LUMBINI ENGINEERING MANAGEMENT AND SCIENCE COLLEGE
(Pokhara University)
ASSIGNMENT - I

Subject: Theory of Computation (TOC) **Date: 2081/02/23**

Instructions:

Answer all questions.

Provide detailed explanations and examples where necessary.

Submit the assignment by the specified deadline.

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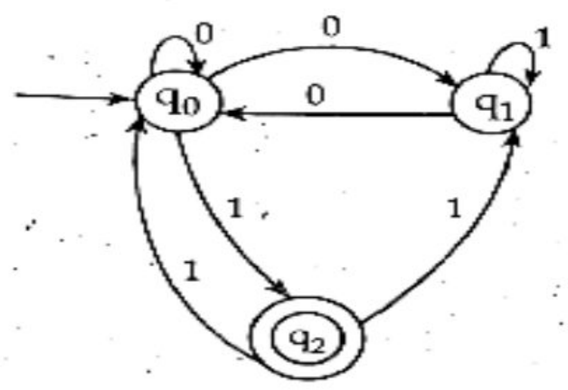
1. Define alphabet, string and language with examples. Discuss the operational characteristics of a Finite Automata.
2. What are the components of finite automata? Design a DFA that accepts the strings given by: M = {w ∈ {a, b}* : w has a number of 'a' divisible by 3 and number of 'b' divisible by 2.
3. What is the significant of finite automata? Design a DFA that accepts the strings over an alphabet $\sum = \{0,1\}$ that either start with 01 or end with 02. Test your design for any two strings.
4. Define DFA formally. Construct a DFA over {a, b} accepting strings having even number of 'a' and odd number of 'b'.
5. Differentiate between DFA and NDFA. Convert the following NDFA to its DFA



6. Construct a FA equivalent to the following Transition Table and construct an equivalent DFA.

Q\ ∑	0	1
→q0	{q0, q1 }	q0
q1	q2	q1
q2	q3	{q3, q2 }
*q3	∅	q3

7. M = ({q1, q2, q3}, {0,1,}, q1, {q3} is a nondeterministic finite automation, where is given by.
   (q1, 0) = {q2, q3}
   (q1,1) = {q1}
   (q2,0) = {q1, q2}
   (q2, 1) = Φ
   (q3, 0) = {q2}
   (q3, 1) = {q1, q2}
   Construct an equivalent DFA.
8. Construct a FA equivalent to the following R.E.
   a. a* + (ab + a)*
   b. (aa + b)* (bb + a)*

c. a(a+b)*bb

9. Explain about decision algorithms for regular language.
10. Show that L = {ww | w → {a, b}*} is not regular.
11. Show that L = {a^n b a^n, n>= 0} is not a regular language by using pumping lemma.
12. Show that the class of languages of FA is closed under union, intersection and kleene closure.
13. Define Parse Tree. When a grammar is called ambiguous? Explain with example.
14. Design CFG for language L(G) = { a^m b^n m>=n} along with parse tree.
15. For the grammar given below:

    E → E + T | T, T → T x F | F, F →(E) | a | b

    Give the derivation (both in sentential and parse tree) of: **(a+b) x a + b**
16. Define context free grammar. Convert the given context free grammar (CFG) into equivalent CNF.

    S → AB

    A → aAA /∈

    B → bBB/∈

17. Prove that a following grammar is ambiguous.

    S →aB | ab

    A → aAB | a

    B → ABb | b
18. Write Short Notes on:
    a. Regular Expression
    b. Relation and Function