Reg. No.

Manipal University, Manipal

III SEMESTER M.Sc. (APPLIED MATHEMATICS AND COMPUTING) END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: FORMAL LANGUAGE AND THEORY OF COMPUTATION [MAT 709.10]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- ❖ Answer **ANY FIVE FULL** the questions.

1A. Prove that for every NDFA, there exists a DFA which simulates the behavior of NDFA. **4 Marks**

1B. Define Mealy Machine.
Design a Moore machine that will read sequences made up of letters A,E,I,O,U and will give as output the same sequences except that in this case where an I directly follows an E, it will be changed to U. **3 Marks**

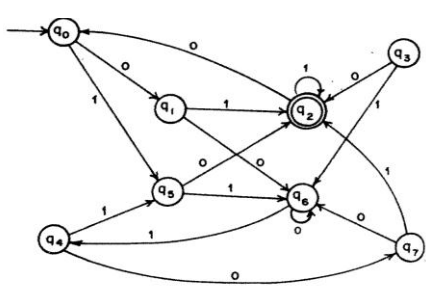
1C. Show that $L = \{ww \mid w \in \{a,b\}^*\}$ is not regular. **3 Marks**

2A. Explain the types of machines which gives output.
Convert the given machine in to an equivalent Moore machine from the given table: **4 Marks**

	Next State			
	i.p a=0		i.p a=1	
State	State	O.P	State	O.P
$\rightarrow q_1$	q_3	0	q_2	0
q_2	q_1	1	q_4	0
q_3	q_2	1	q_1	1
q_4	q_4	1	q_3	0

2B. Find the regular expression representing the set of all strings of the form (i)$a^m b^n c^p$ (ii) $a^m b^{2n} c^{3p}$,where $m,n,p \geq 1$.(iii) $a^n b a^{2m} b^2$ where $m \geq 0, n \geq 1$. **3 Marks**

2C. Construct a minimum state automaton equivalent to the finite automaton given in figure **3 Marks**



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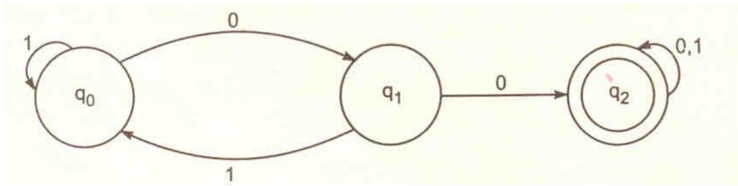
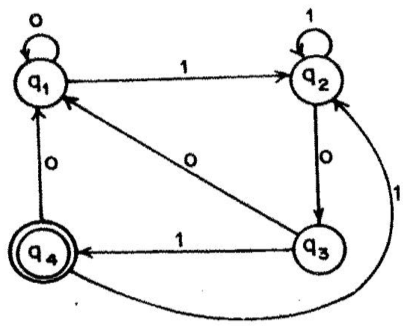
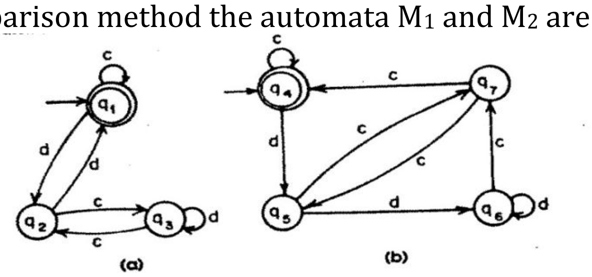
3A.	State and prove Arden's theorem.	**4 Marks**
3B.	Define push down automata. Represent this transition diagram in terms of PDA 	**3 Marks**
3C.	Prove $(1+00^*1) + (1+00^*1)(0+10^*1)^*(0+10^*1) = 0^*1(0+10^*1)^*$.	**3 Marks**
4A.	Find the regular expression corresponding to the figure using Arden's theorem. 	**4 Marks**
4B.	State and prove pumping lemma for regular sets.	**3 Marks**
4C.	Find regular expressions representing the following sets: i)the set of all strings over {0,1} having atmost one pair of 0's or atmost one pair of 1's. ii)the set of all strings over {0,1} ending with 11 and beginning with 00.	**3 Marks**
5A.	State the properties of the transition functions. Prove that for any transition function δ and for any two input strings x and y, $\delta(q,xy)= \delta(\delta(q,x), y)$.	**4 Marks**
5B.	State and prove Kleen's theorem.	**3 Marks**
5C.	Is $\underset{G}{\Rightarrow}$ an equivalence relation on $(v_n \cup v_t)^*$	**3 Marks**
6A.	Define a Greibach normal form. Convert the grammar $S \rightarrow AB, A \rightarrow BS/b, B \rightarrow SA/a$, into GNF.	**4 Marks**
6B.	Verify by the comparison method the automata M_1 and M_2 are equivalent. 	**3 Marks**
6C.	If L is regular then prove that L^T is also regular.	**3 Marks**