

Examination Answer Books

12 Pages

Instructions to Candidates

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 the script or have it typed and the expense of typing 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	2413111
2	Title of Examination Paper	Signals and Systems
3	Module Code	ACDA4009
4	Date and Time of Examination	12/05/2025 9 am
5	Examination Venue	Swansea IQ103
6	Seat Number	8
7	Number of Answer Books handed in	

[illegible]

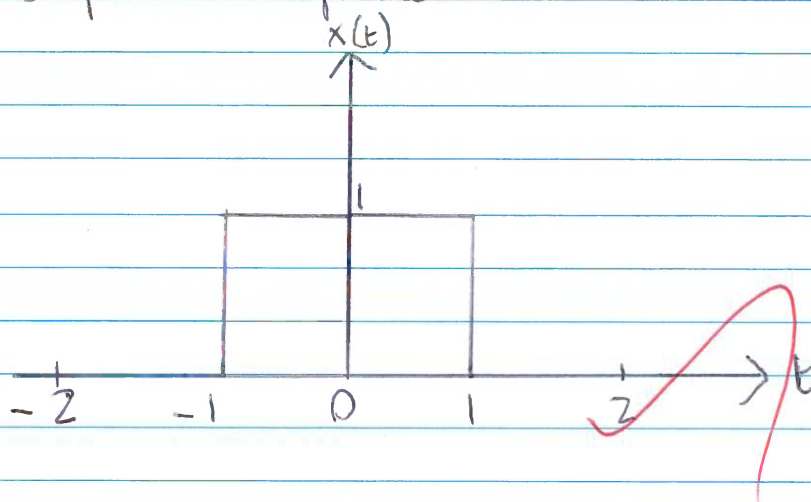
(Gweler yr ochr arall am y fersiwn Cymraeg)

a
1.
a

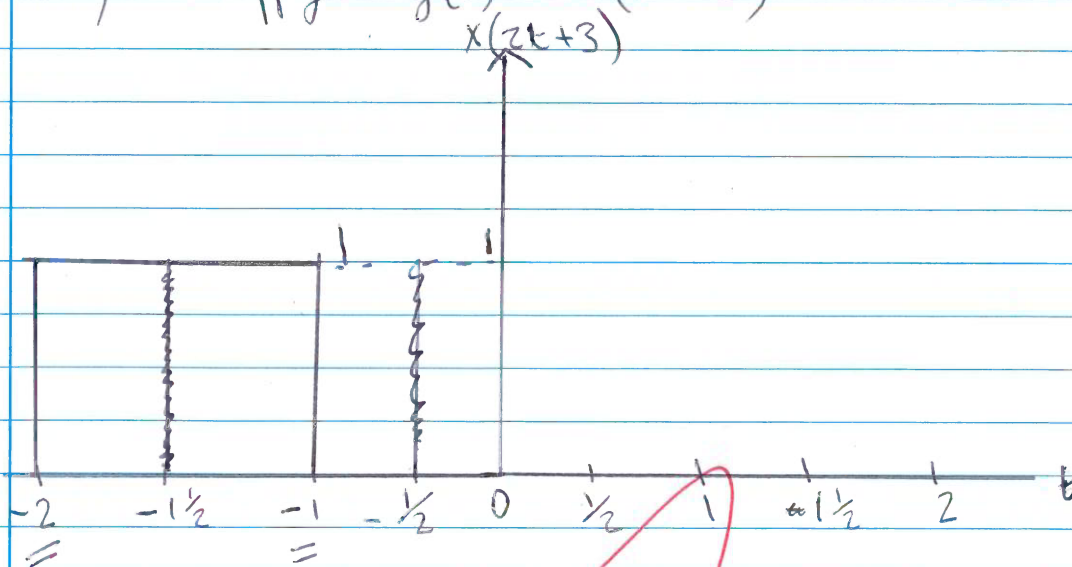
$$i) x(t) = \begin{cases} 1, & \text{if } |t| \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

$x(t)$ = A Continuous time signal
It is a Unit Rectangular Function.

