Answer to the Q. NO - 01(a)

let, $\Sigma = \{0, 1\}$

Given, $L_1 = \{ w$ contains at least three 1s$\}$

Now,

For DFA for given L_1,

$q_0 = 0$ ones

$q_1 = 1$ one

$q_2 = 2$ ones

$q_3 = 3$ or more ones.

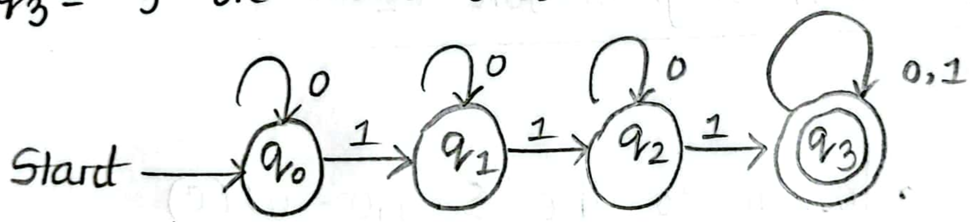


Fig: DFA diagram for L_1

[P.T.O.]

Answer to the Q. NO - 01 (b)

Given,

$L_2 = \{ \omega$ starts and ends with different symbols $\}$

Now,

Starting with q_0,

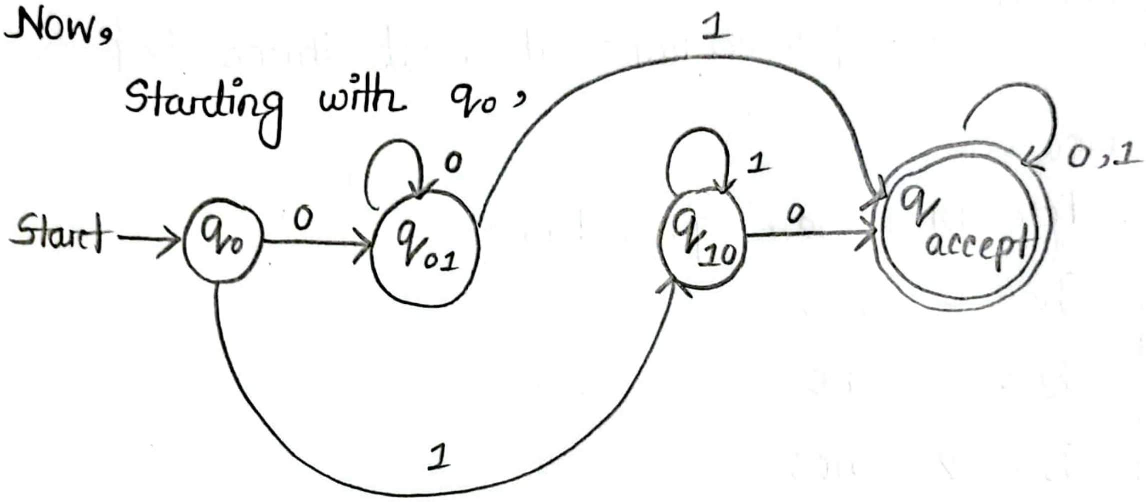


Fig : DFA diagram for L_2

Answer to the Q. NO - 01 (c)

Given, $L_3 = \{ \omega$ doesn't contain 01 as a subsequence $\}$

Now,

Starting :

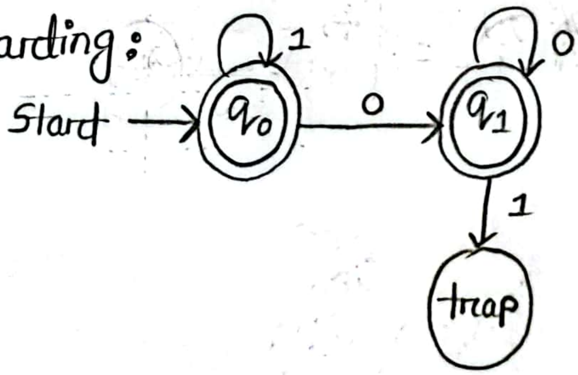


Fig : DFA diagram for L_3

[P.T.O.]

