

Digital Circuit 2

Name: SUJAN BISWAS

Trade: BCSE - Lateral

Roll No: 302010501003

Q. Design a system by to produce a 1 for all numbers less than equal to 25 (other than 0) which are divisible by 3. Use only 2 input NAND gates to design the system.

Q. Use Quinn-McClusky to design the system.

Note: For BCSE ~~all~~ students, implement it for a active-low LED.



Truth Table

	A	B	C	D	E	
0	0	0	0	0	0	X
1	0	0	0	0	1	0
2	0	0	0	1	0	0
3	0	0	0	1	1	0
4	0	0	1	0	0	0
5	0	0	1	0	1	0
6	0	0	1	1	1	0
7	0	0	1	1	1	0
8	0	1	0	0	0	0
9	0	1	0	0	1	0
10	0	1	0	1	0	0
11	0	1	0	1	1	0
12	0	1	1	0	0	1
13	0	1	1	0	1	0
14	0	1	1	1	0	0
15	0	1	1	1	1	0
16	1	0	0	0	0	0
17	1	0	0	0	1	1
18	1	0	0	1	0	0
19	1	0	0	1	1	0
20	1	0	1	0	0	0
21	1	0	1	0	1	0
22	1	0	1	1	0	0
23	1	0	1	1	1	1
24	1	1	0	0	0	0
25	1	1	0	0	1	X
26	1	1	0	1	0	X
27	1	1	0	1	1	X
28	1	1	1	0	0	X
29	1	1	1	0	1	X
30	1	1	1	1	0	X
31	1	1	1	1	1	X

$$Y = \sum (6, 12, 18, 24) + d (0, 26, 27, 28, 29, 30, 31)$$

step-1

Minterm/Don't Care	Binary Rep				
	A	B	C	D	E
0	0	0	0	0	0
6	0	0	1	1	0
12	0	1	1	0	0
18	1	0	0	1	0
24	1	1	0	0	0
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	1	0
29	1	1	1	1	0
30	1	1	1	1	1
31	1	1	1	1	1

step-2

Group	Minterm	A	B	C	D	E
0	0	0	0	0	0	0
2	6	0	0	1	1	0
	12	0	1	1	0	0
	18	1	0	0	1	0
	24	1	1	0	0	0
3	26	1	1	0	1	0
	28	1	1	1	0	0
4	27	1	1	0	1	1
	29	1	1	1	0	1
	30	1	1	1	1	0
5	31	1	1	1	1	1

Step-3:

Group	Matched Pairs	A	B	C	D	E
2	(12, 28) (18, 26) (24, 26) (24, 28)	-	1	1	0	0
		1	-	0	1	0
		1	1	0	-	0
		1	1	-	0	0
3	(26, 27) (26, 30) (28, 29) (28, 30)	1	1	0	1	-
		1	1	-	1	0
		1	1	1	0	-
		1	1	1	-	0
4	(27, 31) (29, 31) (30, 31)	1	1	-	1	1
		1	1	1	-	1
		1	1	1	1	-

