



## 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 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                   | 2315904                              |
| 2 | Title of Examination Paper       | <del>ACDA</del><br>Signals + Systems |
| 3 | Module Code                      | ACDA4004                             |
| 4 | Date and Time of Examination     | 10/5/24<br>12.00                     |
| 5 | Examination Venue                | IQ310                                |
| 6 | Seat Number                      | 13                                   |
| 7 | Number of Answer Books handed in | 1                                    |

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

Examiner Only

2

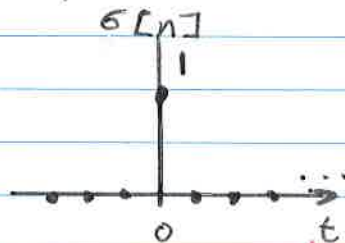
2

63/100

63/100 p. 1  
25/05/24

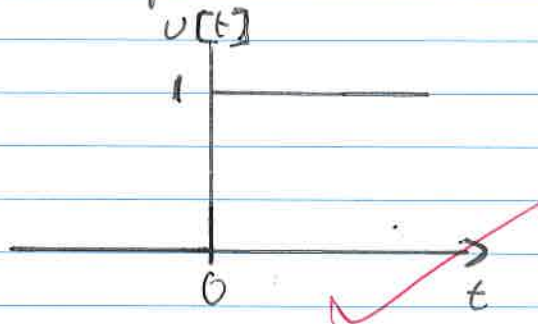
2. a) 
$$g[n] = \begin{cases} 0 & n \neq 0 \\ 1 & n = 0 \end{cases}$$

Signal : discrete time signal  
 function : Unit impulse function  
 graphical representation :

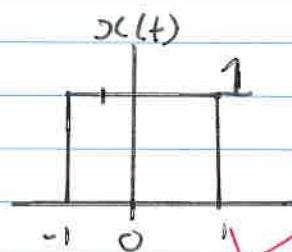


$$u[t] = \begin{cases} 0 & t < 0 \\ 1 & t \geq 0 \end{cases}$$

Signal : Continuous time signal  
 function : Unit Step function.  
 graphical representation :



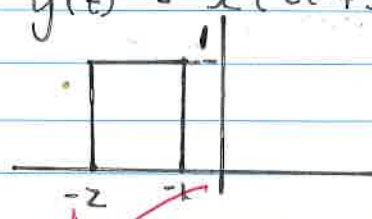
b) i)



ii)  $y(t) = x(2t+3)$   
 time shift  
 $y(t) = x(t+3)$



time shift + variant  
 $y(t) = x(2t+3)$



$92 = \frac{20}{10}$

3. a) i) Inter - Interference communication  
 E 2 C ✓

ii) point to point.  
 11

2 ✓

1 ✓

3

03/20

25 ~ 3/25

5. c) i) PRINT.

