

12 Pages

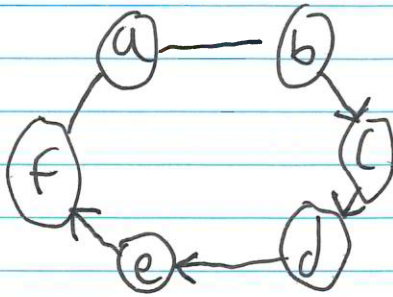
1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or retype and the expense 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.**

1	Student Number	2218703
2	Title of Examination Paper	ELECTRONICS 2
3	Module Code	ACDA6001
4	Date and Time of Examination	8/5/2025
5	Examination Venue	IA109
6	Seat Number	N/A
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	21 ✓
2	10 ✓
3	07 ✓
4	17 ✓
Total	55/100

(Gweler yr ochr arall am y fersiwn Cymraeg)

1. i. d.



1. i. e.

~~$J_2 = \bar{q}_2 q_1 q_0$~~ ~~$J_1 =$~~

$q_1 q_0$	00	01	11	10
q_2 0	0	0	1	0
q_2 1	d	d	d	d

$J_2 = q_1 q_0$

$q_1 q_0$	00	01	11	10
q_2 0	0	d	d	d
q_2 1	0	1	d	1

$K_2 = \bar{q}_1 q_0$

$q_1 q_0$	00	01	11	10
q_2 0	0	1	d	d
q_2 1	0	0	d	d

$$J_1 = \bar{q}_2 q_1 q_0$$

$q_1 q_0$	00	01	11	10
q_2 0	d	d	1	0
q_2 1	d	d	d	d

$$K_1 = q_0$$

$q_1 q_0$	00	01	11	10
q_2 0	1	d	1	d
q_2 1	1	d	d	d

$q_1 q_0$	00	01	11	10
q_2 0	d	d	d	d
q_2 1	d	d	d	d

$q_1 q_0$	00	01	11	10
q_2 0	d	1	1	d
q_2 1	d	1	d	d

$$J_0 = 1$$

$$K_0 = 1$$

21
23

3. i. a.

			W	Z
A	s d	Y_0	0	0
B	i e	Y_1	0	1
C	m c	Y_2	1	1
D	p o	Y_3	0	0
	u d	Y_4	0	0
	e e	Y_5	0	0
	r	Y_6	0	0
		Y_7	0	0
		Y_8	0	1
		Y_9	0	0
		Y_{10}	0	0
		Y_{11}	0	0
		Y_{12}	1	1
		Y_{13}	1	1

3. i. c.

