MANIPAL UNIVERSITY
JAIPUR

**DEPARTMENT OF INFORMATION TECHNOLOGY**

**Assignment for Slow Learners**

**Automata and Compiler Design (IT3202)**

**B. Tech (IT), VI sem., Even 2023-24**

**Due Date: Complete and submit 5 days before ETE exam**

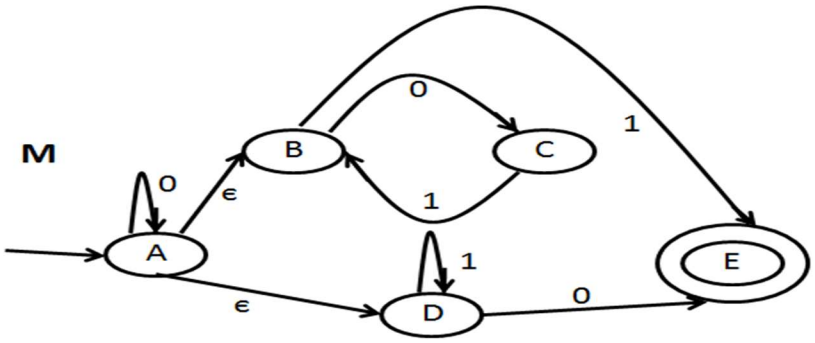
**1.** Find out the following over Σ = {0, 1} -

a. A DFA for the set of all strings that don't include substring "000".
b. An NFA for the set of all strings of language L, where L = {$aw_1aa\ w_2a$: $w_1$, $w_2$ ϵ {0, 1}*}.
c. A Regular Expression for the set of all strings that contains substring "10" exactly once.
d. Grammar G for the set of all strings of language L such that L (G) = {$0^n1^n$, n ≥ 0}.

**2.** Prove that for every NFA, there exists a DFA, which simulates the behavior of NFA. Convert the following NFA into an equivalent DFA over Σ = {0, 1}.

| *δ* | *0* | *1* |
|---|---|---|
| →p | {p, r} | {q} |
| q | {r, s} | {p} |
| *r | {p, s} | {r} |
| *s | {q, r} | Φ |

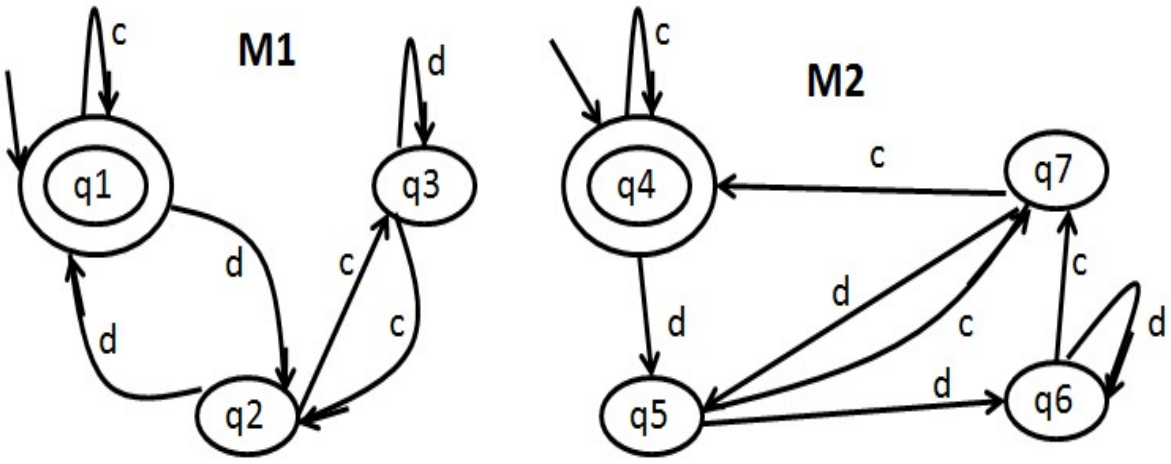
**3.** Consider the following ϵ – NFA M over Σ = {0, 1}.




i. Compute the ϵ – Closure of each state.
ii. Convert the automaton M to a DFA.
iii. Show the processing of the input string **"00111".**

**4.** Prove that the language ***pal*** of palindromes over Σ = {0,1} cannot be accepted by any FA, and it is therefore not regular.

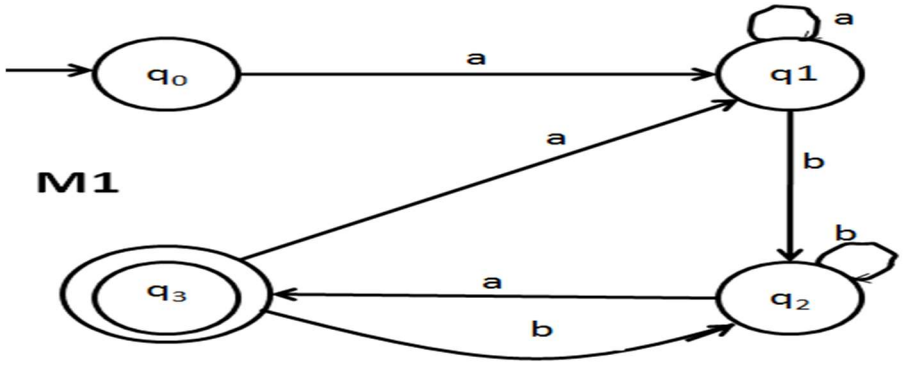
**5.** Compare 2 DFA's M1 and M2 over Σ = {c, d} and design the final DFA if possible.




**6.** Construct the minimum state automaton equivalent to the DFA over Σ = {a, b} whose transition table is given below.

| $\delta$ | $a$ | $b$ |
|---|---|---|
| $\rightarrow q_1$ | $q_2$ | $q_1$ |
| $q_2$ | $q_1$ | $q_3$ |
| $q_3$ | $q_4$ | $q_2$ |
| $*q_4$ | $q_4$ | $q_1$ |
| $q_5$ | $q_4$ | $q_6$ |
| $q_6$ | $q_7$ | $q_5$ |
| $q_7$ | $q_6$ | $q_7$ |
| $q_8$ | $q_7$ | $q_4$ |

**7.** Find the Regular Expression of given NFA M1 over Σ = {a, b} using ARDEN's Theorem –




**8.** Consider the grammar of simple expressions –

E → I | E+E | E*E | (E)

I → a | b| Ia | Ib | I0 |I1

Solve the expression (a101 + b1) * (a + b) using Rightmost Derivation.