



* $b \rightarrow c$
missing
1/0
puts
d

12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either inspect the answers as typed and the expense of typing is charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

2.i

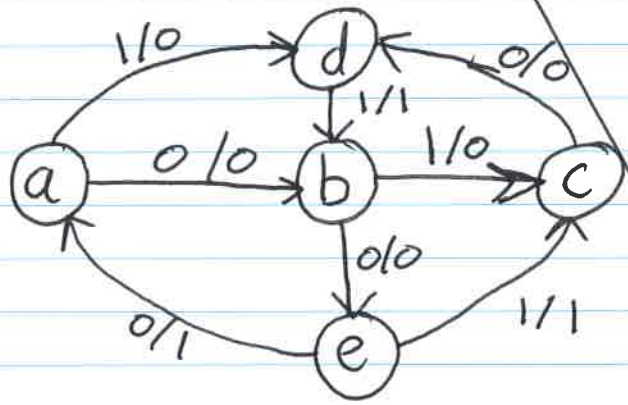
~~CS NS
X0 X1~~

~~CS~~	~~NS~~	~~0~~
~~a~~	~~b~~	~~0~~
~~b~~	~~e~~	~~0~~
~~c~~	~~c~~	~~0~~
~~d~~	~~d~~	~~0~~
~~e~~	~~b~~	~~1~~
~~e~~	~~d~~	~~0~~
~~a~~	~~a~~	~~1~~
	~~c~~	~~1~~
	~~d~~	~~0~~

* $b \rightarrow c$
missing
used 1/0

* 2 Inputs
of 1 for d

CS	NS	0
a	b	0
b	e	0
b	c	0
c	d	0
d	b	1
e	a	1
e	c	1
a	d	0



ii.

- a)
- a - 000
 - b - 001
 - c - 010
 - d - 011
 - e - 100

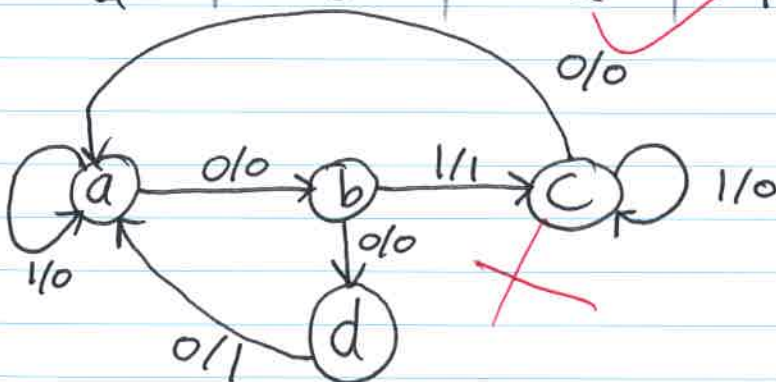
b.

a	000			
b	001			
c	010			
d	011			
e	100			
	CS	I	NS	0
a	000	0	001	0
a	000	1	011	0
b	001	0	100	
b	001	1	010	
c	010	0	011	
c	010	1		
d	011	1		
d	011	1		
e	100	0		
e	100	1		

2. i.

	CS	I	NS	O
*	a	0	b	0
*	a	1	d	0
*	b	0	e	0
*	b	1	c	1
	c	0	d.	0
	c	1	c	0
*	d	0	b	0
*	d	1	d.	0
	e	0	a	1
*	e	1	c	1

