ITS 323 – QUIZ 3 (ITA) ANSWERS

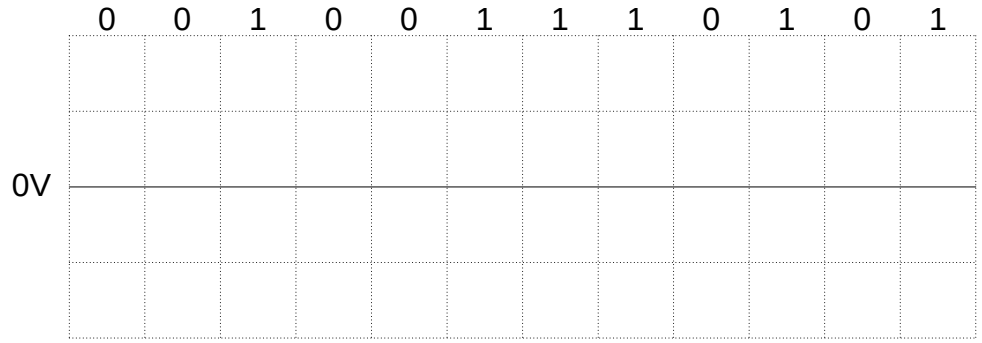
First name: _____ Last name: _____

ID: _____ Total Marks: _____

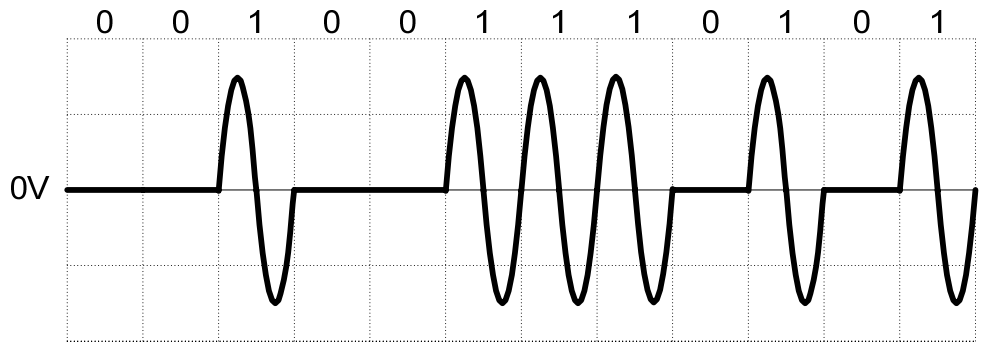
out of 10

Question 1 [2 marks]

Draw the analog signal used to transmit the digital data below if Amplitude Shift Keying is used.



Answer



Question 2 [2 marks]

A single bit even parity check is applied to an 8-bit data frame. For the following cases of errors, indicate if the receiver can detect the error or not (circle the answer):

a) The last bit of the data frame is in error DETECT NOT DETECT

b) The last two bits of the data frame are in error DETECT NOT DETECT

c) The last three bits of the data frame are in error DETECT NOT DETECT

d) The parity bit is in error DETECT NOT DETECT

Answer

a. DETECT b. NOT DETECT c. DETECT d. DETECT

A single bit parity check can detect an odd number of errors (1 error or 3 errors or 5 errors). It doesn't matter if it is the parity bit that is in error. The treats all 9 bits equally.

Question 3 [3 marks]

An error correcting code maps 2-bits of data into a 4 bit codeword according to the following scheme:

- 00 => 1001
- 01 => 0111
- 10 => 1011
- 11 => 1100

The Hamming distance is used to correct errors.

For the following received codewords, indicate what the receiver does. That is, either:

- Assumes NO ERROR;
- Successfully DETECTs and CORRECTs error;
- DETECT ONLY, but cannot correct;

If NO ERROR or DETECT/CORRECT, indicate the received data.

a) 0110 NO ERROR DETECT/CORRECT DETECT ONLY
Received Data: _____

b) 1011 NO ERROR DETECT/CORRECT DETECT ONLY
Received Data: _____

c) 0011 NO ERROR DETECT/CORRECT DETECT ONLY
Received Data: _____

Answer

0110 – DETECT/CORRECT, Received Data: 01

Why? Not a valid codeword (hence DETECT); unique minimum Hamming is 1 (0111) hence CORRECT

1011 – NO ERROR, Received Data: 10

Why? Valid codeword

0011 – DETECT ONLY

Why? Not a valid codeword (hence DETECT); two valid codewords have minimum Hamming distance of 1 (0111 and 1011) and hence connect determine correct codeword

Question 4 [3 marks]

What is the maximum throughput of the Stop and Wait Flow Control protocol.

You can assume:

- Data rate is 1Mb/s

- Data frame size is 5,000 bits
- ACK size is 100 bits
- Propagation time is 15msec
- No processing delay

Answer

The efficiency is time spent sending DATA frames divided by total time spent in transfer. The total time is: time spent sending DATA frames + DATApropagation + ACKpropagation + ACKtransmision

$$Eff = \frac{DataTransmission}{DataTransmission + 2 \times \Pr opagation + ACKTransmission}$$

$$= \frac{\left({}^{5,000}\!/_{1,000,000} \right)}{\left({}^{5,000}\!/_{1,000,000} \right) + 2 \times 15ms + {}^{100}\!/_{1,000,000}}$$

$$= \frac{5}{5 + 30 + 0.1} ms$$

$$= 0.14$$

Therefore throughput is 0.14 x 1Mb/s = 0.14Mb/s