

SURNAME:

Davies

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 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.
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1	Student Number	DAV10099622 GOAC5000-003
2	Title of Examination Paper	DSP and communications
3	Module Code	MAX8515
4	Date and Time of Examination	10/05/2019 1:36pm - 3:36pm
5	Examination Venue	Main Hall, Gower College Swansea
6	Seat Number	38
7	Number of Answer Books handed in	

[illegible]

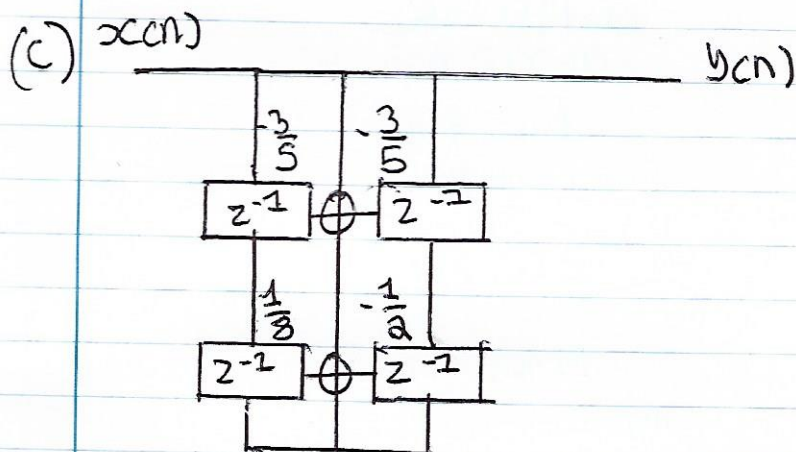
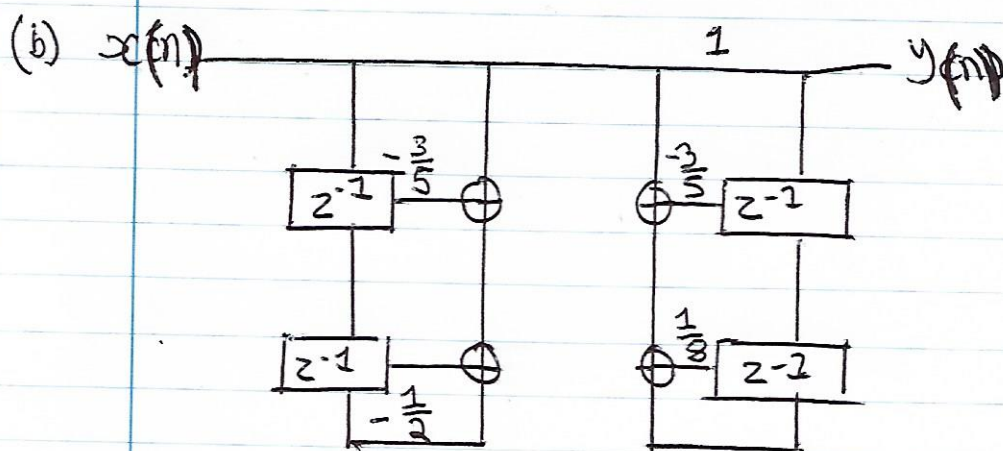
24%

24% ✓

$$y(n) - \frac{3}{5} y(n-1) + \frac{1}{8} y(n-2) = \frac{3}{5} x(n) + \frac{1}{4} x(n-1) + \frac{1}{2} x(n-2)$$

$$(a) Y(z) - \frac{3}{5} z^{-1} Y(z) + \frac{1}{8} z^{-2} Y(z) = \frac{3}{5} X(z) + \frac{1}{4} X(z) z^{-1} + \frac{1}{2} X(z) z^{-2}$$

$$X(z) \frac{3}{5} z^{-1} + X(z) \frac{1}{2} z^{-2} + X(z) \frac{1}{8} z^{-2} = \frac{3}{5} X(z) z^{-1} + X(z) \frac{1}{2} z^{-2}$$



d) IIR
 Advantage: An advantage of a IIR filter is its recursive
 Disadvantage:

FIR

Advantage: Non-Recursive

Disadvantage:

Question Two

a) The difference between channel coding and source coding is,

b)

$\bar{1}$	$\bar{0}$	1	$\bar{0}$	1	0	0	$\bar{1}$	$\bar{1}$	0	0	1
1	0	<u>1</u>	1	1	0	0	1	1	0	0	1

c)

Question Three

$$x(t) = 4 \cos(2000\pi t) + 5 \cos(10000\pi t) + 2 \sin(6000\pi t)$$

$$a) f_1 = 2000$$

$$f_2 = 5000$$

$$f_3 = 3000$$

$$f_{\max} = 10,000$$

$$f > 2\max = 10,000$$

$$= 4 \cos 2\pi(2000)^t + 5 \cos 2\pi \left(\frac{5000\pi}{10000} \right) + 2 \sin 2\pi(3000t)$$

$$= 4 \cos 2\pi \left(\frac{2}{4} t \right) + 5 \cos 2\pi \left(\frac{5}{10} t \right) + 2 \sin 2\pi \left(\frac{3}{6} t \right)$$

$$= 4 \cos 2\pi \left(1 - \frac{1}{4} \right) + 5 \cos 2\pi \left(1 - \frac{4}{10} \right) + 2 \sin 2\pi \left(1 - \frac{2}{6} \right)$$

$$= 4 \cos 2\pi \left(\frac{1}{4} \right) + 5 \cos 2\pi \left(\frac{4}{10} \right) + 2 \sin 2\pi \left(\frac{2}{6} \right)$$

