MANIPAL UNIVERSITY

Deemed- to -be -University under Section 3 of the UGC Act, 1956

DEPARTMENT OF SCIENCES,
III SEMESTER M.Sc (Applied Mathematics and Computing)
END SEMESTER EXAMINATIONS, November - 2017
Subject **FORMAL LANGUAGE AND THEORY OF COMPUTATION [MAT 709.10]**

(REVISED CREDIT SYSTEM)

Time: 3 Hours Date:24/11/2017 MAX. MARKS: 50

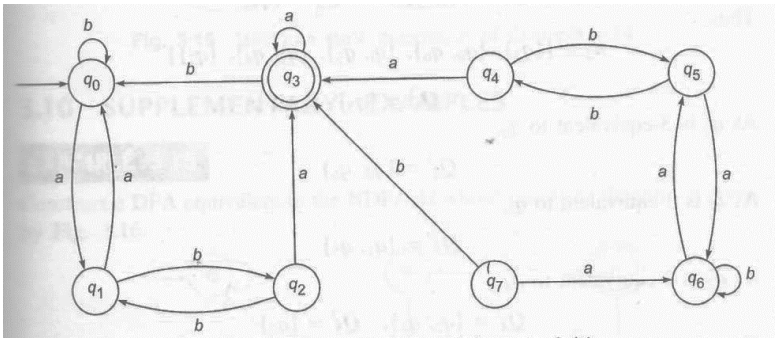
Note: (i) Answer any **FIVE FULL** questions
(ii) All questions carry equal marks (3 + 3+ 4)

1A. Prove that for every NDFA, there exists a DFA which simulates the behavior of NDFA.

1B. Prove that for every CFG G ,we can construct an equivalent grammar G' such that every symbol in $V_N' \cup \sum$ appears in some sentential form.

1C. Design a FA which checks whether a given decimal number is divisible by three.

2A Construct a minimum state automaton equivalent to the transition diagram given by



2B. Define Mealy and Moore machines.
Name the given machine and construct an equivalent machine from the table below

	Next State		
	a=0	a=1	
State	State	State	O.P
$\rightarrow q_0$	q_3	q_1	1
q_1	q_1	q_2	0
q_2	q_2	q_3	0
q_3	q_3	q_0	0

2C. State and prove Pumping lemma.

3A. Consider the grammar G given by $S \to 0SA_1 2, S \to 012, 2A_1 \to A_1 2, 1A_1 \to 11$. Test whether (i)00112 ϵL(G) and (ii)001122$\in$ L(G).

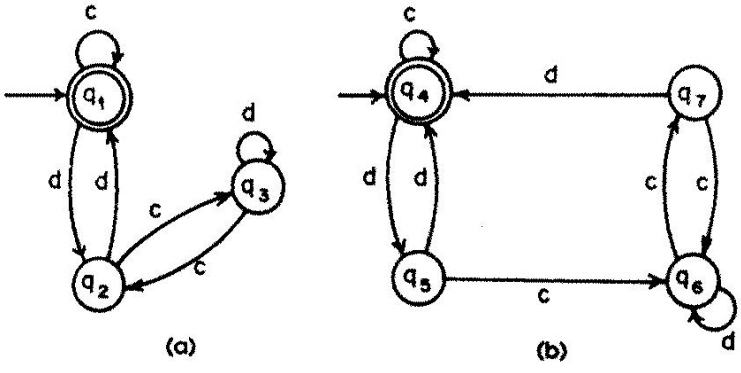
3B. Prove $(1 + 00^*1) + (1 + 00^*1)(0 + 10^*1)^*(0 + 10^*1) = 0^*1(0 + 10^*1)^*1$.

3C. Is it possible for a regular grammar to be ambiguous?

4A. Convert the grammar $S \to AB, A \to BS \mid b, B \to SA \mid a,$ into GNF.

4B. Show that the set of all non-palindromes over {a, b}is a context-free language.

4C. Verify by Comparison Method the automata are equivalent

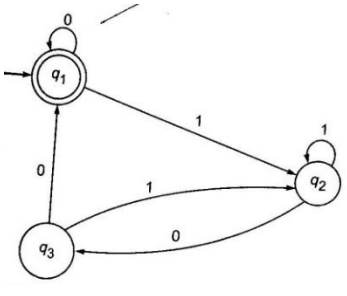


5A. Show that L = {ww $\mid$ w $\in \{a, b\}^*$} is not regular.

5B. State and prove Kleene's Theorem.

5C. Design a Moore machine to generate 1's complement of the given binary number.

6A. Construct a regular expression corresponding to the following FA shown in figure using algebraic method.



6B. Let G be a CFG in CNF and T be a derivation tree in G. If the length of the longest path in T is less than or equal to K, then the yield of T is of length less than or equal to 2^{K-1}.

6C. Explain the model of pushdown automation.

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