BA

	00	01	11	10
C 00	0	0	1	0
01	1	0	0	0
11	0	0	0	0
10	0	0	1	0

BA

	00	01	11	10
C 00	0	1	1	0
01	1	0	0	0
11	0	0	0	0
10	1	0	1	0

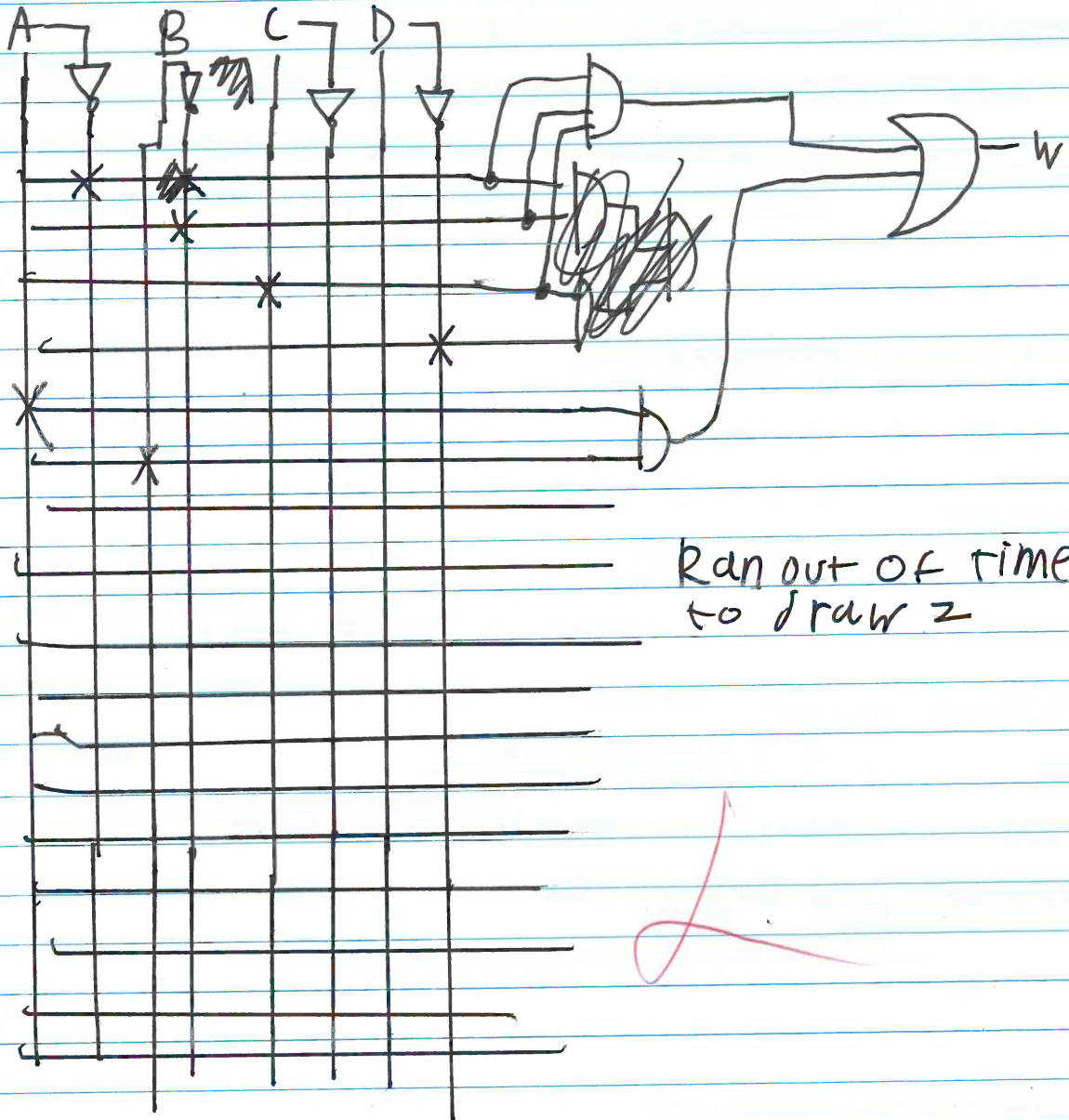
$$W = \bar{A}\bar{B}C\bar{D} + AB$$

$$Z = AB + A\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD$$

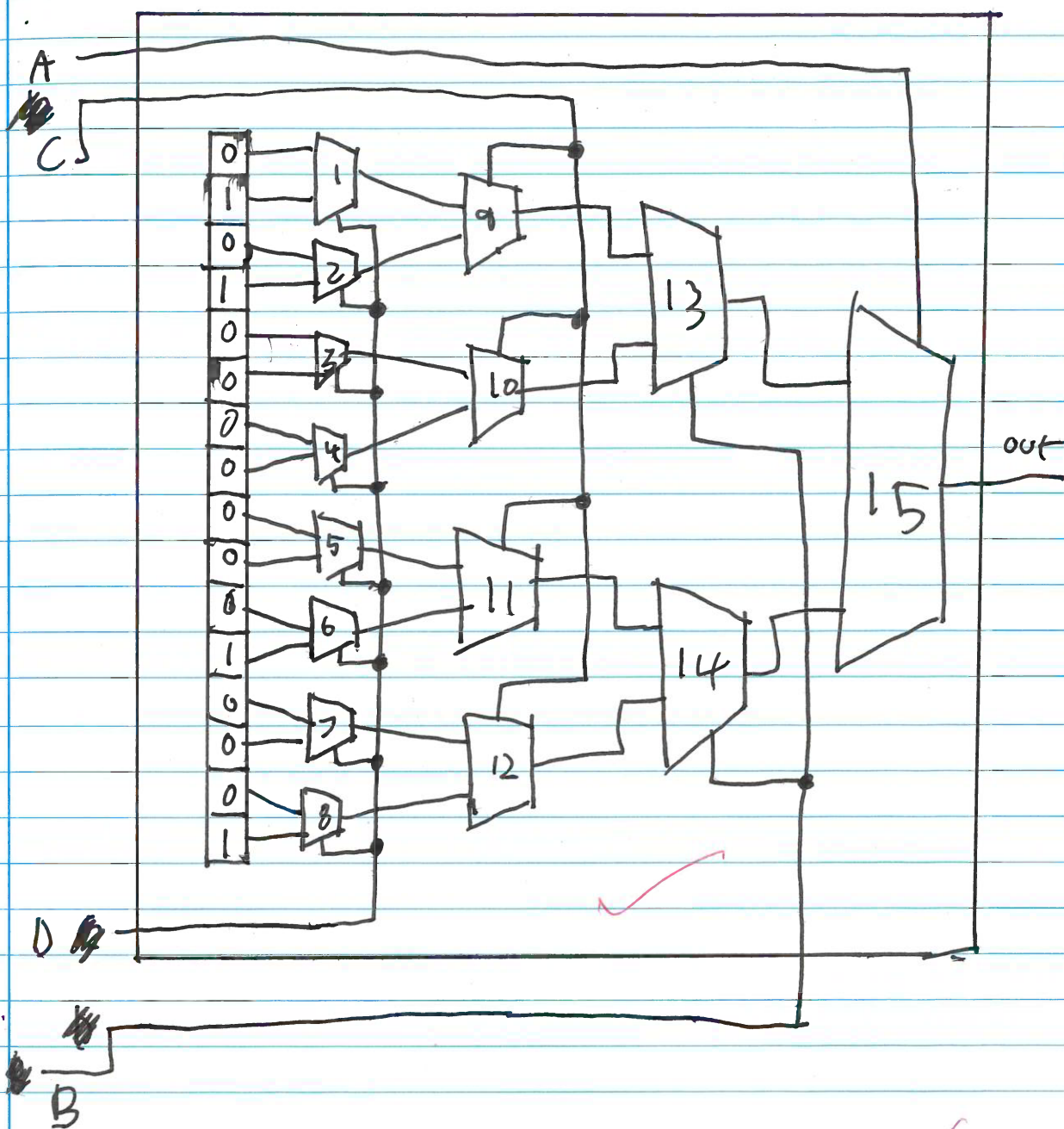
K-map
is used

07
25

3.i.d.



4. i. b.



8

17
25

D. Bridger a.e

1.

a. [See answer booklet]

b.

State Table

Q _n	Q _{n+1}
a	b
b	c
c	d
d	e
e	f
f	a

c.

State Assignment Table

State	Assignment
a	000
b	001
c	010
d	011
e	100
f	101

d.

JK Flip Flop excitation table

Q _n	Q _{n+1}	J	K
0	0	0	d
0	1	1	d
1	0	d	1
1	1	d	0

Mod 6 Counter excitation table

q ₂	q ₁	q ₀	Q ₂	Q ₁	Q ₀	J ₂	K ₂	J ₁	K ₁	J ₀	K ₀
0	0	0	0	0	1	0	d	0	d	1	d
0	0	1	0	1	0	0	d	1	d	d	1
0	1	0	0	1	1	0	d	d	0	1	d
0	1	1	1	0	0	1	d	d	1	d	1
1	0	0	1	0	1	d	0	0	d	1	d
1	0	1	0	0	0	d	1	0	d	d	1
1	1	0	d	d	d	d	d	d	d	d	d
1	1	1	d	d	d	d	d	d	d	d	d

e.

2.

a. [See answer booklet]

b. [See answer booklet]

c.

State Table

q	x	Q _{n+1}
a	0	a ✓
a	1	b ✓
b	0	c ✓
b	1	a ✓
c	0	a ✓
c	1	d ✓
d	0	a ✓
d	1	a ✓

State Assignments

State	Assignment
a	00
b	01
c	10
d	11

d.

Excitation Table

PS			NS				
q2	q1	x	Q2	Q1	z	D1	D0
0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	1
0	1	0	1	0	0	1	0
0	1	1	0	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	0	0	0	0	0
1	1	1	0	0	1	0	0

e. [See answer booklet]

3.

a. [See answer booklet]

b.

Truth Table

A	B	C	D	w	z
0	0	0	0	0	0
0	0	0	1	0	1
0	0	1	0	1	1