CS	I	NS	O
a	0	b	0
a	1	a	0
b	0	d	0
b	1	c	1
c	0	d	0
c	1	c	0
d	0	a	1



- ii)
- a)
- a - 00
- b - 01
- c - 10
- d - 11

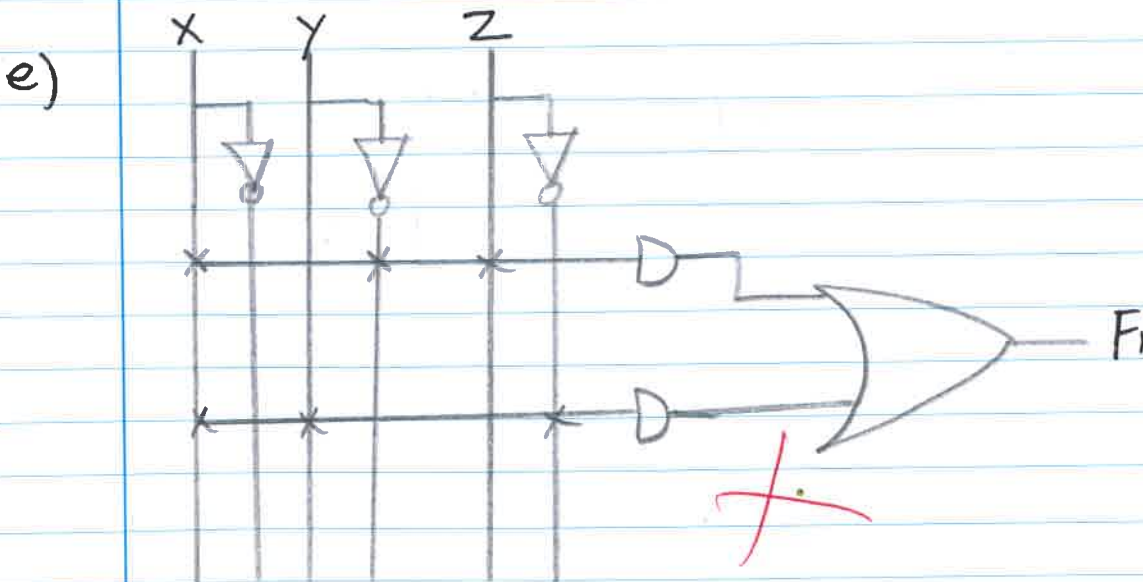
ii) b)

	CS	I	NS	O
a	0 0	0	0 1	0
a	0 0	1	0 0	0
b	0 1	0	1 1	0
b	0 1	1	0 0	1
c	1 0	0	0 0	0
c	1 0	1	1 0	0
d	1 1	0	0 0	1
d	1 1	1		

c)

CS (x,y)	I (z)	D F/P	O
0 0	0	0 1	0
0 0	1	0 0	0
0 1	0	1 1	0
0 1	1	1 0	1
1 0	0	0 0	0
1 0	1	1 0	0
1 1	0	0 0	1

d) $F = x\bar{y}z + xy\bar{z}$



5. i.

$$F_1(XYZ) = \sum m(0, 3, 5, 6)$$

$$F_2(XYZ) = \sum m(0, 1, 2, 4, 7)$$

a).

