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(A) Finally answer is :—

$$f_1 = f_4\,ce + de + g$$
$$f_2 = f_4\,d + (cd + g)e$$
$$f_3 = abc$$

(Here, $f_4 = a + b$)

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(A)

Hence:

$f_{ax} = x_a x_b + x_{ac} x_{bc} x_d + x_a x_b x_{cd} + x_{cd} x_g$

Kernal - cube incidence matrix

		a	b	ac	bc	d	cd	g
a+b	$x_a x_b$	1	1	0	0	0	0	0
ac+bc+d	$x_{ac} x_{bc} x_d$	0	0	1	1	1	0	0
a+b+cd	$x_a x_b x_{cd}$	1	1	0	0	0	1	0
cd+g	$x_{cd} x_g$	0	0	0	0	0	1	1

Hence,
prime rectangles are

kernal vers

1. $(\{x_a x_b, x_a x_b x_{cd}\}, \{a, b\})$ a+b

~~2. $(\{x_a x_b x_{cd}, x_{cd} x_g\}, \{cd\})$ cd~~

$\boxed{\text{Hence, we can name } f_4 = a+b}$

~~f_5 = cd (we can either~~ leave it also ~~, as it does not affec~~

~~and~~

~~rewrite~~ expression as;

~~$f_1 = f_4 ce + de + g$~~

$f_2 = \cancel{f_4 d + (cd+g)e}$ ~~$(f_5+g)e$~~

~~$f_3 = f_5 e$~~

(B) We ~~may want to~~ leave f_5 ~~also~~.

Hence;

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Q.① $f_1 = ace + bce + de + g$
$f_2 = ad + bd + cde + ge$
$f_3 = abc$

Ⓐ for f_1

	a	b	c	d	e	g
ace	1	0	1	0	1	0
bce	0	1	1	0	1	0
de	0	0	0	1	1	0
g	0	0	0	0	0	1

Hence,
literals ⇒ ① $(\{ace, bce\}, \{c, e\})$
② $(\{ace, bce, de\}, \{e\})$

Ⓑ for f_2

	a	b	c	d	e	g
ad	1	0	0	1	0	0
bd	0	1	0	1	0	0
cde	0	0	1	1	1	0
ge	0	0	0	0	1	1

literals ⇒ ① $(\{ad, bd, cde\}, \{d\})$
② $(\{cde, ge\}, \{e\})$

Ⓒ for f_3

no literals

⇒ Hence, $K(f_1) = \{(a+b), (ac+bc+d)\}$
$K(f_2) = \{(a + b + cd), (cd+g)\}$
$K(f_3) = \{\}$

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Q.③ As in question 2.

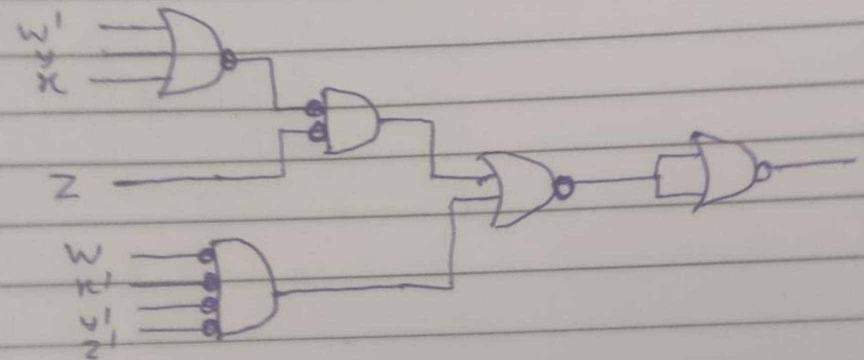
From K map :-

$f(w,x,y,z) = \Sigma(1,3,5,7,8,11,13,15)$

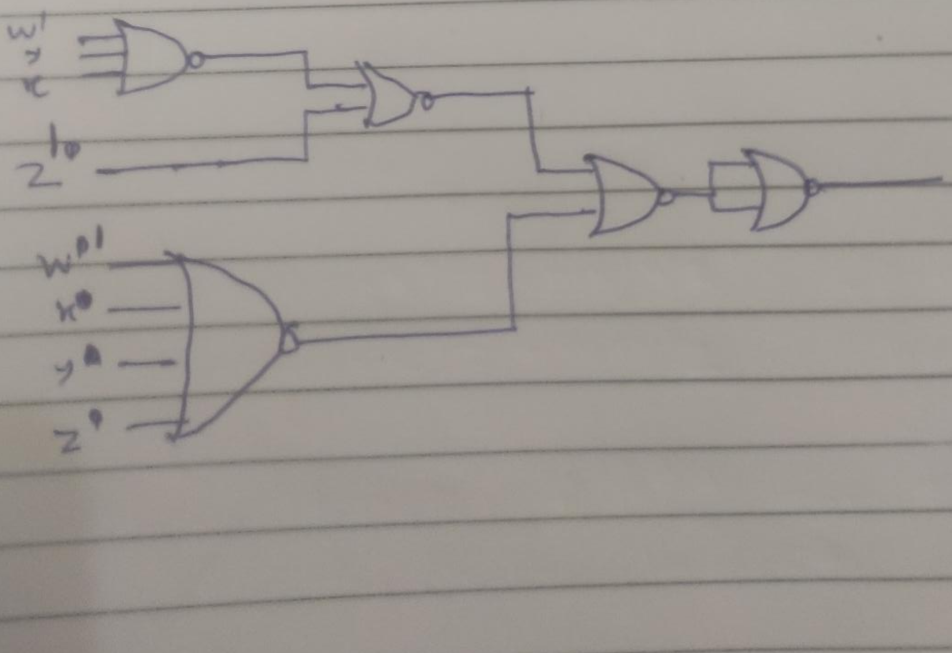
$= w'z + yz + xz + wx'y'z'$

$\therefore f = (w'+y+x)z + wx'y'z'$

Circuit Diagram (simple)