ii) Graphical Representation:



iii) Apply $y(t) = x(2t+3)$

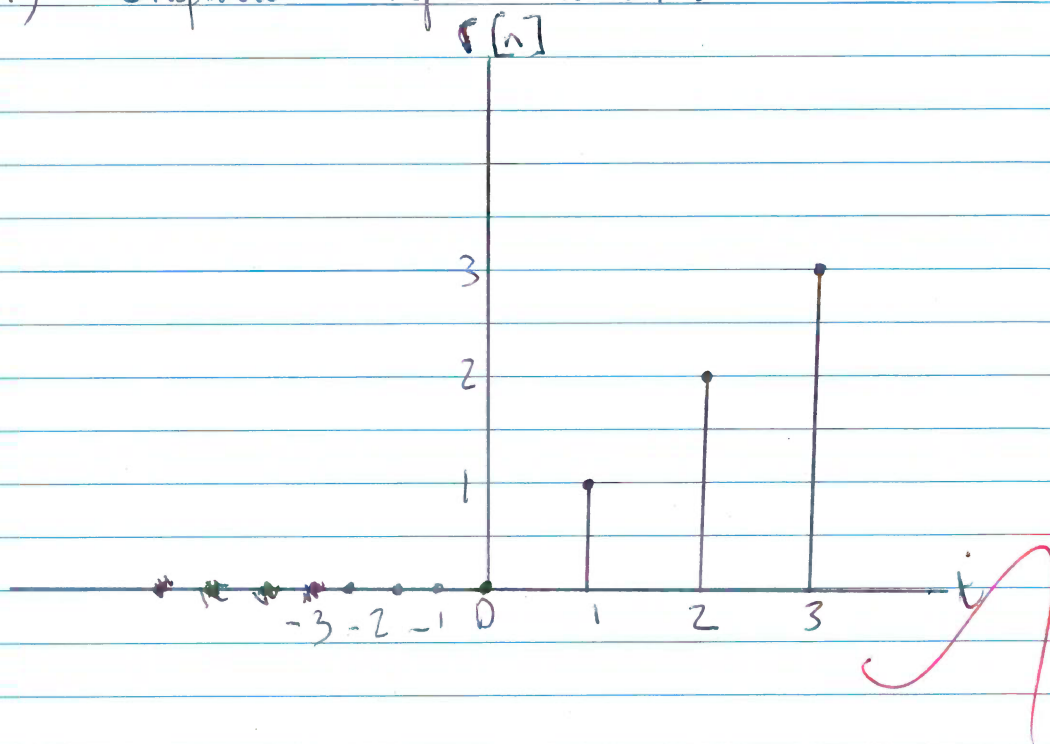


B) The time shifting property is the $x(2k+3) + 3$ in the above transformation and causes the function to shift in the negative direction 3 times in the scale that the function is in. When it is a ~~+~~ minus it causes it to shift in a positive direction.

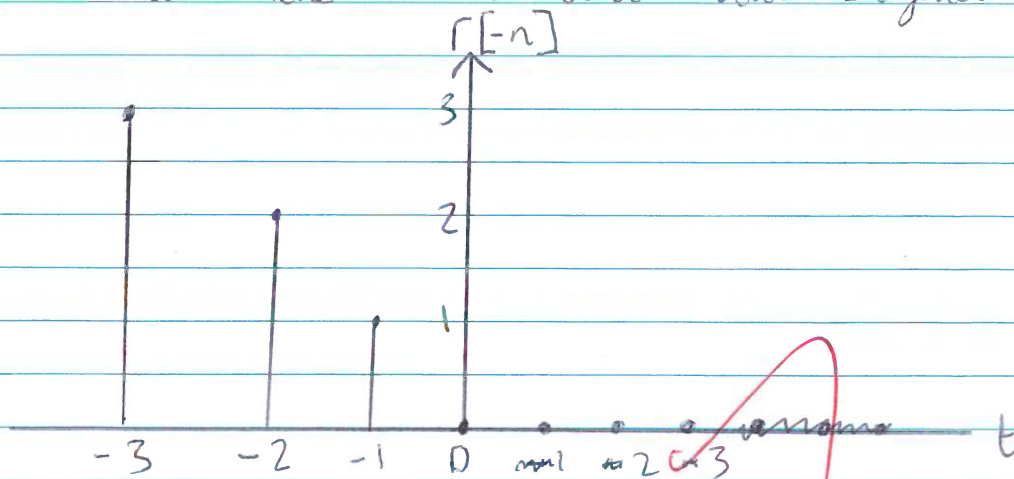
2. a) i) $r[n] = \begin{cases} n, & \text{if } 0 \leq n \leq 3 \\ 0, & n = 0 \end{cases}$

The signal is a discrete time signal.
The signal is also a Unit Ramp Function.