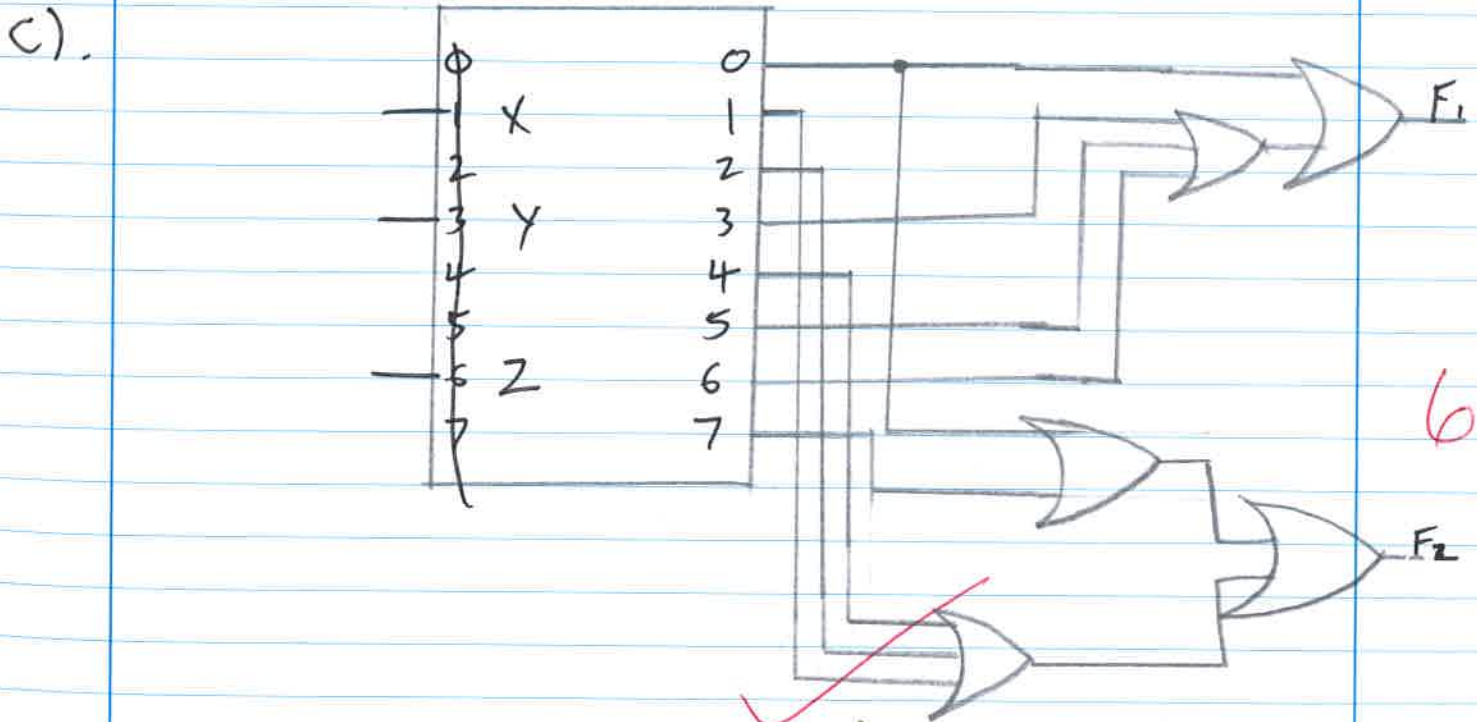
X	Y	Z	F_1	F_2
0	0	0	1	1
1	0	0	0	1
2	0	1	0	1
3	0	1	1	0
4	1	0	0	1
5	1	0	1	0
6	1	1	1	0
7	1	1	0	1

b)

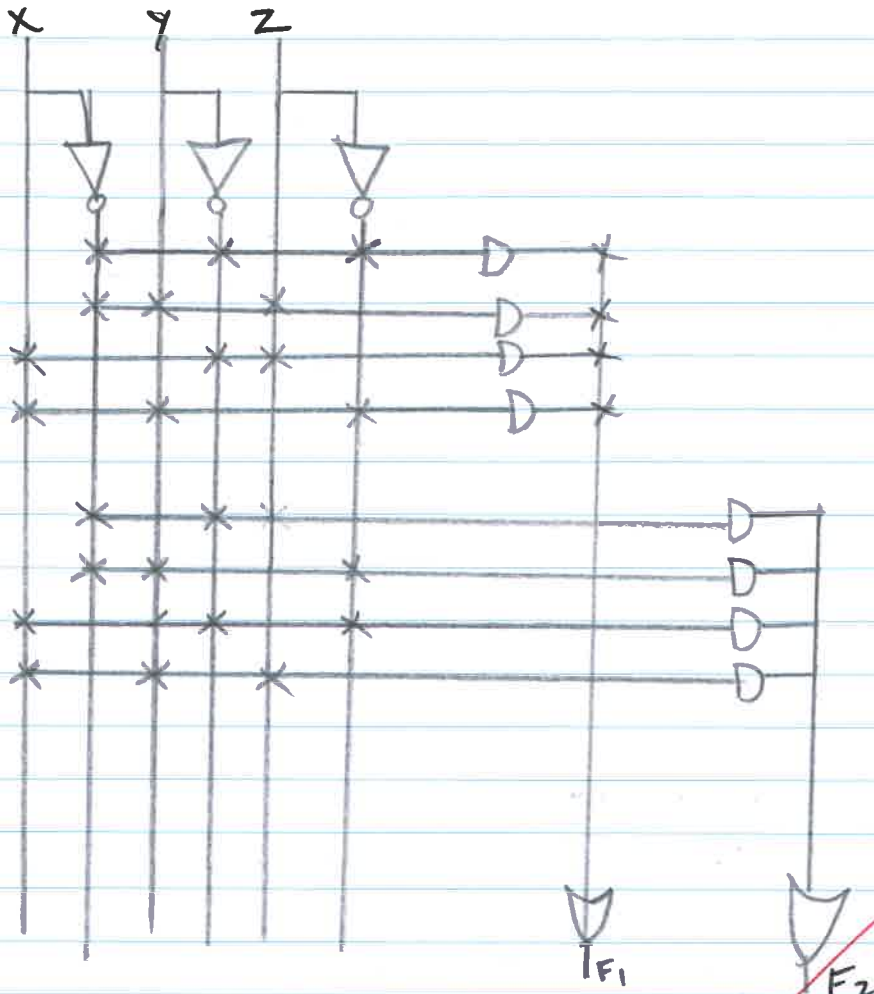
$$F_1 = \bar{X}\bar{Y}\bar{Z} + \bar{X}YZ + X\bar{Y}Z + XY\bar{Z}$$

