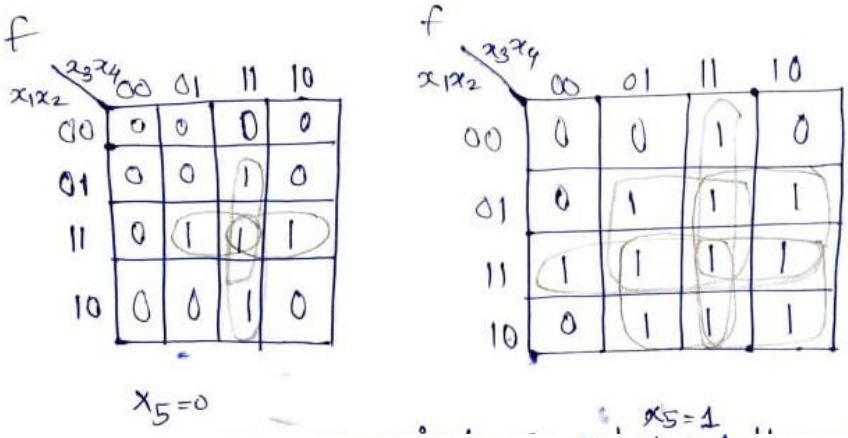
QUESTION 1

193079024

Sarvesh Kale

Q1 NAND Implementation -→



Q1.) NAND.

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$f = \overline{x_5}(x_1x_2x_3 + \overline{x_1}x_3x_4 + x_2\overline{x_3}x_4 + x_1x_2\overline{x_4}) +$
$x_5x_1x_2 + x_5x_3x_4 + x_5x_2\overline{x_4} + x_5x_2\overline{x_3} + x_5x_1\overline{x_4} +$
$x_5\overline{x_1}x_3.$

$\overline{\overline{x_5}.f_1 + g} \quad \overline{\overline{x_5}f_1 . \overline{g}} \quad \overline{\overline{x_5}f_1}, \overline{g}$

Simplification.

$f_1 = x_1x_2\overline{x_3} + x_1x_3x_4 + x_1x_2x_3 + x_1x_2x_4$ and g is following

$g = x_5x_1x_2 + x_5x_3x_4 + x_5x_2x_4 + x_5\overline{x_2}x_3 + x_5x_1x_4 + x_5x_1x_3$

$f_1 = \overline{\overline{m}.\overline{n}}$

$m = x_4x_2\overline{x_3} + x_1x_3x_4 + x_1x_2x_4$

$n = x_1x_2x_3$

$\overline{m} = \overline{x_4 . \overline{x_2x_3}} \; \overline{\overline{x_1x_3x_4}} \; \overline{x_1\overline{x_2x_4}}$

$\overline{n} = \overline{\overline{x_1x_2x_3}}$

$\overline{g} = \overline{x_5x_1x_2} \; \overline{x_5x_3x_4} \; \overline{x_5x_2x_4} \; \overline{x_5x_3\overline{x_2}} \; \overline{x_5x_1x_4} \; \overline{x_5x_1x_3}$

Q1.

