Part A

Question 5

Table 1 Calculated Magnitude and phase of X[k]

n	x[n]	X[k]	Magnitude	Phase
0	12	20	20	0
1	0	4	4	0
2	8	20	20	0
3	0	4	4	0

Question 6

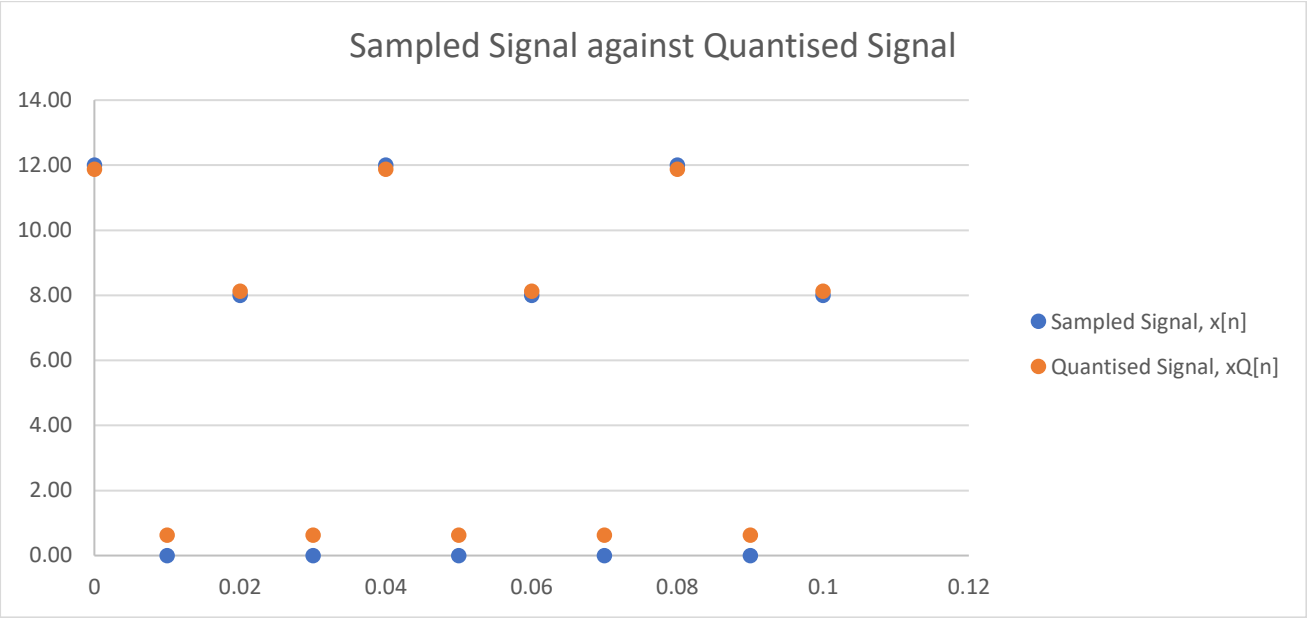

Figure 1 - Sampled Signal against Quantised Signal

Question 7

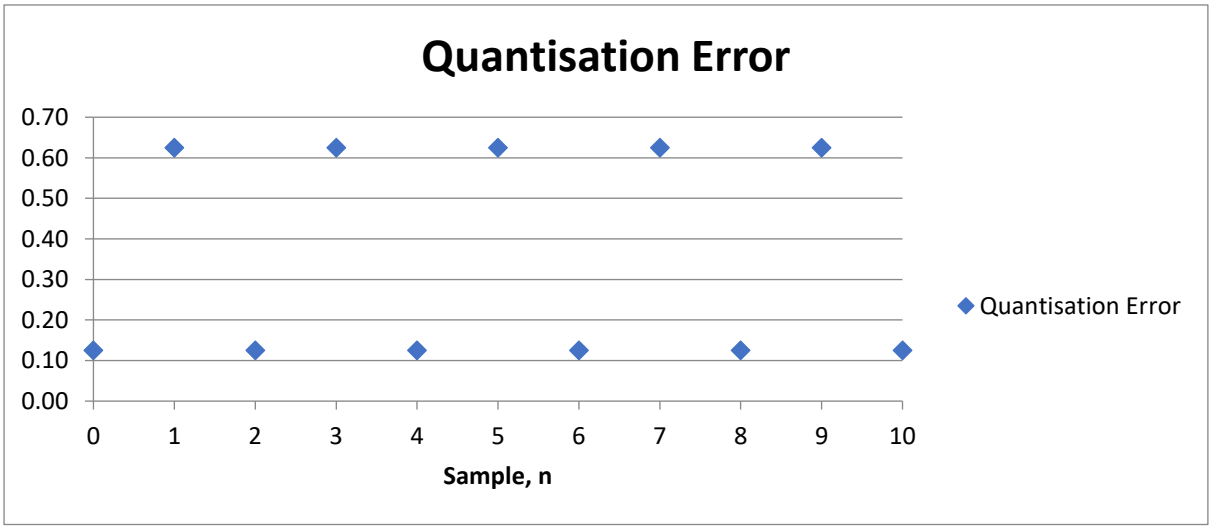

Figure 2 - Quantisation Error

Part B

Question 1

Table 1 - Columns G to L

Recovered Bitstream	Bit Coding	Corresponding Level	Sample, n	Error	Recovered Signal
=IF(V60<0.5, 0, 1)	=CONCATENATE(W60, W61, W62, W63)	=BIN2DEC(X60)	0	=ABS(BIN2DEC(CONCATENATE(R60,R61,R62,R63))-Y60)	=IF(Y60="","",Y60*K2)
=IF(V61<0.5, 0, 1)					=IF(Y61="","",Y61*K2)
=IF(V62<0.5, 0, 1)					=IF(Y62="","",Y62*K2)
=IF(V63<0.5, 0, 1)					=IF(Y63="","",Y63*K2)
=IF(V64<0.5, 0, 1)	=CONCATENATE(W64, W65, W66, W67)	=BIN2DEC(X64)	1	=ABS(BIN2DEC(CONCATENATE(R64,R65,R66,R67))-Y64)	=IF(Y64="","",Y64*K2)
