

ELEX 4340 :Data Communications
Term 201330

MID-TERM EXAMINATION
8:30 – 10:20 AM
October 31, 2013

This exam has four (4) questions. The marks for each question are as indicated. There are a total of 17 marks. Answer all questions. Write your answers in the exam book provided. Show your work. Numerical answers must include units. You may answer the questions in any order. Books, notes and calculators are allowed. You may keep this exam paper.

Show your work.

Question 1 (5 marks)

Consider the last two digits of your student number as a decimal number between 0 and 99. Convert this number to an 8-bit binary number written in MS-bit-first order.

Sketch the waveform showing how this number would be transmitted in network order (MS bit first) using the *differential* Manchester line code described in the course. Assume the previously transmitted symbol was a high-to-low transition.

Assume a data rate of 1 Mb/s and unipolar signaling using 0 and 5V voltage levels. Show the voltage levels (in volts) and the duration of one bit period (in microseconds) on your sketch.

Question 2 (4 marks)

You measure the capacitance of one meter of 50 ohm co-ax cable as 50 pF. What is the inductance of the cable per meter? If the cable uses air as the dielectric and the inner conductor diameter is 1 mm, what is the shield diameter?

Question 3 (4 marks)

The magnitude of the transfer function of a channel (including all transmit filters, channel, and receive filters) has a loss of 3 dB at 250 kHz, and 1 dB at 100 kHz. The channel does not cause ISI to a data waveform. What is the (maximum) symbol rate of this waveform? Why? What is the loss at 400 kHz? Why?

Question 4 (4 marks)

An FM radio station transmits with a power of 50 kW at a frequency of 100 MHz. The transmit antenna has a gain of 10 dB. Assuming a direct line of sight distance of 1 km between the transmitting and receiving antennas, what power is received by a receiving antenna with a gain of 0 dB? Give your answer in dBm.