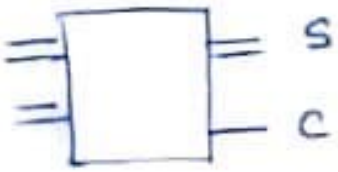
Q1.

A B	C D		
$A_1 A_0$	$B_1 B_0$	$S_1 S_0$	C
0 0	0 0	0 0	0
0 0	0 1	0 1	0
0 0	1 0	1 0	0
0 0	1 1	x x	x
0 1	0 0	0 1	0
0 1	0 1	1 0	0
0 1	1 0	0 0	1
0 1	1 1	x x	x
1 0	0 0	1 0	0
1 0	0 1	0 0	1
1 0	1 0	0 1	1
1 0	1 1	x x	x
1 1	0 0	x x	x
1 1	0 1	x x	x
1 1	1 0	x x	x
1 1	1 1	x x	x



Marks:

* Correct I/O : 3
* Correct TT : 3
* Correct K-map : 3
* Correct Exp + ckt : 3

→ make k-maps

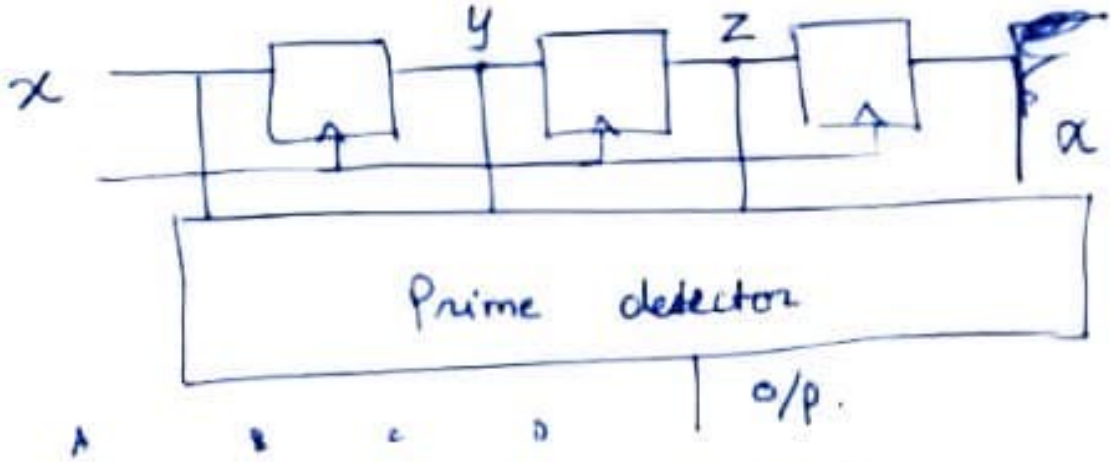
→ $C = A_0B_1 + A_1B_0 + A_1B_1$

$S_0 = A_1B_1 + A_1'A_0'B_0 + A_0B_1'B_0'$

$S_1 = A_0'B_1 + A_0B_0 + A_1B_0$

Q2. Input bit stream: x

Use 3 D FFs in series (shift register)



x	y	z	α	o/p
0	0	0	0	x
0	0	0	1	x
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

0 & 1 are neither prime nor composite

Marks:

ckt: 4

TT: 4

Exp & ckt: 4

$o/p = x'y' + x'\alpha + y'z\alpha + yz'\alpha$

Q4.

(i) 3D2

(ii) 5C8

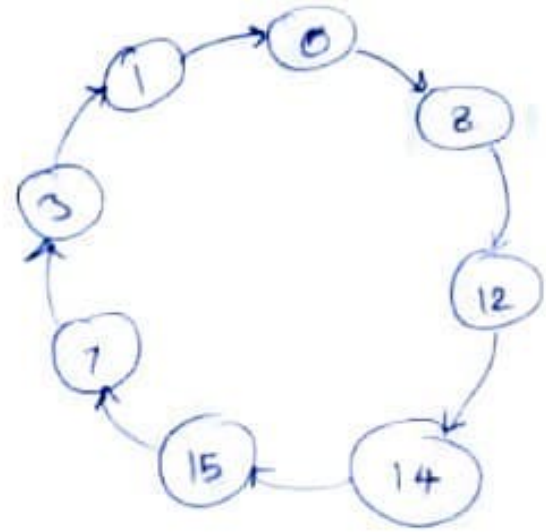
(iii) 521

(iv) A2

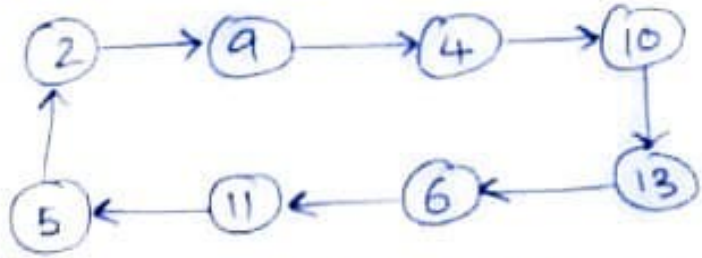
(v) 11. 11 000 1111 010 111 00001 ...

Q5

A	B	C	E
0	0	0	0
1	0	0	0
1	1	0	0
1	1	1	0
1	1	1	1
0	1	1	1
0	0	1	1
0	0	0	1
0	0	0	0



Other states For example starting at 2, similar table can be made. State diagram:



In general, in k clock cycles, the state becomes its complement & in another k cycles it returns to original So 2k.