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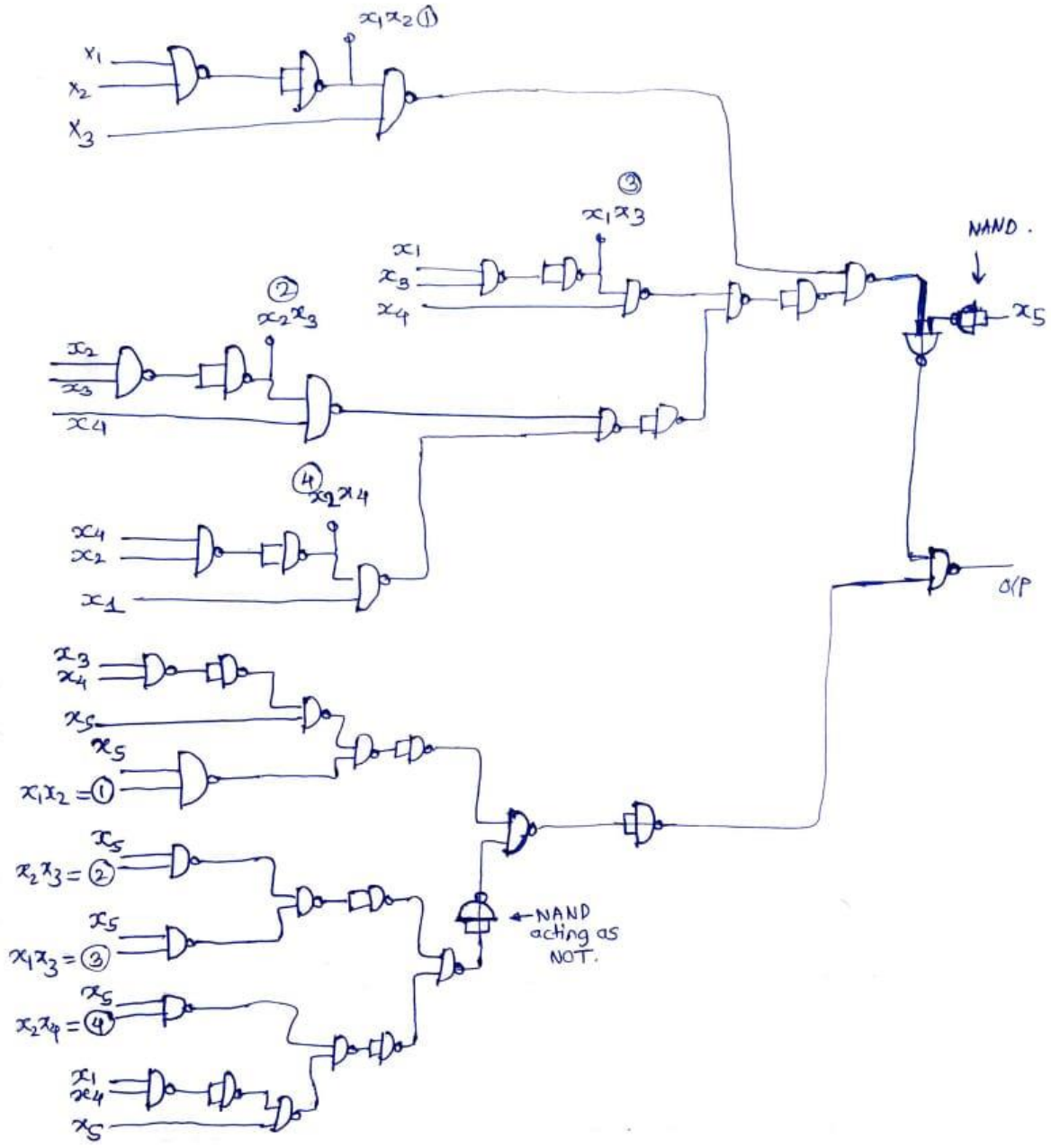

MAJORITY FUNCTION IMPLEMENTATION USING NAND GATES.

