

Do not open this exam until you are told.

This exam is for:

Sample Paper 1 A00123456

- *This exam has two (7) questions on seven (8) pages. Answer all questions.*
- *The marks for each question are as indicated. There are a total of 23 marks.*
- *Write your answers and all rough work in this exam paper and nowhere else. Make a note if you continue your answer on the back of a sheet.*
- *Books and notes are allowed. No electronic devices other than calculators are allowed.*
- *Each exam is equally difficult. Answer your own exam.*

Name: _____

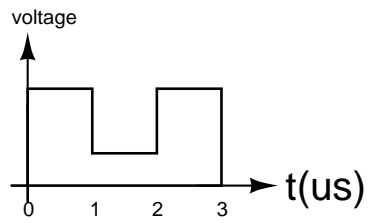
BCIT ID: _____

Signature: _____

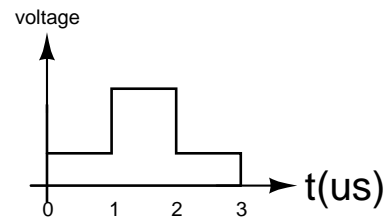
Question	Mark	Max.
1		4
2		5
3		3
4		2
5		4
6		2
7		5
Total		23

Question 1 (4 marks)

A communication system's transmitter outputs either waveform A or waveform B (shown below) once every $3 \mu\text{s}$. The probability of transmitting waveform A is 0.25 and the probability of transmitting waveform B is 0.75.



A



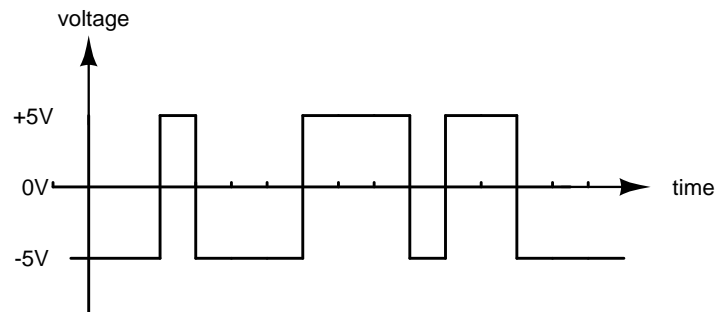
B

What are:

- (a) the symbol rate?
- (b) the information rate in bits/second?
- (c) the baud rate?

Question 2 (5 marks)

The following waveform shows an ASCII character being transmitted over an RS-232 interface using even parity.



- (a) How many data bits were transmitted? You may assume there are less than 10 data bits.
- (b) What ASCII character was transmitted? Show your work.

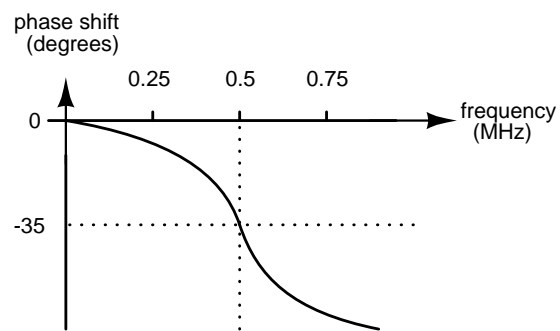
Question 3 (3 marks)

You are given a length of co-ax cable and use an LCR bridge to measure the capacitance and inductance of the cable. With the far end open-circuited you measure the capacitance as 23 pF and with the far end short-circuited you measure the inductance as 120 nH.

- (a) What is the characteristic impedance of the cable?
- (b) If the dielectric constant of the dielectric is 1.8 and the diameter of the shield is 0.5 cm, what is the diameter of the inner conductor?

Question 4 (2 marks)

You measure the phase shift between the input and output of a channel at various frequencies and obtain the following result:



- (a) Is this a linear-phase channel? How can you tell?
- (b) What is the delay through the channel at 500 kHz?

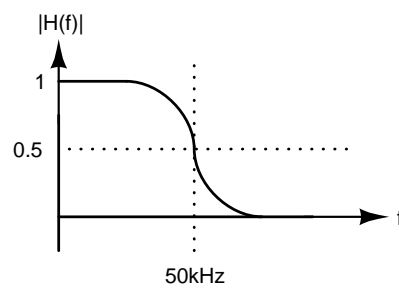
Question 5 (4 marks)

A system transmits data using an NRZ line code with two voltage levels. The channel adds white Gaussian noise. The received levels are 0 V and 3.5 V with an RMS noise voltage of 1 V. The (mis-adjusted) receiver uses a decision threshold of 1.5 V.