Hence, finally (using nor only)



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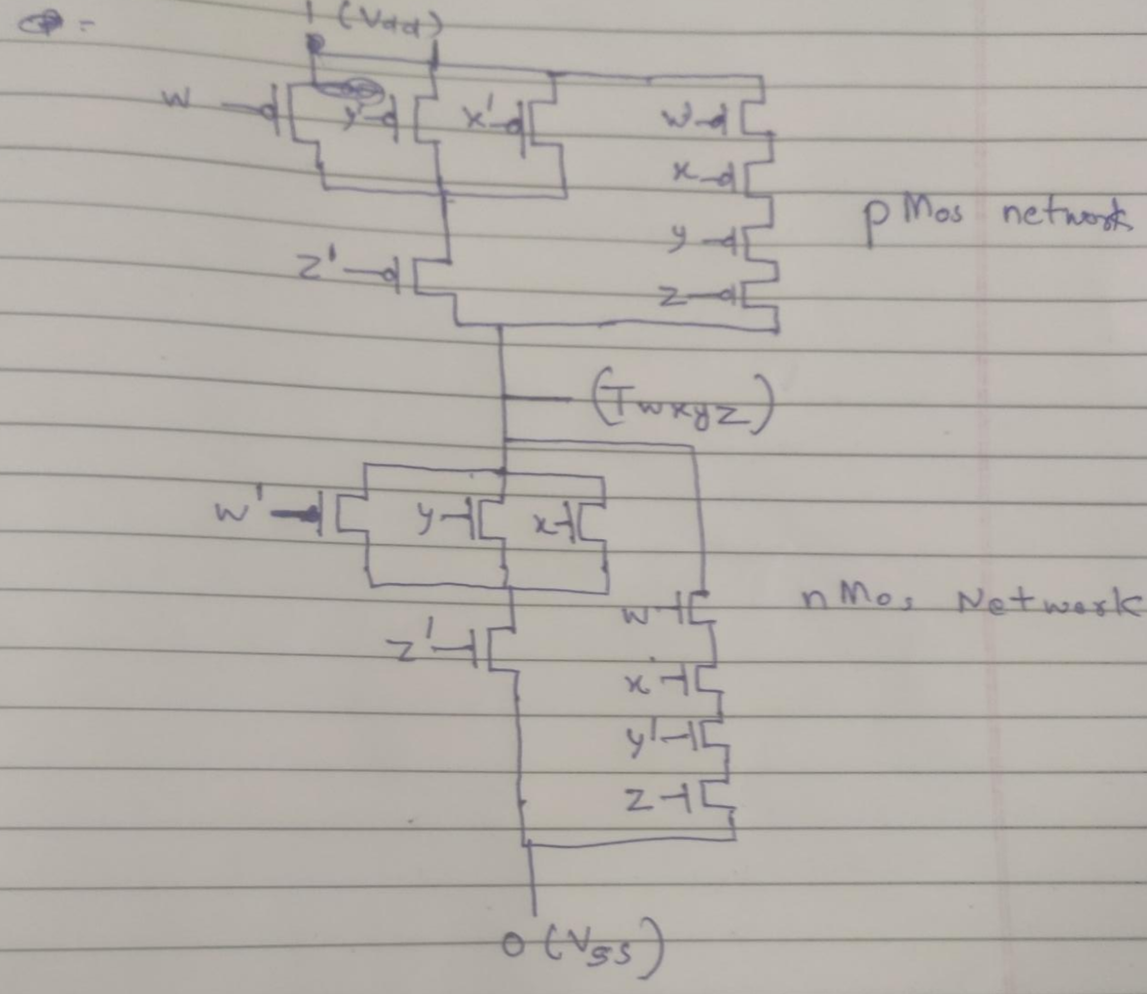

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Q.(2) Given,

$f(w,x,y,z) = \Sigma(1,3,5,7,8,11,13,15)$

using k-map

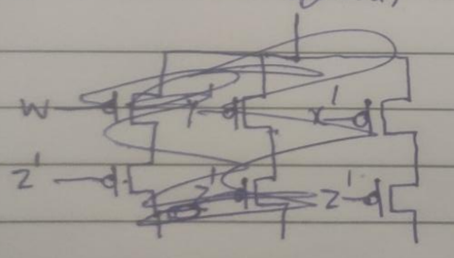
yz \ wx	00	01	10	11
00	·	·	·	1
01	1	1	1	·
10	1	1	1	1
11		·		·

$f = w'z + yz + xz + wx'y'z'$

and $f' = w'z' + yz' + xz' + wx'y'z$ (using k map)

we, will use complex gate implementation

1(Vdd)



$f = (w' + y + x)z + wx'y'z'$ (Simplification)

$f' = (w' + y + x)z' + wxy'z$ (Simplication)

we will use ~~@~~ pMos for f's represantati

and f' for its complement.