0	0	1	1	0	0
0	1	0	0	0	0
0	1	0	1	0	0
0	1	1	0	0	0
0	1	1	1	0	0
1	0	0	0	0	1
1	0	0	1	0	0
1	0	1	0	0	0
1	0	1	1	0	0
1	1	0	0	1	1
1	1	0	1	1	1
1	1	1	0	d	d
1	1	1	1	d	d

Fundamental Boolean expressions

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

$$z = \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD + AB\bar{C}\bar{D} + ABC\bar{D}$$

c. [See answer booklet]

d. [See answer booklet]

4.

a.

Truth Table

A	B	C	D	out
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
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	0
1	1	1	0	0
1	1	1	1	1

b. [See answer booklet]

c. When 0010 is provided to the LUT inputs, the pins are set as follows: A=0, B=0, C=1, D=0. In the left-most layer of multiplexers (1 to 8), they are each choosing from a pair of stored bits. Since D is 0, they will all choose the top value. E.g. MUX2 chooses 0 instead of 1.

The next layer (9 to 12) is connected to pairs of multiplexers in the previous layer. This layer is driven by C, which is 1, so they will all choose the bottom value. E.g. MUX9 will choose the output from MUX2 instead of from MUX1, which is 0.

Third layer (13 and 14) does similar, selecting one value from the previous 4 multiplexers. This layer is driven by B, which is 0, so MUX9 and MUX11 are selected. MUX9 is outputting 0, so MUX13 outputs 0.

The final layer decides between multipliers 13 and 14. It is driven by input A, which is 0, so it chooses MUX13. The final answer from MUX15 is 0.