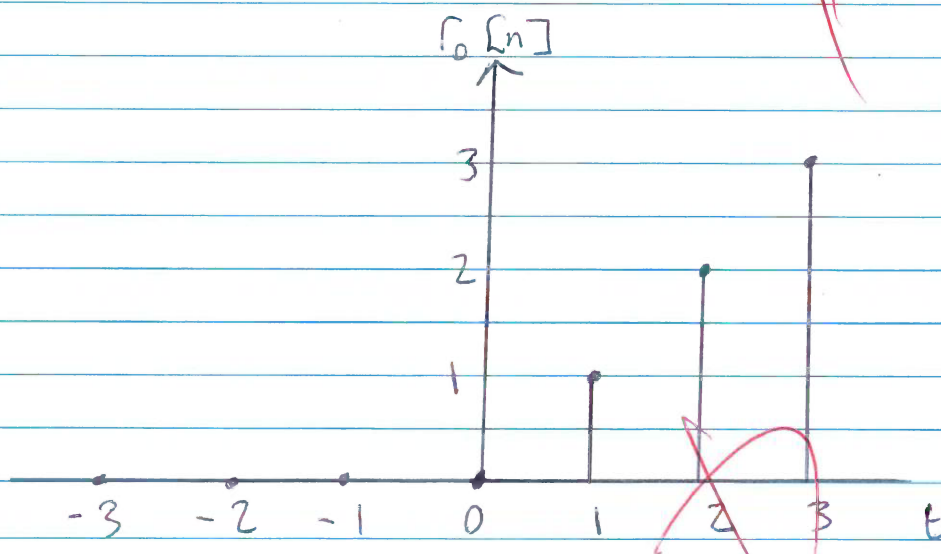
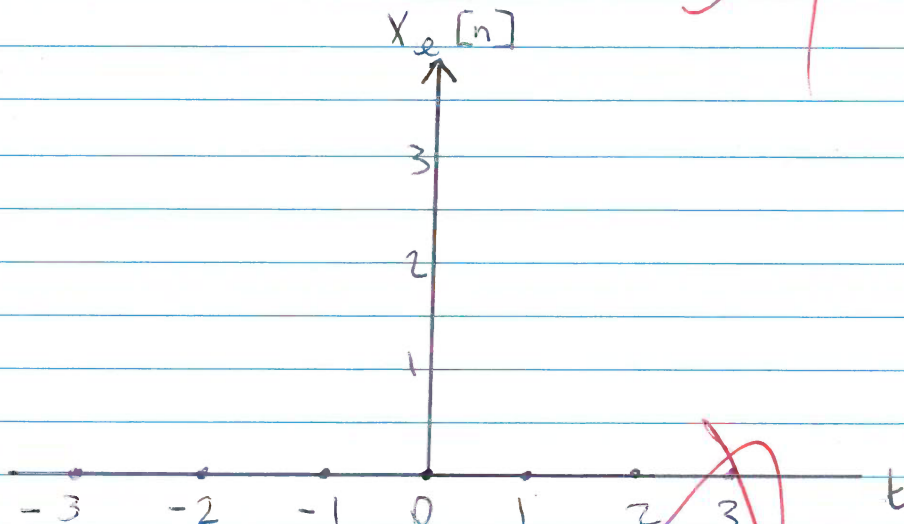
ii) Graphical representation:



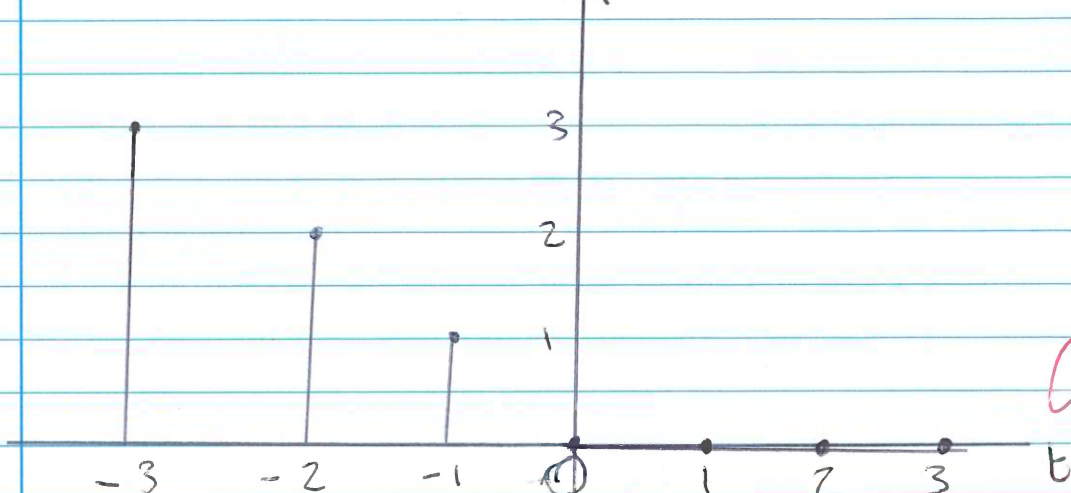
2/a) iii) Find the even and odd signal



$$x_e[n] = \frac{1}{2} (x[n] + x[-n])$$



iv) $w[n] = r_0[n]$, find $w[n]$



10/20

0

3.

a) i)

$$\begin{cases} 1, & \text{for } 0 \leq t < 1 \\ 0, & \text{for } 1 \leq t < 2 \\ 1, & \text{for } 2 \leq t < 3 \end{cases}$$

✓

2 ✓

ii.)

$$y(t) = h(t) \times (x(t))$$

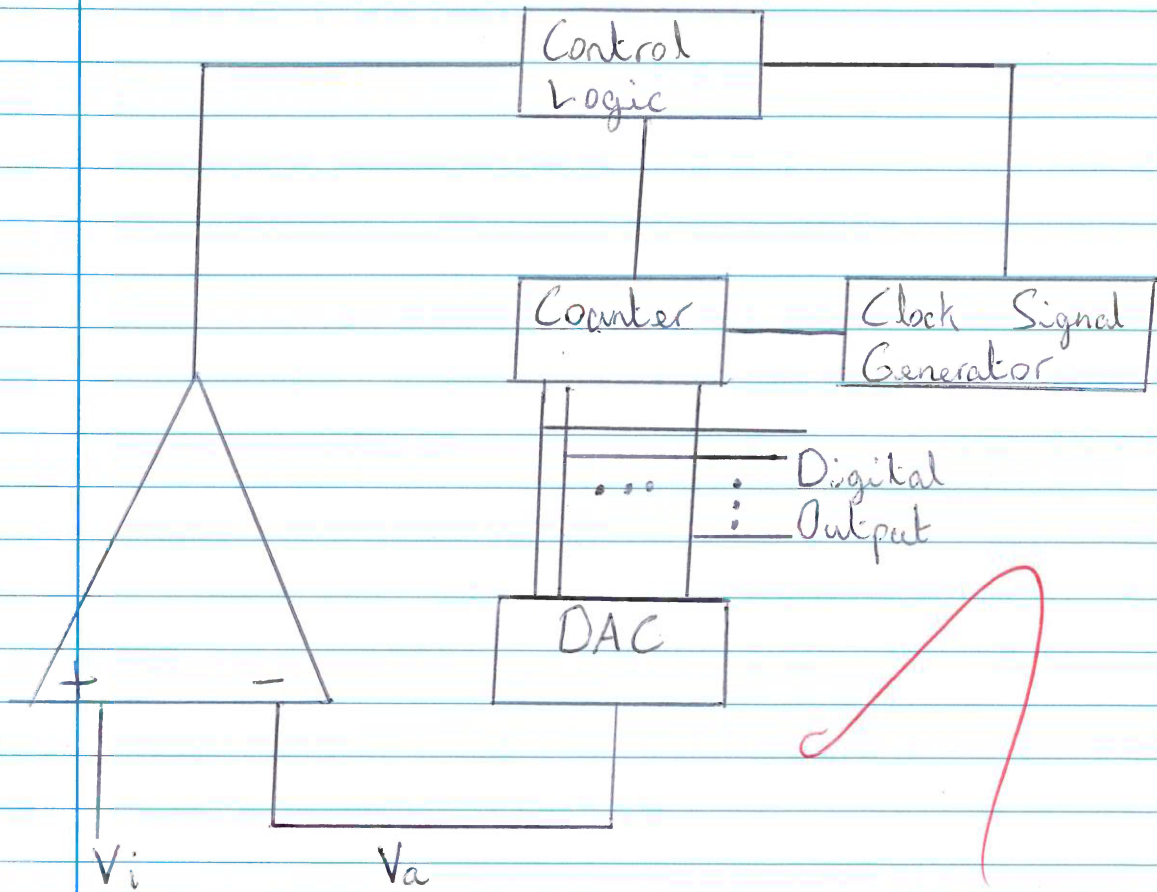
$$\int_{-\infty}^{\infty} h$$

02/20

0

4.

a) i.) Draw the block diagram of Counter type ADC.



ii) List of Components.