$$P = 50 = 0101\ 0000$$

$$R = 52 = 0101\ 0010$$

$$I = 44 = 0100\ 1001$$

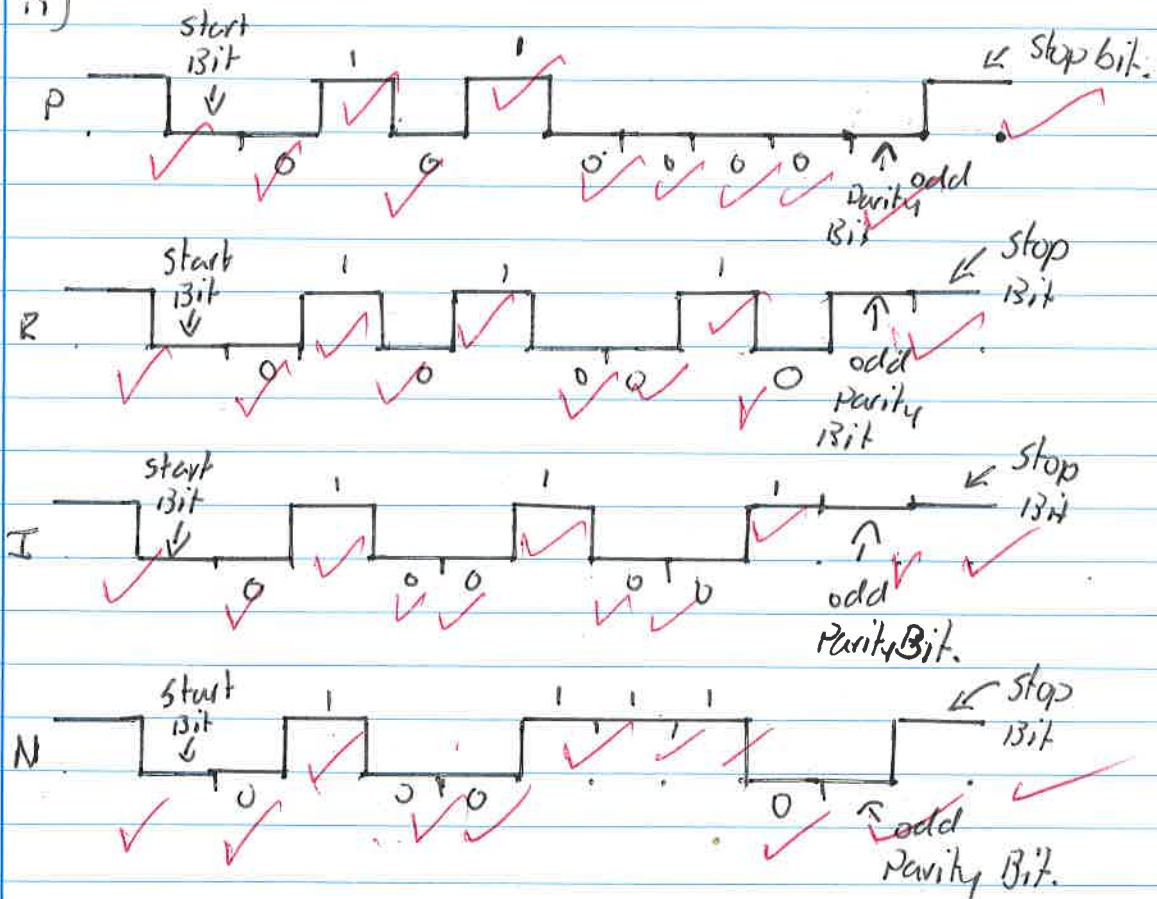
$$N = 4E = 0100\ 1110$$

$$T = 54 = 0101\ 0100$$

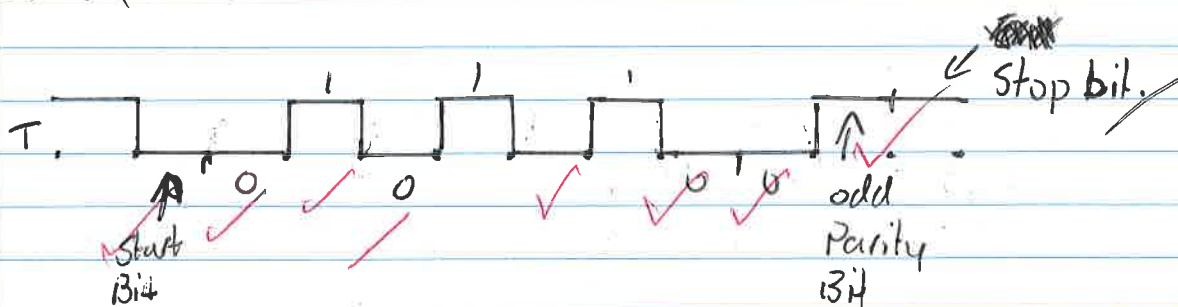
∴ Print = 010000001001001001001111

|        | 8 | 4 | 2 | 1 |
|--------|---|---|---|---|
| 0      | 0 | 0 | 0 | 0 |
| 1      | 0 | 0 | 0 | 1 |
| 2      | 0 | 0 | 1 | 0 |
| 3      | 0 | 0 | 1 | 1 |
| 4      | 0 | 1 | 0 | 0 |
| 5      | 0 | 1 | 0 | 1 |
| 6      | 0 | 1 | 1 | 0 |
| 7      | 0 | 1 | 1 | 1 |
| 8      | 1 | 0 | 0 | 0 |
| 9      | 1 | 0 | 0 | 1 |
| (10) A | 1 | 0 | 1 | 0 |
| (11) B | 1 | 0 | 1 | 1 |
| (12) C | 1 | 1 | 0 | 0 |
| (13) D | 1 | 1 | 0 | 1 |
| (14) E | 1 | 1 | 1 | 0 |
| (15) F | 1 | 1 | 1 | 1 |

ii)



