Describe the Universal Turing Machines and its modifications. **(4+4+6)**

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