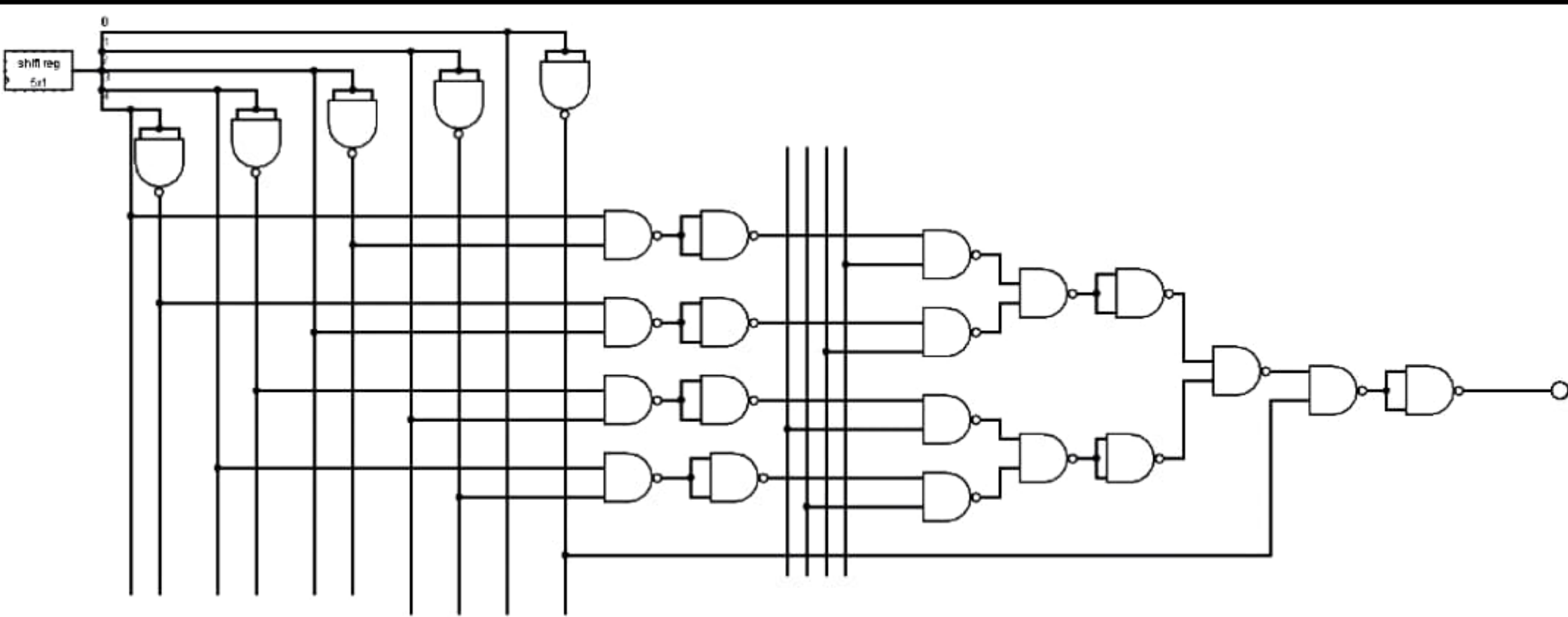
Step-4

Group	Matched Pairs	A	B	C	D	E
2	(24, 26, 28, 30) (24, 28, 26, 30)	1	1	-	-	0
		1	1	-	-	0
3	(26, 27, 30, 31) (26, 30, 27, 31) (28, 29, 30, 31) (28, 30, 29, 31)	1	1	-	1	-
		1	1	-	1	-
		1	1	1	-	-
		1	1	1	-	-

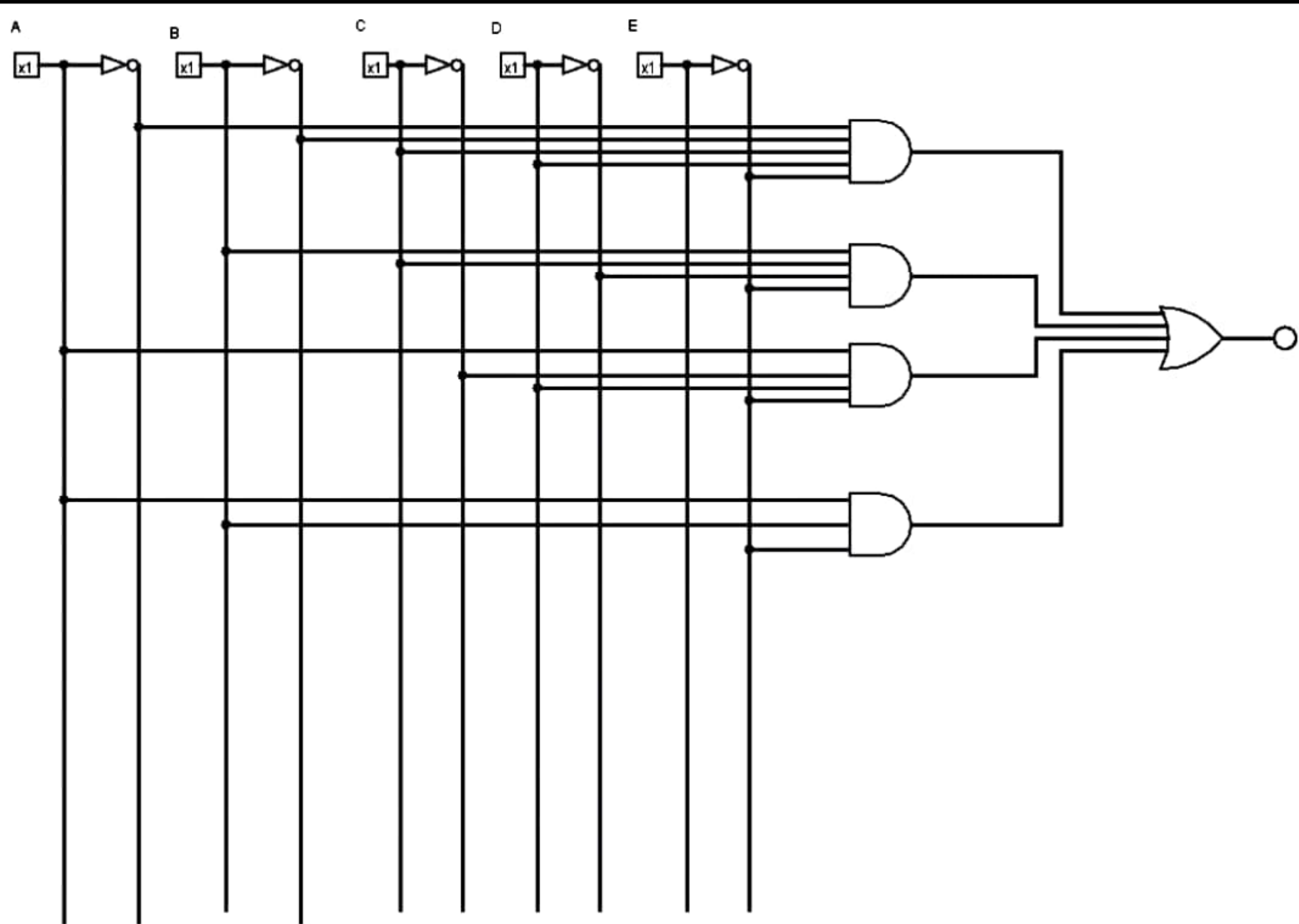
Prime Implicant Chart:

Prime Implicant	Minterms	6	12	18	24
$\bar{A}\bar{B}\bar{C}\bar{D}\bar{E}$	0				
$A\bar{B}\bar{C}\bar{D}\bar{E}$	6	(*)			
$\bar{A}B\bar{C}\bar{D}\bar{E}$	(12, 28)		(*)		
$A\bar{B}\bar{C}D\bar{E}$	(18, 26)			(*)	
$AB\bar{E}$	(24, 26, 28, 30)				(*)

$$Y = \bar{A}\bar{B}\bar{C}\bar{D}\bar{E} + A\bar{B}\bar{C}\bar{D}\bar{E} + \bar{A}B\bar{C}\bar{D}\bar{E} + AB\bar{E}$$



Circuit Using 2 input NAND Gate



Circuit without using NAND gate