Reg.No										

MANIPAL UNIVERSITY, MANIPAL

THIRD SEMESTER M.SC (APPLIED MATHEMATICS & COMPUTING) END SEMESTER MAKE UP EXAMINATION –December / January 2015-16

SUB : Formal Language and Theory of computation

Time : 3 Hrs. **Max.Marks : 50**

Note : a) Answer any FIVE full questions. b) All questions carry equal marks (3 +3+4)

1A. Sketch the block diagram of a finite automaton and explain it's parts.

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

1C. Prove that if L is regular then L^T is also regular.

2A. Define Moore machines.

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

2B. Construct a grammar which generates all odd integers up to 999.

2C. Show that the set L={a^{i^2} |i ≥ 1 is a prime } is not regular.

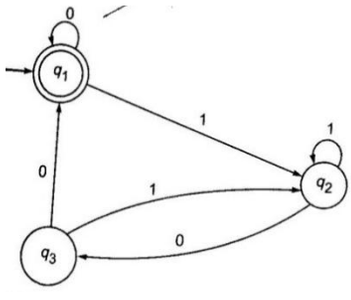
3A. Let L be the set of all palindromes over {a,b}.Construct a grammar G generating L.

3B. Explain Chomsky classification of languages,.

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

4A. Prove $(1 + 00^*1) + (1 + 00^*1)(0 + 10^*1)^*(0 + 10^*1) = 0^*1(0 + 10^*1)^*1$.

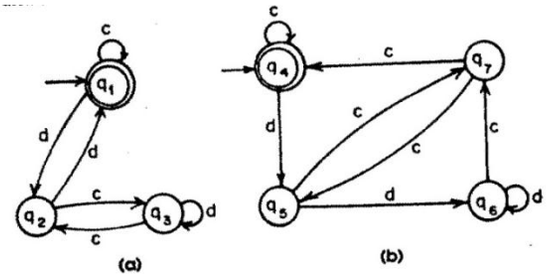
4B. Construct a regular expression corresponding to the following FA shown in figure using algebraic method.



4C. Construct a minimum state automaton equivalent to a given automaton M whose transition table is :

States	Input	
	a	*b*
→ q_0	q_0	q_3
q_1	q_2	q_5
q_2	q_3	q_4
q_3	q_0	q_5
q_4	q_0	q_6
q_5	q_1	q_4
(q_6)	q_1	q_3

5A. Define comparison method. Determine whether the given two machines are equivalent by comparison method



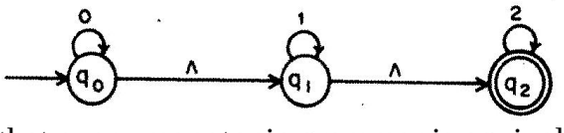
5B. Construct a deterministic acceptor equivalent to M= ($\{q_0, q_1, q_2,\}$,{a,b}, δ ,q_0, $\{q_2\}$) where δ is as given by the table:

State/∑	a	b
→ q_0,	q_0, q_1,	q_2,
q_1,	q_0,	q_1,
(q_2)		q_0, q_1,

5C. State and prove pumping lemma.

6A. Show that Grammar S → aB/ab,A → aAB/a,B → ABb/b is ambiguous

6B. Obtain an equivalent automaton without ∈ moves with proper explanation to the figure below.



6C. Prove that every monotonic grammar is equivalent to a type 1 grammar.

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