- Control Logic
- Counter
- Comparator
- Clock Signal Generator
- DAC

iii) The comparator's Working Principle:

The comparator receives an analogue input signal from the DAC (V_a). The comparator then compares this analogue signal V_a against V_i . As long as $V_i > V_a$ the comparator will send a "1" to the control logic and the counter type ~~ADC~~ will keep sending control logic will continue to send a clock pulse to the clock signal generator which will continue the cycle. If the comparator compares $V_i > V_a$ then the comparator will send a "0" to the control logic which will then disable the clock pulses to the clock signal generator and the counter will be displayed as the digital output.

iv) The DAC is needed to convert the incoming binary (digital) input from the counter into an analogue signal V_a which it sends to the comparator. This will then compare V_i and V_a and will send a 1 to the control logic if $V_i > V_a$ and a 0 if $V_i < V_a$.

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5.

a)

i. PRINT

P = Hex = 50

Binary = 0101 0000

I = Hex = 49

Binary = 0100 1001

R = Hex = 52

Binary = 0101 0010

N = Hex = 4E

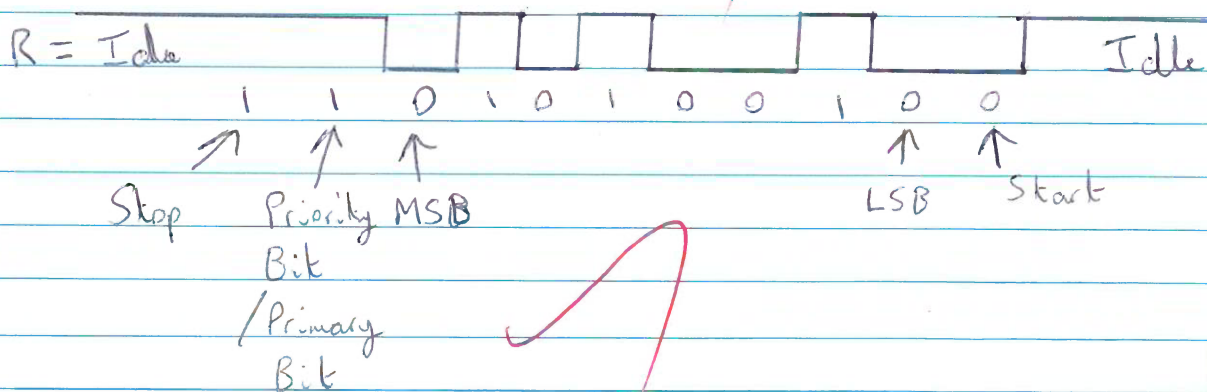
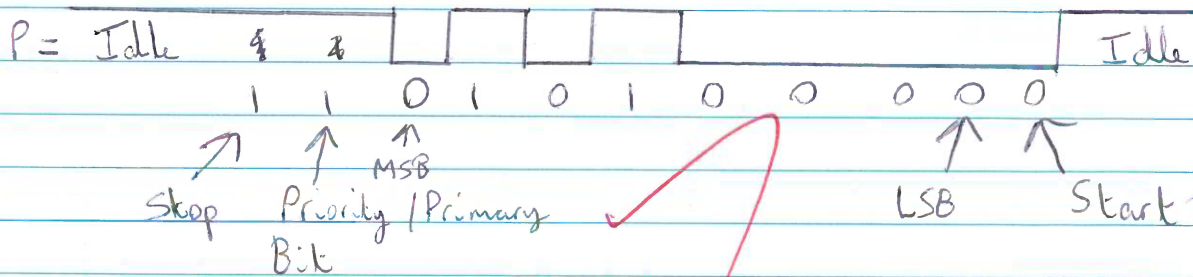
Binary = 0100 1110