k-map expression considering

$$F_2 = \bar{X}\bar{Y} + \bar{X}Y\bar{Z} + X\bar{Y}\bar{Z} + XY\bar{Z}$$



d)



$$F_1 = \bar{X}\bar{Y}\bar{Z} + \bar{X}YZ + X\bar{Y}\bar{Z} + X\bar{Y}\bar{Z}$$

$$F_2 = \bar{X}(\bar{Y} + Z) + X\bar{Y}\bar{Z} + XYZ$$

$$F_2 = \bar{X}\bar{Y} + \bar{X}YZ + X\bar{Y}\bar{Z} + XYZ$$

6

6

20/20

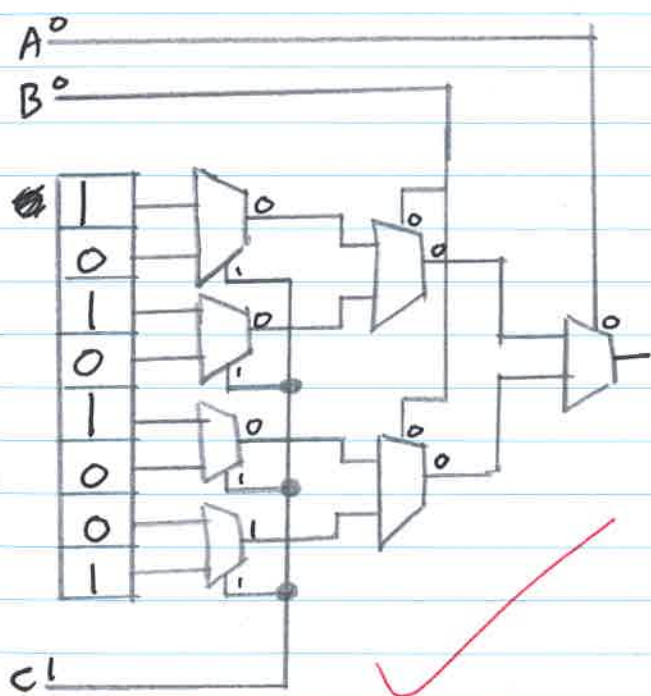
20

6 ii)

a)
$$f = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$$

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

b)

