

This exam paper is for:

Extra Paper, A00123456

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

- this page intentionally left blank -

FINAL EXAMINATION

9:30 AM – 12:30 PM

NE1-209

Wednesday, January 8, 2014

This exam has seven (7) questions on two (2) pages. The marks for each question are as indicated. There are a total of 34 marks. Answer all questions. Write your answers in the exam book provided. Show your work. 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)

The Greek characters (glyphs) alpha (α) and beta (β) have Unicode values (“code points”) of 945 and 946 decimal respectively. What sequence of bytes would be used to encode the two-character sequence $\alpha\beta$ using the UTF-8 encoding? Give your answer in hexadecimal.

Table 3-6 from version 6.2 of the Unicode standard is given below.

Table 3-6. UTF-8 Bit Distribution

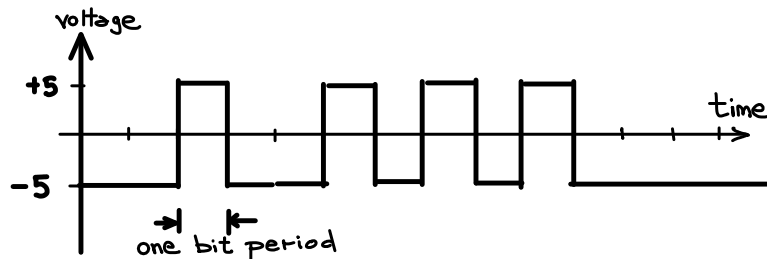
Scalar Value	First Byte	Second Byte	Third Byte	Fourth Byte
00000000 0xxxxxxx	0xxxxxxx			
00000yyy yyxxxxxx	110yyyyy	10xxxxxx		
zzzzyyyy yyxxxxxx	1110zzzz	10yyyyyy	10xxxxxx	
000uuuuu zzzzyyyy yyxxxxxx	11110uuu	10uuzzzz	10yyyyyy	10xxxxxx

Question 2 (4 marks)

You would like to make air-dielectric co-axial cable with a characteristic impedance of 66 ohms using half-inch (12mm inside diameter) copper tubing for the outer conductor. What diameter wire (in mm) do you need to use for the center conductor? What is the corresponding AWG wire size?

Question 3 (3 marks)

The following waveform is the voltage at the output of an RS-232 serial port. Assuming it shows the transmission of a complete word using 7 data bits, one stop bit and no parity, what value was transmitted? Give your result in hexadecimal notation. Assuming it was an ASCII-encoded character, what character was transmitted?



Question 4 (3 marks)

The channel used by a cable modem can be modeled as an AWGN channel with a bandwidth of 6 MHz. You want a cable modem link to operate at 50 Mb/s. For what SNR values could you be certain that the link would *not* operate reliably? Give your answer in dB.

Question 5 (5 marks)

A block code uses the following four codewords:

1001
0110
1010
0101

What are the values of k and n ? What is the minimum distance of this code? How many errors can be detected by this code? How many errors can be corrected by this code? What codeword(s) is/are most likely to have been transmitted if the codeword 1101 is received?

Question 6 (2 marks)

Draw the waveform that would be transmitted for the bit sequence 0, 1, 1, 0 assuming voltage levels of 0 and 5 V and a Manchester line code. Use the Manchester line code conventions used in this course.

Question 7 (12 marks)

- (a) a signal containing only two frequency components, one at 1 kHz and one at 2 kHz is input to a communication channel. At the output a component at a frequency of 1.5 kHz is detected. Could this component be caused by linear distortion? Could it be caused by non-linear distortion? Explain *briefly*. (2 marks)
- (b) is the output of a ML PRBS generator: random, pseudo-random or deterministic? (1 mark)
- (c) which of the following protocols might be specified by an Ethernet frame's Type field: IP, Ethernet, TCP? (1 mark)
- (d) does a bus network topology require the use of an Ethernet bridge? (1 mark)
- (e) how many cable pairs are required by an 100Mb/s Ethernet PHY? (1 mark)
- (f) a one's-complement checksum computed according the IP protocol standard is used to protect four 16-bit values which have values 1, 2, 3, and 2. The checksum is 0xff7. Does the checksum indicate an error? Show your work. (2 marks)
- (g) is the IP address 173.188.65.93 in the network 173.188.128.0/17? (2 marks)
- (h) arrange the following protocols in order from the lowest level to the highest level: TCP, SMTP (an e-mail protocol), IP, Ethernet. (2 marks)