FORMAL LANGUAGES AND AUTOMATA THEORY

ASSIGNMENT - 1

1. Convert the following NFA into equivalent DFA.

δ	a	b
→A	{A,B}	{B}
(B)	Φ	{A,B}

2. Convert the following NFA with ε to equivalent NFA without ε.

	0	1	ε
→q_0	Φ	q_0	q_1
q_1	q_1	Φ	q_2
(q_2)	q_1	q_0	Φ

3. Check whether the following two FSM's are equivalent or not.

M1	a	b
→P	Q	S
(Q)	P	R
R	S	Q
(S)	R	P

M2	a	b
→A	C	C
B	C	A
(C)	A	B

4. Construct the minimum state automata for the following.

	0	1
→q_0	q_1	q_2
q_1	q_1	q_2
q_2	q_1	q_2
q_3	q_1	q_4
(q_4)	q_1	q_2

5. Design a Moore Machine to determine the residue mod 4 for each binary string treated as binary integer.

6. Describe the following sets by regular expressions.
    i) The set of all strings of 0's and 1's beginning with '00'
    ii) The set of all strings of 0's and 1's beginning with '1' and ending with '00
    iii) The set of all strings of 0's and 1's with atleast two consecutive 0's.

7. State pumping lemma for regular languages. Prove that the following language

    i) $\{a^n b^n \mid n \geq 1\}$ is not a regular.
    ii) $\{a^n \mid n \geq 1\}$ is a regular.

8. Simplify the following R.E.
    i) $\varepsilon + (0^*(011)^*)(0^*(011)^*)^*$
    ii) $a\,(\,a^*a + a^*) + a^*$

9. Construct NFA with ε transition for the following expression
    i) $11+ 0^*$
    ii) $10 + (0 + 11)0^*\ 1$

10. Write the closure properties of Regular Languages?