Answer to the Q. NO - 01 (d)

Given,

$L_1 = \{ \omega \text{ contains at least three 1s} \}$

$L_4 = \{ \omega \text{ ends with at least one 0} \}$

for $L_1 \cap L_4$,

The strings:

(I) 1110

(II) 1100

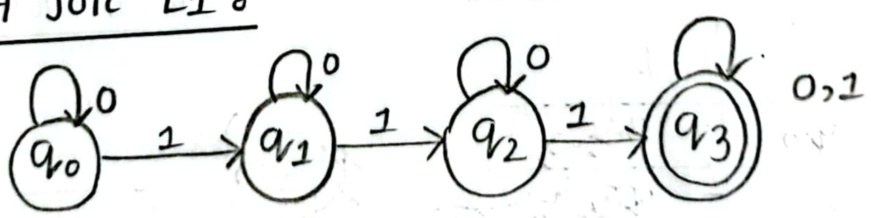
(III) 1010

(IV) 0110

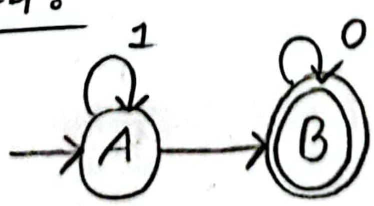
Answer to the Q. NO- 01(e)

For $L_1 \cap L_4$,

The DFA for L_1:



The DFA for L_4:



[P.T.O.]

Here,

$$M_1 = \{q_0, q_1, q_2, q_3\}$$
$$M_2 = \{A, B\}$$

$\therefore M = M_1 \times M_2$

$= \{(q_0A), (q_1A), (q_2A), (q_3A), (q_0B), (q_1B), (q_2B), (q_3B)\}$

Here,

Start State $= \{q_0A\}$

set of final states, $L_1 = \{q_3\}$

and $L_2 = \{B\}$

Final state $= \{q_3B\}$

Now,

Transition Table for L_1:

	0	1
$\rightarrow q_0$	q_0	q_1
q_1	q_1	q_2
q_2	q_2	q_3
$* q_3$	q_3	q_3

Transition Table for L_4:

	0	1
A	B	A
* B	B	A

[P.T.O.]

Transition of the new DFA
(Input symbol 0 and 1) :

$\delta = (q_0A, 0) = q_0A$

$\delta(q_1A, 0) = q_1B$

$\delta(q_2A, 0) = q_2B$

$\delta(q_3A, 0) = q_3B$

$\delta(q_0B, 0) = q_0B$

$\delta(q_1B, 0) = q_1B$

$\delta(q_2B, 0) = q_2B$

$\delta(q_3B, 0) = q_3B$

$\delta(q_0A, 1) = q_1A$

$\delta(q_1A, 1) = q_2A$

$\delta(q_2A, 1) = q_3A$

$\delta(q_3A, 1) = q_3A$

$\delta(q_0B, 1) = q_1A$

$\delta(q_1B, 1) = q_2A$

$\delta(q_2B, 1) = q_3A$

$\delta(q_3B, 1) = q_3A$

DFA:

