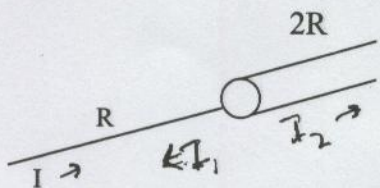


# Assignment 3



1) An instantaneous pulse with current  $I$  travels down a PCB line, which has an  $R$  ohm impedance and which connects to a  $2R$  ohm cable. What is the relation between the pulse with current  $I_2$  that continues down the higher impedance cable and the pulse with current  $I_1$  that reflects backward? Show derivation.

$$I_2 - I_1 = I$$

$$V = IR = V_2 + V_1 = 2I_2R + I_1R$$

$$I_2 = I + I_1 = 2I_2 + I_1 + I_1$$

$I_2 = -2I_1$

2) The resistivity of the  $2R$  line is twice that of the  $1R$  line. If the  $2R$  line cross sectional radius is twice that of the  $1R$  line cross sectional radius, what does that say about the current transmission loss on the  $1R$  line with respect to that on the  $2R$  line?

$$\frac{P_{2R}}{P_{1R}} = 2 = \frac{2R \cdot A_2 / L_2}{R \cdot A_1 / L_1} = 8L_2 / L_1$$

$L_2 = L_1/4 \Rightarrow$  the current travels 4 times further on  $1R$  line

3) What is the octal and hexadecimal equivalent of decimal number 1022? Prove without using a calculator!

$$1024 - 2 = 512 + 256 + 128 + 64 + 32 + 16 + 8 + 4 + 2$$

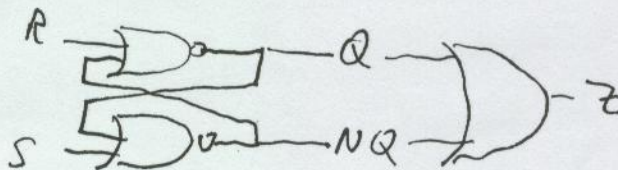
$$\begin{array}{cccccccc} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 \\ \hline & 3 & F & E & & & & & \end{array} \text{ (hex)}$$

$$\begin{array}{cccccccc} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 \\ \hline & 1 & 7 & 7 & 6 & & & & \end{array} \text{ (octal)}$$

4) An OR is formed between the two outputs of the SR flip-flop resulting at point Z. What is the Boolean algebraic expression relating Z to inputs S and R. Use Q and NQ as the outputs of the flip-flop.

$$\overline{R + NQ} + \overline{S + Q} = Z$$

$$Z = 1!$$



5) An RC circuit is driven by power supply  $V_{cc}$ . Express the voltage  $V$  across the capacitor as a function of time  $t$  using  $R$  as the resistance and  $C$  as the capacitance of the circuit.

$$V_c = V_{cc} (1 - e^{-t/RC})$$