T = Hex = 54

Binary = 0101 0100

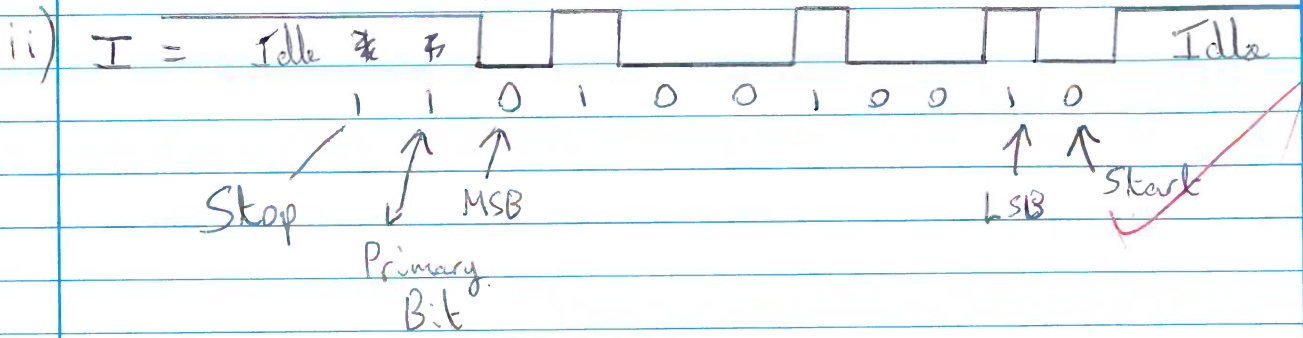
0	0	0000
Dec	Hex	84 2 1
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

ii) Relevant diagrams



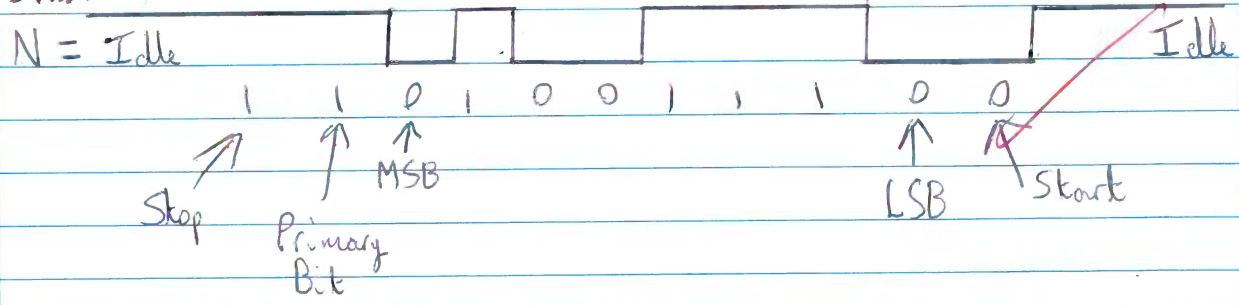


5.