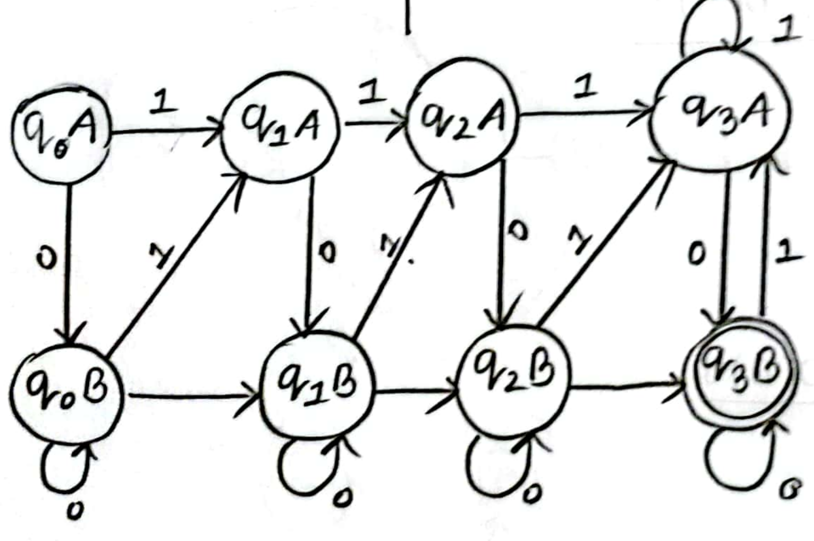


Fig: State diagram of DFA for $L_1 \cap L_4$

[P.T.O.]

Answer to the Q. NO - 01 (f)

Given,

$L_2 = \{w$ starts and ends with different symbols$\}$

$L_4 = \{w$ ends with at least one 0$\}$

Now, all four- letter strings for $L_2 \cap L_4$ will be :

(i) 1000

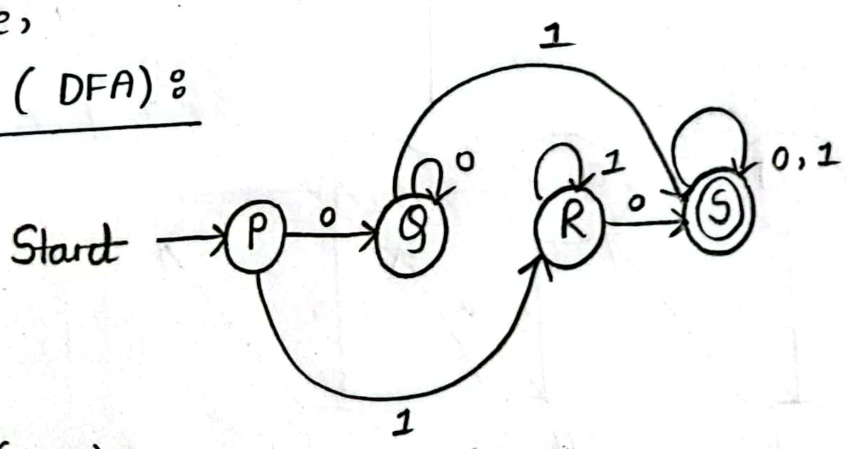
(ii) 0100

(iii) 0101

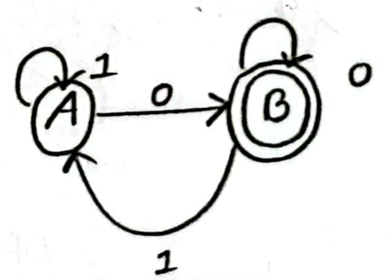
Answer to the Q. NO - 01 (g)

Here,

L2 (DFA) :



L4 (DFA) :



[P.T.O.]

here,

$$M_1 = \{P, Q, R, S\}$$
$$M_2 = \{A, B\}$$

$$\therefore M = M_1 \times M_2$$
$$= \{(PA), (QA), (RA), (SA), (PB), (QB), (RB), (SB)\}$$
$$= \{(AP), (AQ), (AR), (AS), (BP), (BQ), (BR), (BS)\}$$

Now, Starting with state = AP

Final or ending state = BS

Transition Table for L_2:

	0	1
P	Q	R
Q	Q	S
R	S	R
S	S	S

Transition Table for L_4:

	0	1
A	B	A
B	B	A

[P.T.O.]