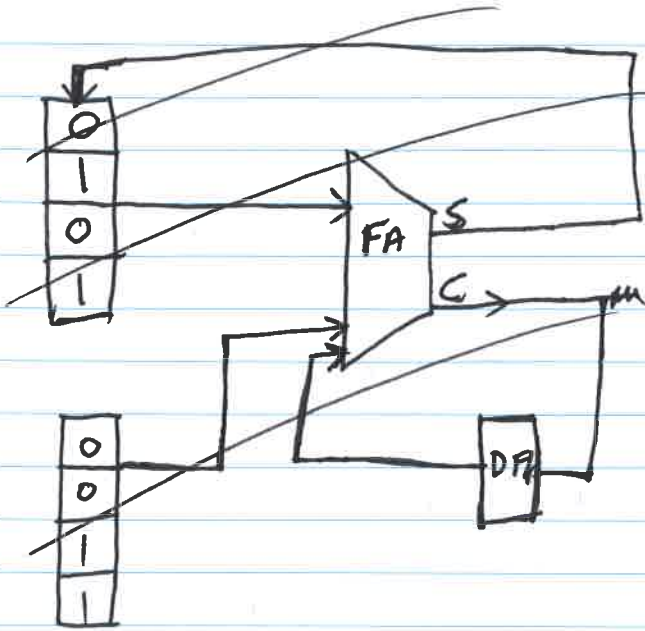


08
20

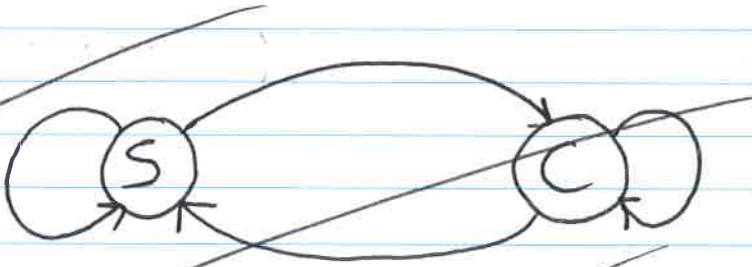
8

8

4: a)

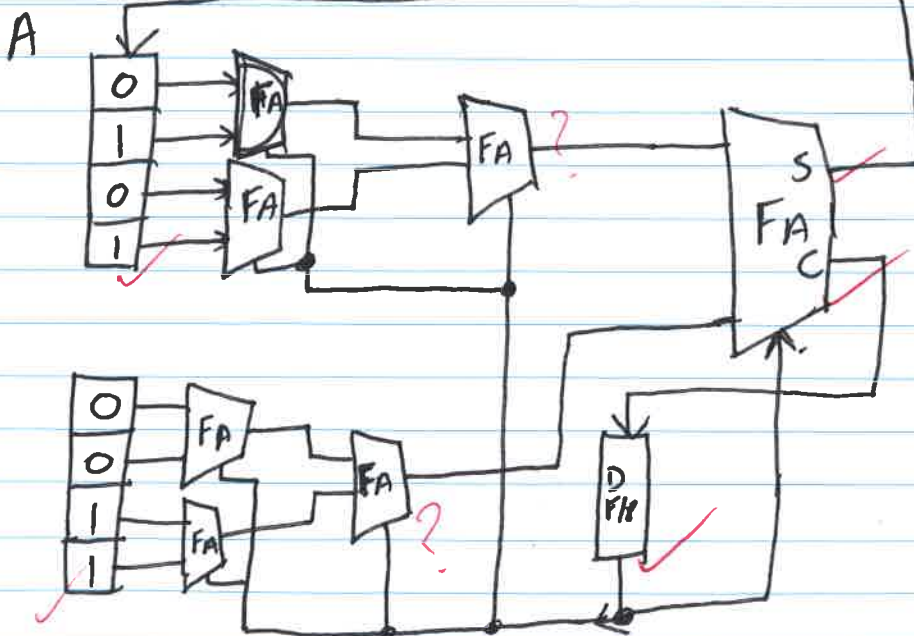


b)