5 a) ii) (CONT) T = 0101 0100



3

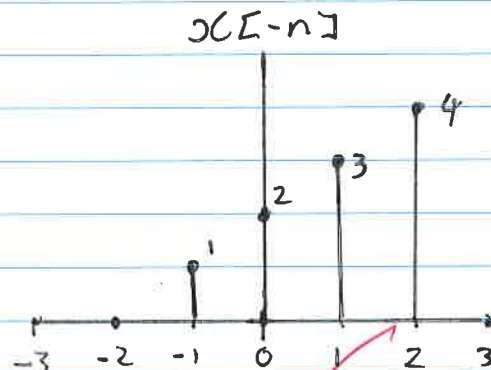
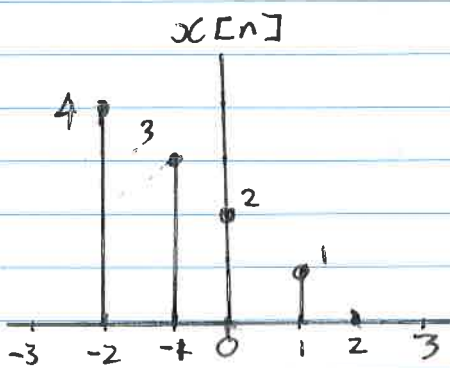
(3)

20/20

20/20

25

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



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

$$@ 0 = \frac{1}{2} [2 + 2] = 2$$

$$@ 1 = \frac{1}{2} [1 + 3] = 2$$

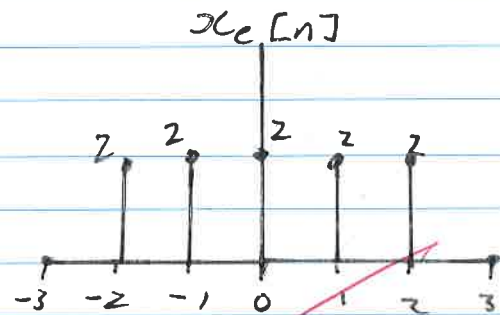
$$@ 2 = \frac{1}{2} [0 + 4] = 2$$

$$@ 3 = \frac{1}{2} [0 + 0] = 0$$

$$@ -1 = \frac{1}{2} [3 + 1] = 2$$

$$@ -2 = \frac{1}{2} [4 + 0] = 2$$

$$@ -3 = \frac{1}{2} [0 + 0] = 0$$



$$x_o[n] = \frac{1}{2} [x[n] - x[-n]]$$

$$@ 0 = \frac{1}{2} [2 - 2] = 0$$

$$@ 1 = \frac{1}{2} [1 - 3] = -1$$

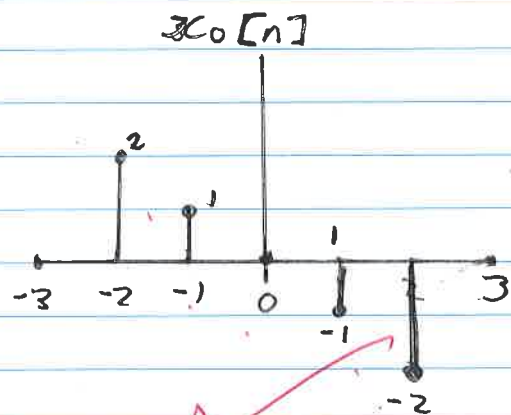
$$@ 2 = \frac{1}{2} [0 - 4] = -2$$

$$@ 3 = \frac{1}{2} [0 - 0] = 0$$

$$@ -1 = \frac{1}{2} [3 - 1] = 1$$

$$@ -2 = \frac{1}{2} [4 - 0] = 2$$

$$@ -3 = \frac{1}{2} [0 - 0] = 0$$



1 a) ii) ~~statement~~  
 $x_e[n] + x_o[n] = x[n]$  ①

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

$$x_o[n] = \frac{1}{2} [x[n] - x[-n]]$$
 ③

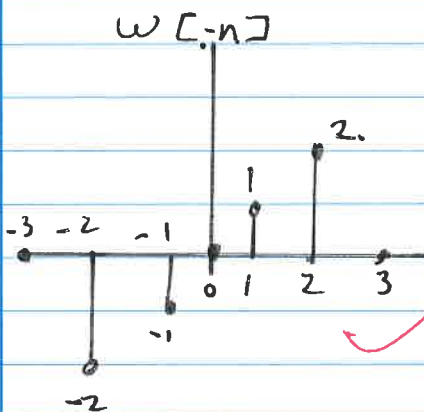
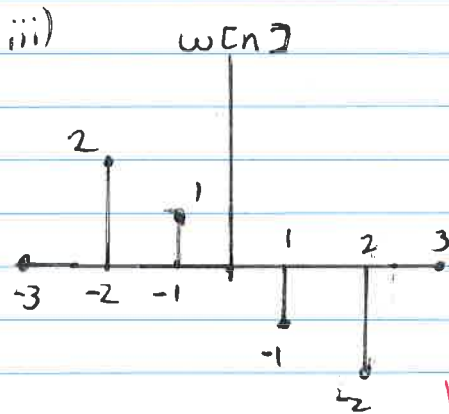
by adding equations 2 + 3 :