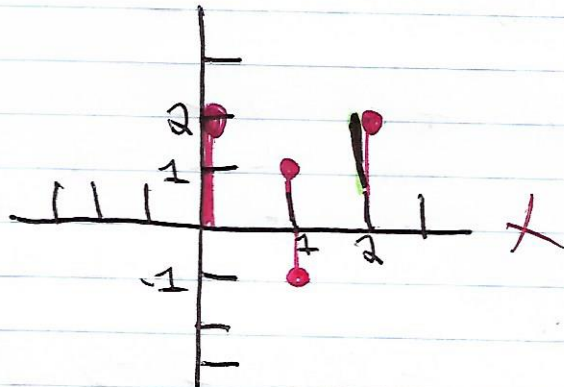
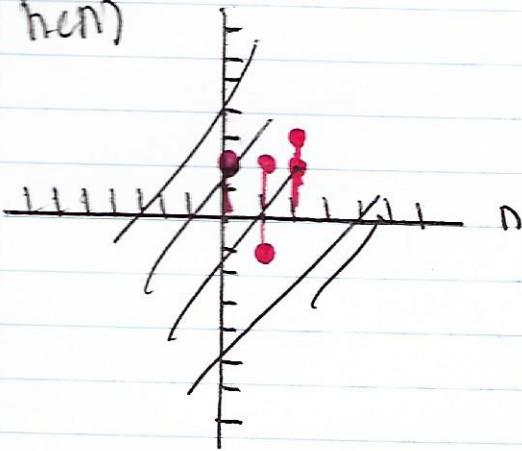
$$= 9 \cos 2\pi \left(\frac{13}{2} \right) + 2 \sin 2\pi \left(\frac{2}{6} \right)$$

b)

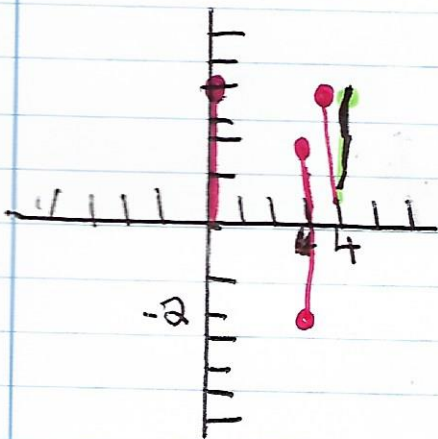
Question Four

a) $h(n) = [2, 1, -1, 2]$

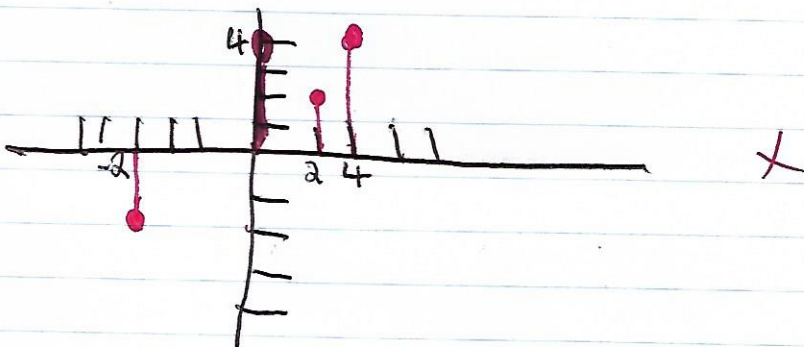
$h(n)$



b) $2h(n-2) = [4, 2, -2, 4]$



$2h(n+2) = [4, 2, -2, 4]$



c)

$$h(n) = 2, 1, -1, 2$$

$$OC(n) = 2, -1, 2, -1$$

$$y(n) = \begin{matrix} 4 & 2 & -2 & 4 \\ & -2 & -1 & 1 & -2 \\ & & 4 & 2 & -2 & 4 \\ & & & -2 & -1 & 1 & 2 \end{matrix}$$

Question Five

$$C = B \log_{10} \left(1 + \frac{S}{N} \right)$$

IEEE 12

Centre frequency = 2437 MHz

Occupies = 2427 MHz $\rightarrow$ 2447 MHz (20 MHz difference) ✓

Temp = 25°C

Tx = 1 watts

Antenna = 6 dB

$$FSPL = 20 \log_{10}(d) + 20 \log_{10}(f) + 32.44$$

Distance = 1 km

$$K = 1.38 \times 10^{-23} \text{ W/K/Hz}$$

$$KTB = 1.38 \times 10^{-23} \times (25 \times 30) = 1.035 \times 10^{-20} \rightarrow \text{Noise}$$

$$20 \log_{10}(1) + 20 \log_{10}(20) + 32.44 = 58.46 \quad \times$$

$$30 + 6 = 36 \text{ dBm}$$

$$36 - 58.46 = -22.46$$

$$10 \log = \text{mw}$$

$$10^{-0.02} = 0.954$$

$$C = \frac{1}{1} \left(\frac{0.954}{1.035 \times 10^{-20}} \right) =$$