- (a) What is the probability of error when the 0 V level is received?
- (b) What is the probability of error when the 3.5 V level is received?
- (c) If both levels are equally likely, what is the average probability of error?

Question 6 (2 marks)

The diagram below shows the magnitude of the overall transfer function of a channel including the transmitter pulse-shaping filter.



- (a) What is the maximum symbol rate that can be transmitted over this channel without ISI?
- (b) If the system used 16-level signalling, what would be the corresponding bit rate?

Question 7 (5 marks)

You receive an IP frame with the following header bytes (in hex):

45 00 00 34

01 01 40 00

ff 06 d1 0b

0a 00 00 02

0a 00 00 01

Answer the following questions:

- (a) How many bytes do you expect there to be in the payload of the IP frame (i.e. following the header)? Give your answer in decimal.
- (b) What protocol will be used in the payload of the IP frame? Give the number, not the name of the protocol.
- (c) Is the destination of this packet on the internet? Explain (briefly).
- (d) Is the header checksum correct? Show your work.

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This exam is for:

Sample Paper 2 A00123456

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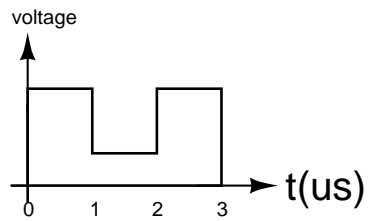
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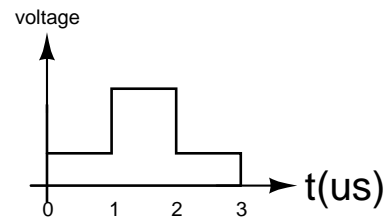
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A



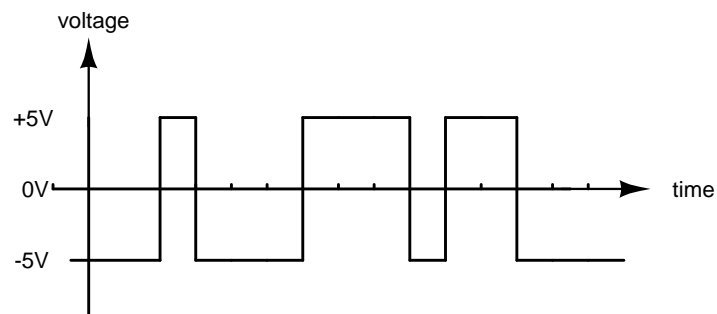
B

What are:

- (a) the symbol rate?
- (b) the information rate in bits/second?
- (c) the baud rate?

Question 2 (5 marks)

The following waveform shows an ASCII character being transmitted over an RS-232 interface using even parity.



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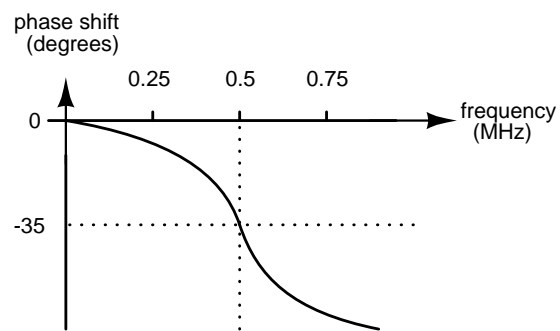
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You measure the phase shift between the input and output of a channel at various frequencies and obtain the following result:



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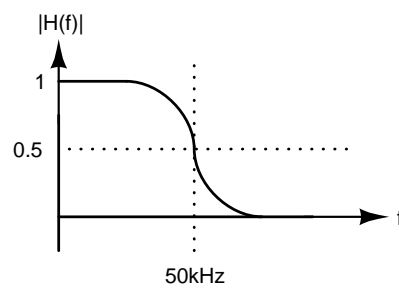
Question 5 (4 marks)

A system transmits data using an NRZ line code with two voltage levels. The channel adds white Gaussian noise. The received levels are 0 V and 7 V with an RMS noise voltage of 2 V. The (mis-adjusted) receiver uses a decision threshold of 3 V.

- (a) What is the probability of error when the 0 V level is received?
- (b) What is the probability of error when the 7 V level is received?
- (c) If both levels are equally likely, what is the average probability of error?

Question 6 (2 marks)

The diagram below shows the magnitude of the overall transfer function of a channel including the transmitter pulse-shaping filter.



- (a) What is the maximum symbol rate that can be transmitted over this channel without ISI?
- (b) If the system used 8-level signalling, what would be the corresponding bit rate?

Question 7 (5 marks)

You receive an IP frame with the following header bytes (in hex):

45 00 00 34

01 01 40 00

ff 06 66 c0

0a 00 00 02

0a 00 00 01

Answer the following questions:

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