=IF(V65<0.5, 0, 1)					=IF(Y65="","",Y65*K2)
=IF(V66<0.5, 0, 1)					=IF(Y66="","",Y66*K2)
=IF(V67<0.5, 0, 1)					=IF(Y67="","",Y67*K2)
=IF(V68<0.5, 0, 1)	=CONCATENATE(W68, W69, W70, W71)	=BIN2DEC(X68)	2	=ABS(BIN2DEC(CONCATENATE(R68,R69,R70,R71))-Y68)	=IF(Y68="","",Y68*K2)
=IF(V69<0.5, 0, 1)					=IF(Y69="","",Y69*K2)
=IF(V70<0.5, 0, 1)					=IF(Y70="","",Y70*K2)
=IF(V71<0.5, 0, 1)					=IF(Y71="","",Y71*K2)

Part B

Question 2

Table 2 - Samples of recovered signal

Sample, n	Time (s)	Low Noise Recovered Signal	High Noise Recovered Signal
0	0	11.25	11.25
1	0.01	0.00	0.00
2	0.02	7.50	5.00
3	0.03	0.00	6.25
4	0.04	11.25	11.25
5	0.05	0.63	0.00
6	0.06	8.13	2.50
7	0.07	0.63	1.25
8	0.08	11.88	16.25
9	0.09	0.63	0.00
10	0.1	8.13	7.50

Question 3

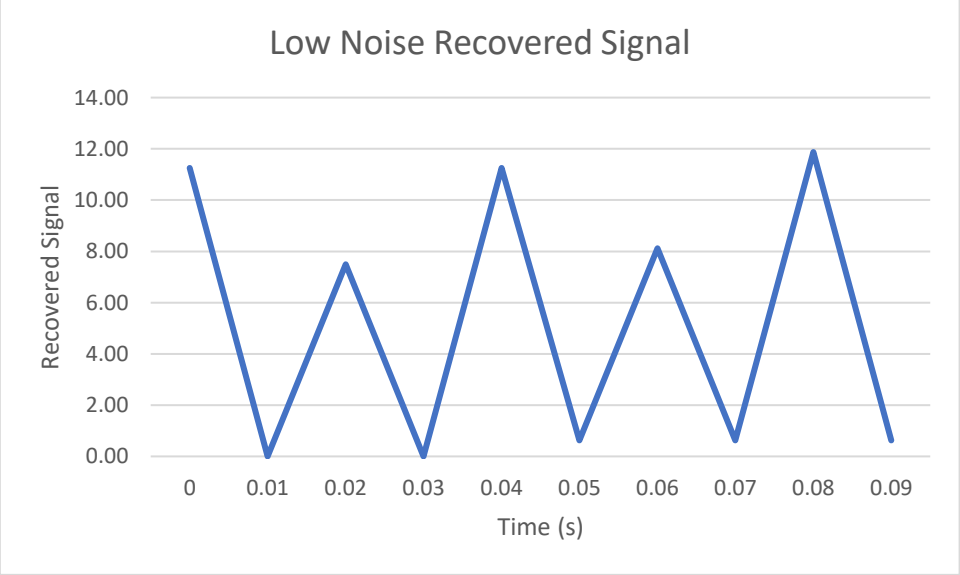

Figure 3 - Low noise

Part B

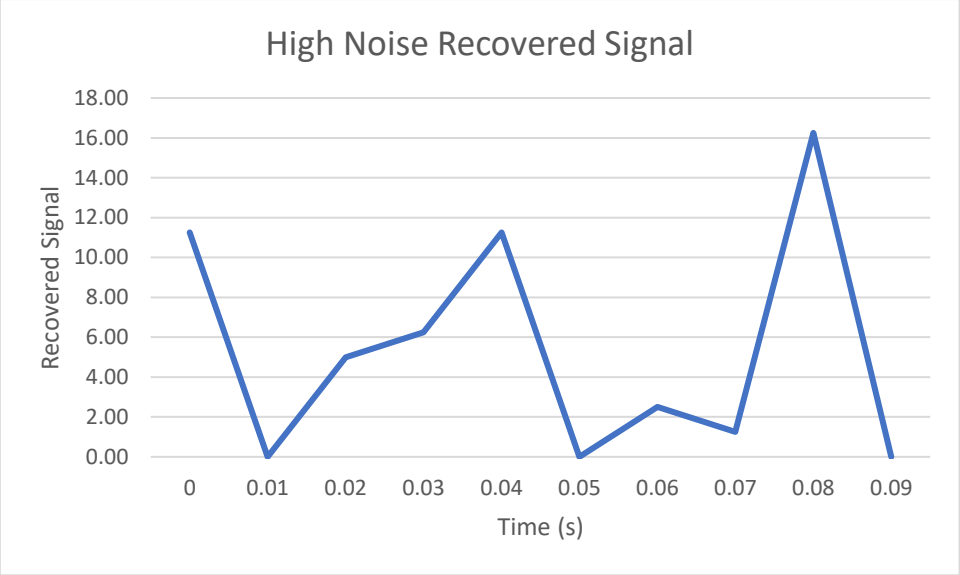

Figure 4 - High noise