Solutions to Assignment 4

Question 1

From the data sheet:

1. the turns ratio is 1:1. The term CT means that the winding is center-tapped. The impedance ratio is the square of the turns ratio so it is also 1:1.

2. the voltage ratio is the same as the turns ratio, 1:1

3. the HiPot specification is 1500 Vrms

4. the CM (common-mode) to DM (differential-mode) REJ (rejection) ratio at 100 MHz is -35 dB minimum.

5. the depth of the LED and signal pins below the bottom surface of the connector is 0.125 inches

6. LED2 is the orange and green LED. According to the table, when pin 9 is positive (+, high) and pin 10 is negative (-, low) the colour of the orange/green LED is orange.

7. various answers are possible. As an example, the Digikey pricing is $5.58 in quantities of 1 and $3.64 in quantities of 1000.

Question 2

If the capacitance C is 100 pF (10^{-10}) and the RC time constant is 1 μs (10^{-6}) the maximum resistance R=RC/C must be 10k (10^4) ohms. If the pull-up voltage is 5 V, the power consumed is $V^2/R = 25/10^4 = 2.5$mW. Ten years is $10 \times 365 \times 24 = 87600$ hours. So the cost of electricity for ten years at 0.015 cents per Wh ($0.15 per kWh) is $2.5\text{mW} \times 87600\text{hours} \times 0.015\text{cents/Wh} =$ 3.3 cents.

Question 3

From Table 24-1 the PCS (Physical Coding Sublayer) output/input of the 4B5B encoder for an MII (Media Independent Interface) input/output of 0x0F, assuming an 8-bit value, is 11110 11101 (in order from MS to LS bit). This is not the waveform (it gets converted to/from an MLT-3 waveform).

Question 4

HDLC framing requires start and end flags of 0111 1110 along with bit-stuffing of a '0' after every consecutive 5 '1' bits. The following table shows the values of the bits making up the HDLC frame including start and end flags and three stuffed bits (underlined). This assumes the values are transmitted from MS to LS bit:

bits	explanation
0111 1110	start flag
1111 1 0 111	0xFF with stuffed bit
11 0 00 0000	0xC0 with stuffed bit
0011 0011	0x33
0000 0111 11 0 00 0110	0x07C6 with stuffed bit
0111 1110	end flag