$$x_e[n] + x_o[n] = \frac{1}{2} [x[n] + \cancel{x[-n]} + x[n] - \cancel{x[-n]]}$$

$$x_e[n] + x_o[n] = \frac{1}{2} [2x[n]]$$

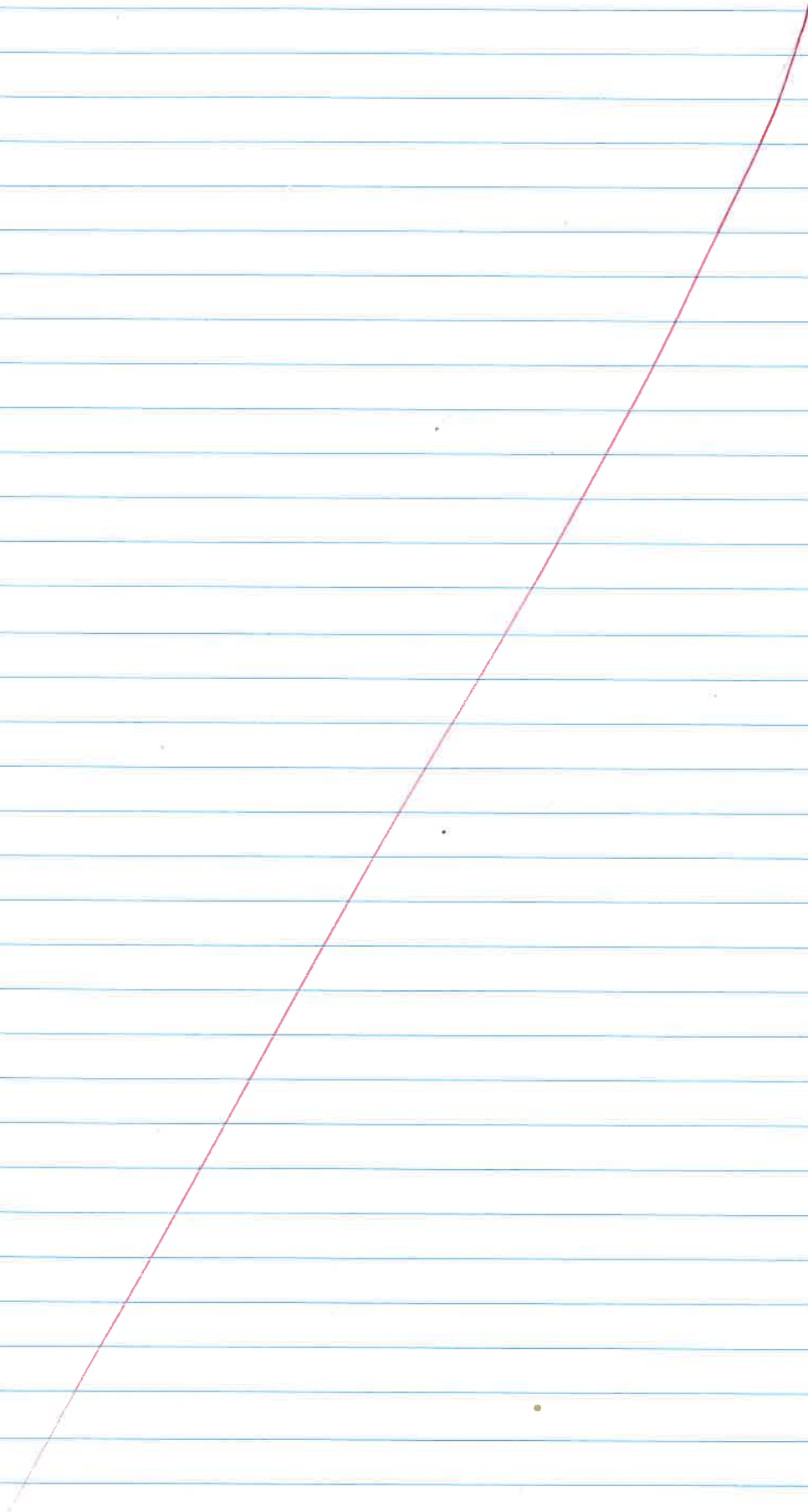
$$x_e[n] + x_o[n] = x[n] = \text{equation 1}$$

∴ Proof achieved. ✓



Question No.

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Rhif y Cwestiwn

Arholwr yn unig