Transition for DFA (new) $\rightarrow L_2 \cap L_4$:

$\delta(AP, 0) = BQ$
$\delta(AQ, 0) = BQ$
$\delta(AR, 0) = BS$
$\delta(AS, 0) = BS$

$\delta(BP, 0) = BQ$
$\delta(BQ, 0) = BQ$
$\delta(BR, 0) = BS$
$\delta(BS, 0) = BS$

$\delta(AP, 1) = AR$
$\delta(AQ, 1) = AS$
$\delta(AR, 1) = AR$
$\delta(AS, 1) = AS$

$\delta(BP, 1) = AR$
$\delta(BQ, 1) = AS$
$\delta(BR, 1) = AR$
$\delta(BS, 1) = AS$

∴ DFA for $L_2 \cap L_4'$:

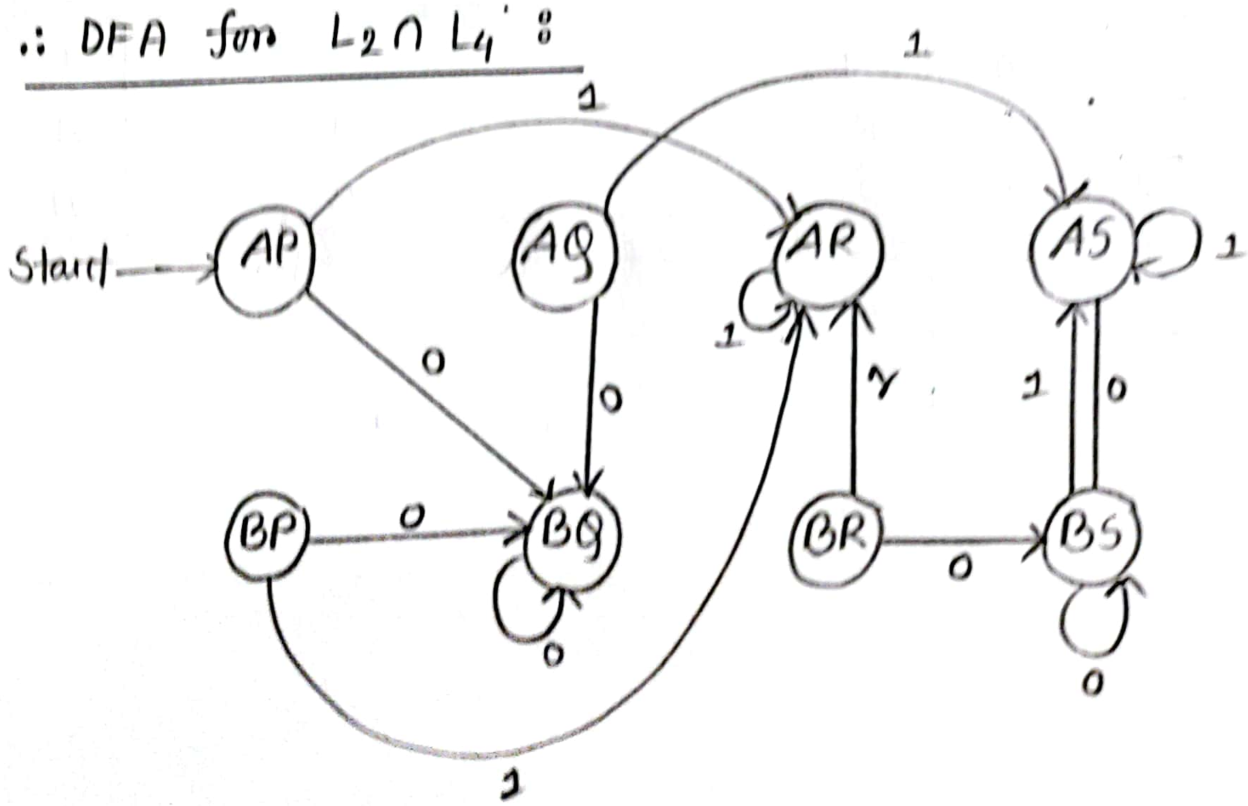


Fig: DFA diagram for $L_2 \cap L_4$