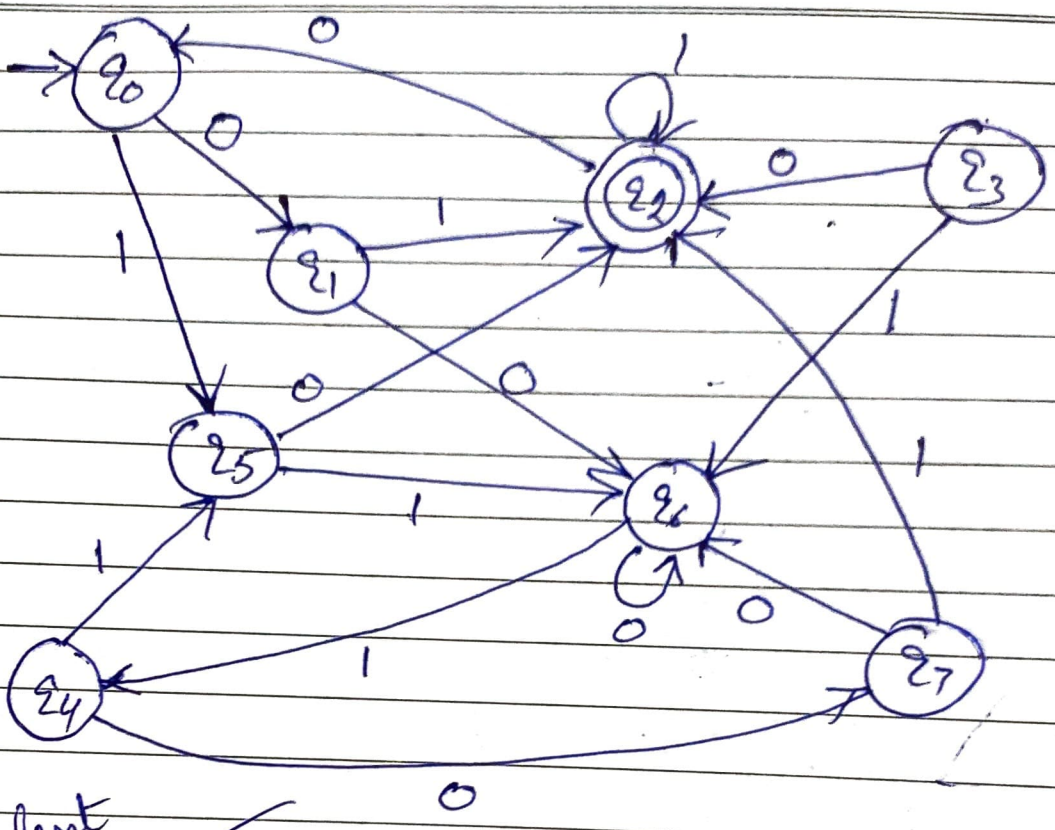
MINIMIZATION OF FINITE AUTOMATA

Find minimized finite automata Equivalent to:



Equivalent Transition Table

Present state P.S.	0	1
→ q_0	q_1	q_5
q_1	q_6	q_2
(**q_2**)	q_0	q_2
q_3	q_2	q_6
q_4	q_7	q_5
q_5	q_2	q_6
q_6	q_6	q_4
q_7	q_6	q_2

$Q = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7\}$ ✓ Need to find equivalence classes.

$\pi_0 = ?$
$\pi_1 = ?$
$\pi_2 = ?$
⋮

$\pi_0 = \{ Q_1^0, Q_2^0 \}$ ✓

Q_1^0 → Final states of Q

$Q_2^0 = Q - Q_1^0$ ie non final states of Q.

ie, $\pi_0 = \{\{q_2\}, \{q_0, q_1, q_3, q_4, q_5, q_6, q_7\}\}$ ✓

$\pi_1 = \{Q_1', Q_2', Q_3' \cdots\}$ — (1)

$Q_1' = \{q_2\}$.

$Q_2' = \{q_0, q_4, q_6\}$ ✓

$Q_3' = \{q_1, q_7\}$

$Q_4' = \{q_3, q_5\}$.

∴ (α) ⇒

$\pi_1 = \{\{q_2\}, \{q_0, q_4, q_6\}, \{q_1, q_7\}, \{q_3, q_5\}\}$ ✓ (#)

Now check if $\pi_1 = \pi_0$?

Nothyare not same.

∴ we will find π_2 from π_1

Rough work

	0	1	Result
q_0, q_1	q_1, q_6 (Y)	q_5, q_2 (N)	No
q_0, q_3	q_1, q_2 No	×	No.
q_0, q_4	q_1, q_7 (Y)	q_5, q_5 (Y)	Yes
q_0, q_5	q_1, q_2 (N)	×	No
q_0, q_6	q_1, q_6 (Y)	q_5, q_4 (Y)	(Y), ✓
q_6, q_7	q_1, q_6 Y	q_5, q_2 NO	NO

q_1, q_3, q_5, q_7

q_1, q_7	q_6, q_6	q_2, q_2	(Y)
q_1, q_5			No
q_1, q_3		q_6, q_2 No	×
q_3, q_5	q_6, q_2		No

SONA GOLD PREMIUM STATIONERY

$\Pi_2 = \{Q_1^2, Q_2^2, Q_3^2, Q_4^2, \ldots\}$ — (β)

$Q_1^2 = \{q_2\}$

$Q_2^2 = \{q_0, q_4\}$

$Q_3^2 = \{q_6\}$.

$Q_4^2 = \{q_1, q_7\}$.

$Q_5^2 = \{q_3, q_5\}$ put in (β)

$Q_6^2 = \{\}$

$\therefore \Pi_2 = \{\{q_2\}, \{q_0, q_4\}, \{q_6\}, \{q_1, q_7\}, \{q_3, q_5\}\}$

Now, still $\Pi_2 \neq \Pi_1$. ∴ go for Π_3. For this take Π_2 as reference.

Rough Work.

	a		Result
q_0, q_4	q_4, q_7 (1 check in) (#) (Y)	q_5, q_3 (Y)	Yes.
q_0, q_6	q_1, q_6 check in (#) (No)	✗	No
q_4, q_7	q_6, q_6 (Y)	q_2, q_2 (Y)	(Y)
q_3, q_5	✓	✓	(Y)

$\Pi_3 = \{Q_1^3, Q_2^3, Q_3^3, Q_4^3, Q_5^3, \ldots\}$ — (γ)

$Q_1^3 = \{q_2\}$.

$Q_2^3 = \{q_0, q_4\}$.

$Q_3^3 = \{q_6\}$,

$Q_4^3 = \{q_1, q_7\}$.

$Q_5^3 = \{q_3, q_5\}$. Put in (γ)

$\therefore \Pi_3 = \{\{q_2\}, \{q_0, q_4\}, \{q_6\}, \{q_1, q_7\}, \{q_3, q_5\}\}$.

Rough work.

	0	1	Result
q_0, q_4	q_4, q_7 (Y)	q_5, q_3 (Y)	(Y)
q_1, q_7	q_6, q_6 (Y)	q_2, q_2 (Y)	(Y)
q_3, q_5	q_2, q_2 (Y)	q_6, q_6 (Y)	(Y)

$\Rightarrow \boxed{\Pi_3 = \Pi_2}$

∴ Stop here.

$\therefore \pi_3 = \{ \{q_2\}, \{q_0, q_4\}, \{q_6\}, \{q_1, q_7\}, \{q_3, q_5\} \}$

These 5 groups become 5 states of Minimized Finite Automata.

Now create a Transition diagram of Min. F.A. from the actual Tran. Table.