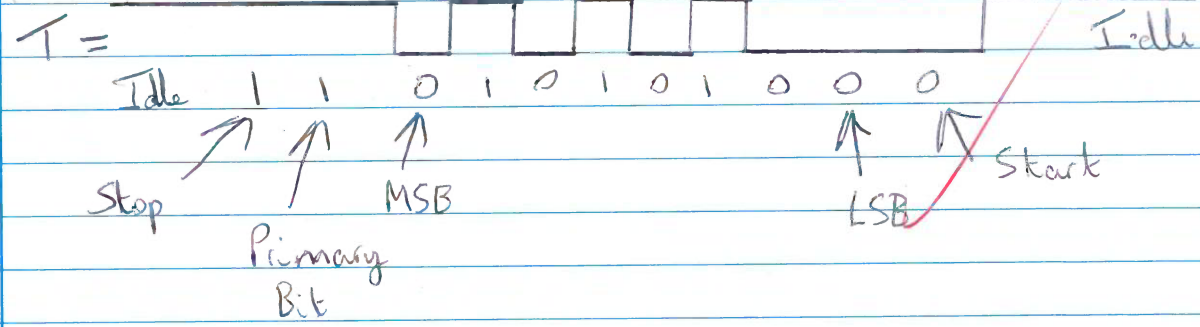
3

01010100



3

01010100



3

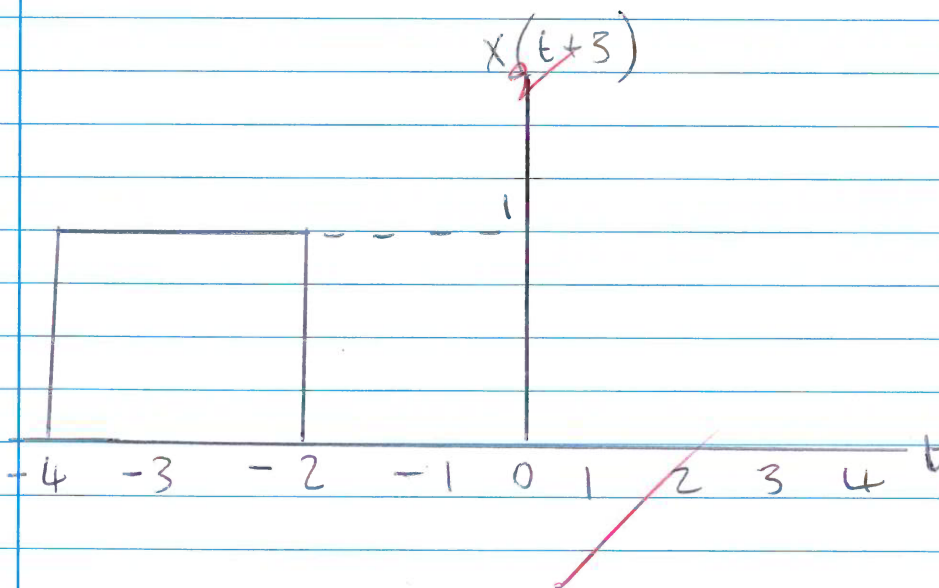
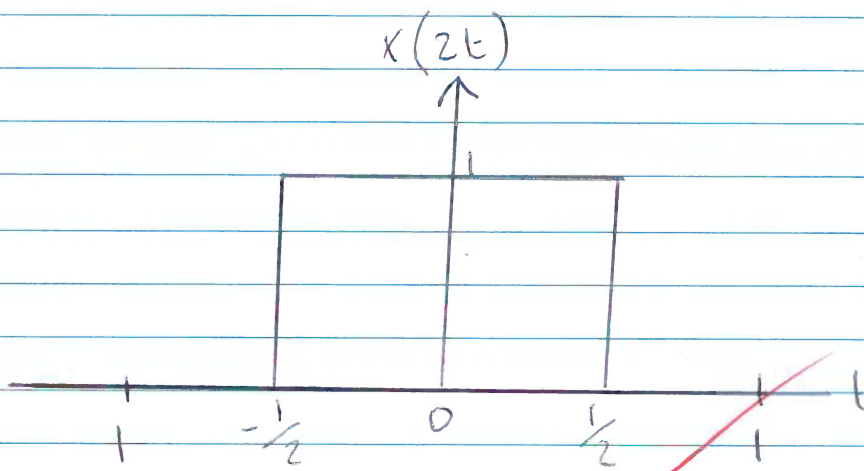
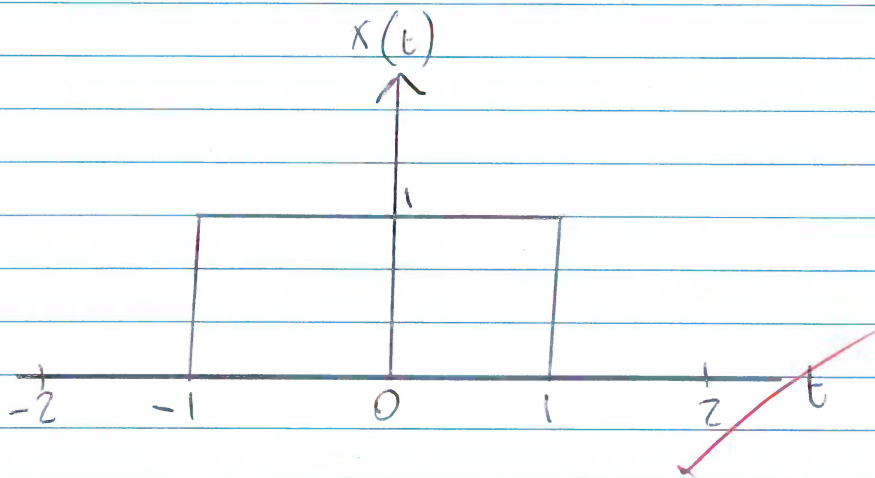
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1.

a)

iv)



marks
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before

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Question No.

Examiner Only

Arholwr yn unig

Rhif y Cwestiwn