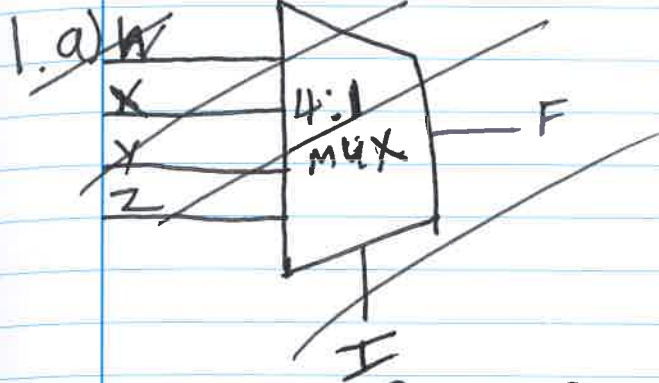
~~scribbled text~~

4a. #

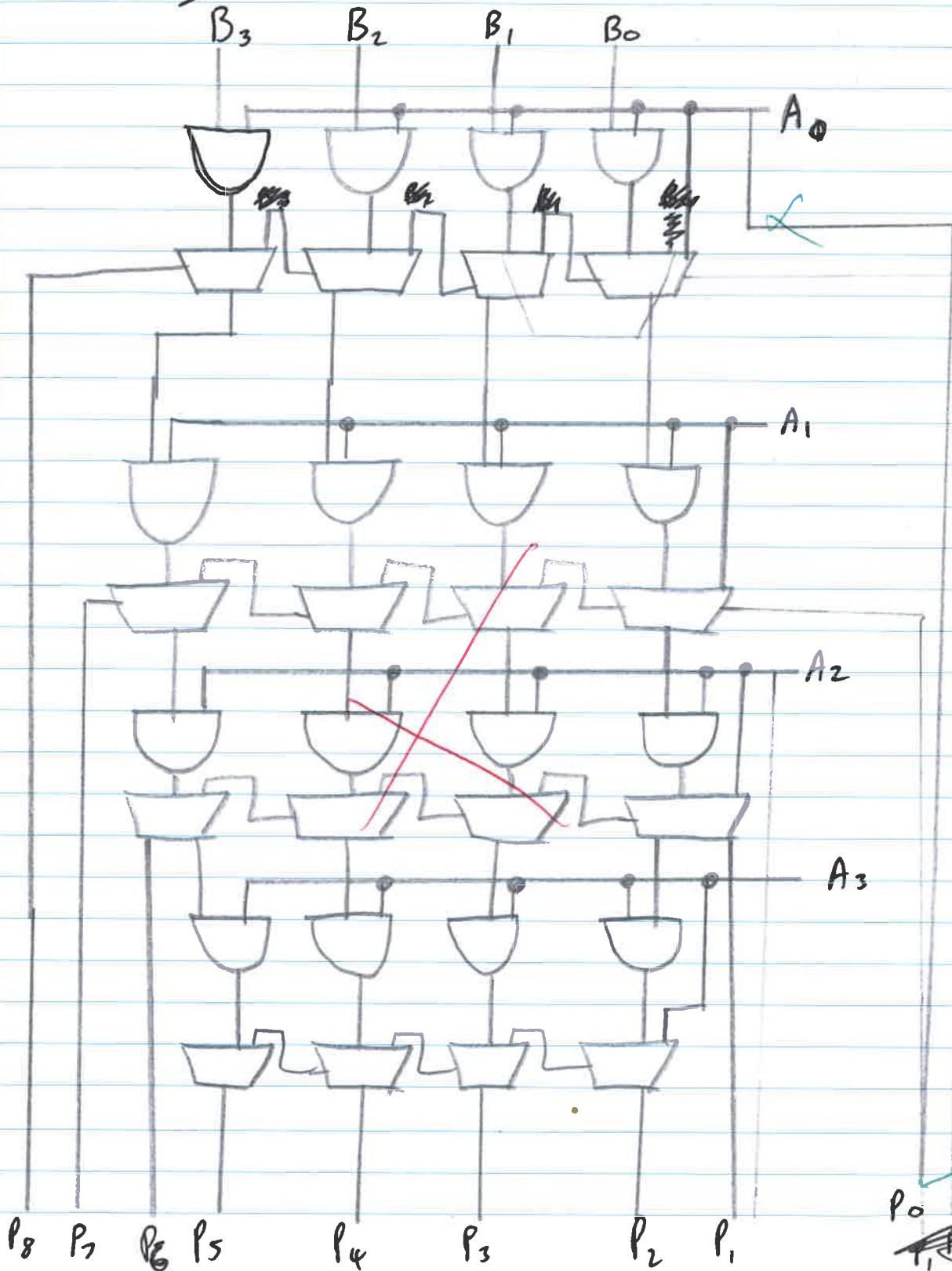


0/20

24-0



Q3.
b)



0

6

24 = 6

Rhif y Cwestiwn

Q3.d) Library. ieee. Std

~~Begin~~

Inputs; ~~A, B~~

A (0 to 1) Std logic,
B (0 to 1) Std logic,

outputs;

X (0 to 3),

Begin;

~~If A = NOT~~

$X_1 = (\text{NOT } A) \text{ AND } (\text{NOT } B),$
 $X_2 = A \text{ AND } (\text{NOT } A) \text{ AND } B,$
 $X_3 = A \text{ AND } (\text{NOT } B),$
 $X_4 = A \text{ AND } B.$

END PROCESS.

46

CS
A.B.C.D

I

NS

O