Nor implementation →

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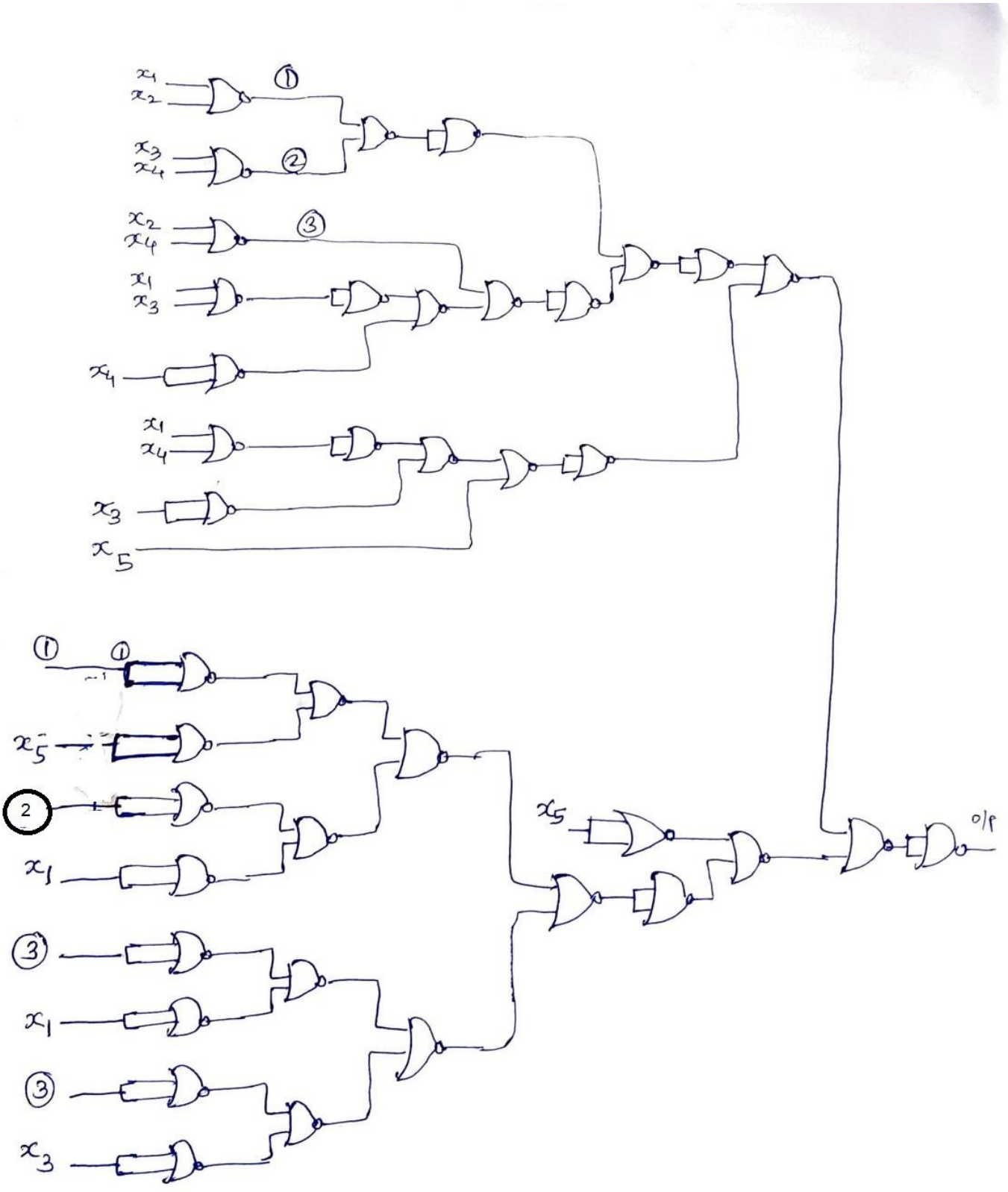
Implementation using NOR gates.

expression of TT in SOP form

$$\overline{x_5}\left(\overline{(x_1+x_2)(x_3+x_4)(x_2+x_4)(x_3+\overline{x_4}+x_1)(x_1+\overline{x_3}+x_4)}\right)+ x_5\left(\overline{(x_1+x_2+x_3)(x_1+x_3+x_4)(x_1+x_2+x_4)(x_2+x_3+x_4)}\right)$$

$$\Rightarrow \frac{x_5+(\overline{x_1}.\overline{x_2}+\overline{x_3}.\overline{x_4}+\overline{x_2}.\overline{x_4}+\overline{x_3}.x_4.\overline{x_1}+\overline{x_1}x_3\overline{x_4})+}{\overline{x_5}+\overline{x_1}.\overline{x_2}\,\overline{x_3}+\overline{x_1}.\overline{x_3}\,\overline{x_4}+\overline{x_1}\,\overline{x_2}\,\overline{x_4}+\overline{x_2}.\overline{x_3}\,\overline{x_4}}$$


x1
x2
①
x3
x4
②
x2
x4
③
x1
x3
x4
x1
x4
x3
x5
①
①
x5
2
x1
③
x1
③
x3
x5
o/p

Q1.) The below expression implementation is drawn as a multiplexer.

f

x_1x_2 \ x_3x_4	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	0	1	1	1
10	0	0	1	0

$x_5 = 0$

f

x_1x_2 \ x_3x_4	00	01	11	10
00	0	0	1	0
01	0	1	1	1
11	1	1	1	1
10	0	1	1	1

$x_5 = 1$

we are going to use shannons theorem.

$$f_{\overline{x_5}} = x_2x_3x_4 + x_1x_3x_4 + x_1x_2x_3 + x_1x_2x_4$$

$$f_{x_5} = x_5x_1x_2 + x_5x_3x_4 + x_5x_2x_4 + x_5x_2x_3 + x_5x_1x_4 + x_5x_1x_3$$