Date:

EXPNO: 7

Name: Design a mod 4 Synchronous up/down coonter with a control line using D flip flops.

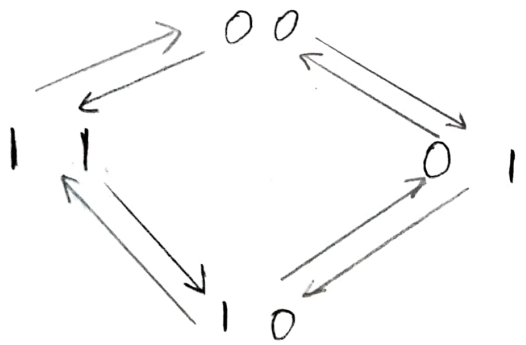
Aparatus used:

1- D flip flops - 2
2. Xor gate - 1
3. clock

Theory:

Up/down coonter is a combination of both up counter and down counter. It has a control line to select weather the counter is upcounter of do wn coonter.
& Since its synchronous counter it has common clock for both flip flops.

State diagram:



State table:

Cntrl I/P	Present State		Next State		Excitation table for DFF	
C	Q_A	Q_B	Q_{AN}	Q_{BN}	D_A	D_B
0	0	0	0	1	0	1
0	0	1	1	0	1	0
0	1	0	1	1	1	1
0	1	1	0	0	0	0
1	0	0	1	1	1	1
1	0	1	0	0	0	0
1	1	0	0	1	0	1
1	1	1	1	0	1	0

K-maps:

1) D_A

C \ $Q_A Q_B$	00	01	11	10
0	0	1	0	1
1	1	0	1	0

$D_A = C \oplus Q_A \oplus Q_B$

2) D_B

C \ $Q_A Q_B$	00	01	11	10
0	1	0	0	1
1	1	0	0	1

$D_B = Q_B'$

Practical Procedure:

1.) Ic's are placed on bread board

2) connection are made as per designed circuit

3) make sure of Power Supply is Proper & adiquit