ASSIGNMENT COVER SHEET

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Date of Submission	2/05/2020

Question	Max [%]	Mark [%]
Transmitter	/20	
a	5	
b	5	
c	5	
d	5	
Receiver	/40	
e	10	
f	10	
g	20	
Equaliser	/40	
h	20	
i	10	
j	10	
TOTAL	100	

1 Transmitter and pulse shaping

1.1 Real World Feasibility

1.1.1 Binary Polar Signalling

Binary polar signaling is the most suitable for real world applications as it has the most distinct signals, only a large amount of noise can change the signal value at the and receiver.

1.1.2 4-PAM

4-PAM is still usable in the real world, especially within a wired communication system. This is because the signal can be easily affected by noise as the amplitude spacing between '00' and '01' is smaller than the difference between binary polar signaling, assuming that the highest and lowest amplitudes are the same for both signals. However, 4-PAM provided greater data rates when compared to binary polar encoding as twice the number of bit can be sent in the same bandwidth.

1.1.3 8-PAM

1.2 Power Spectral Density of 4-PAM

With a rectangular pulse shaping the PSD of a 4-PAM signal is shown in (1) and (2).

$$R_n = \lim_{N\to\infty} \frac{1}{N} \sum_k a_k a_{k-n} \tag{1}$$

$$R_0 = \lim_{N\to\infty} \frac{1}{N} \sum_k a_k^2 \tag{2}$$

$$S_x(f) = \frac{1}{T_s}[R_0 + 2\sum_{n=1}^{\infty} R_n \cos 2\pi n f T_s] \tag{3}$$

$$S_y(f) = \frac{|\mathrm{sinc}(T_s)|^2}{T_s} S_x(f) \tag{4}$$

2 Receiver

3 Equaliser