Assignment - TOC

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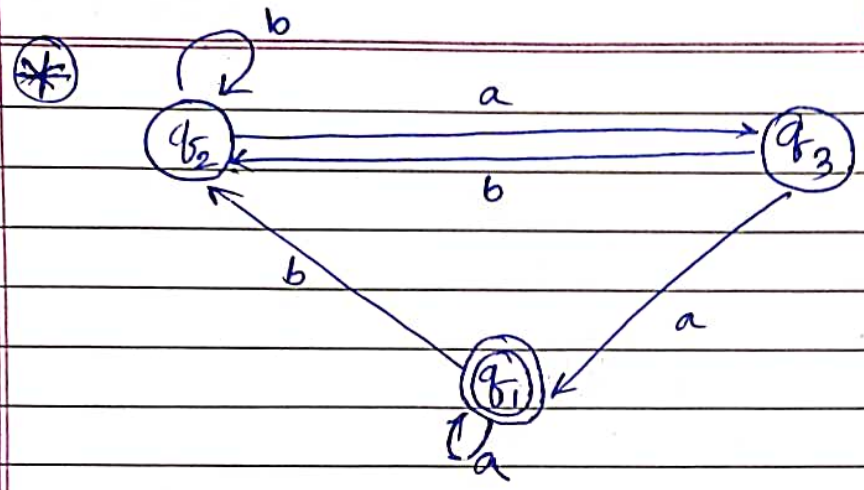
Page No.
Date



Here, the initial state and final state is q_1.
The equation for the three state is q_1, q_2, q_3, are.

$q_1 = q_1 a + q_3 a + \varepsilon$ [ε move is because q_1 is the initial state]

$q_2 = q_1 b + q_2 b + q_3 b$

$q_3 = q_2 a$

Now, we solve these three equations—

$q_2 = q_1 b + q_2 b + q_3 b$

$= q_1 b + q_2 b + (q_2 a) b$ (substituting value of q_3)

$= q_1 b + q_2 (b + ab)$

$= q_1 b (b + ab)^*$ (Applying Arden's theorem)

$q_1 = q_1 a + q_3 a + \varepsilon$

$= q_1 a + q_1 ba + \varepsilon$ (Substituting value of q_3)

$= q_1 a + q_1 b(b + ab^*)aa + \varepsilon$ (substituting value of q_2)

Page No.
Date

$$q_i = q_1 (a + b(b + ab)^* aa) + \varepsilon$$
$$= \varepsilon (a + b(b + ab)^* aa)^*$$
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so, the regular expression is $(a + b(b + ab)^* aa)^*$.

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