Assignment 1

Due Tuesday, March 25. Show your work. Hand in your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Question 1

Consider the rightmost four characters of your BCIT ID as a decimal number. Convert this number to:

- a 16-bit binary number (in network order)

- a hexadecimal number (in network order)

- write the numbers above with the two bytes in little-endian order and the bits within each byte also in little-endian order.

Question 2

Find the Unicode code point (the index in the Unicode code table) for the following character: "CANADIAN SYLLABICS PAA" (Hint: `http://unicode.org` -> *The Unicode Standard* -> *Code Charts* -> *Unified Canadian Aboriginal Syllabics*).

Question 3

The UTF-8 encoding rules shown below describe how a numeric value (like 0x7c73) is converted to sequence of one or more bytes that represent that character. This is Table 3-6 in version 6.2 of the Unicode standard.

Each sequence of letters (e.g. yyyyyy) in the Scalar value column represents a sequence of bits in the binary representation of the Unicode code point value that is copied into the corresponding positions in the Byte columns.

Values with code points less than 128 are encoded as one byte, those less than 0x800 are encoded as two bytes and the rest as three bytes.

The Chinese character for "Rice" (the grain) is "米" with Unicode value (code point) U+7C73.

- how many octets does it take to represent the character?

- what are the values of these octets in hexadecimal?

Question 4

If you wanted to make twisted pair cable with 80 ohm characteristic impedance using 14-gauge wire and polyethylene insulation, what insulation thickness would you need to use? What would be the capacitance of the cable per meter? Give your answers in mm and pF.

Question 5

What phase difference would you expect between the signal at the input and output of a co-axial cable if the cable is 50m long and the frequency is 3 MHz?

Question 6

A TV transmitter at Seymour Mountain transmits 50kW at a frequency of 644 MHz using an antenna with a gain of 12dBi. How much power would be received at BCIT by an omnidirectional antenna? Giver your answer in dBW.

Notes: Omnidirectional antennas do not concentrate power in any particular direction and thus have a gain of 1 (0 dB). The distance is about 12 km.

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