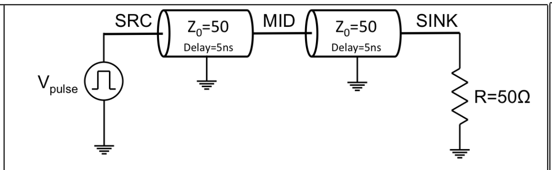
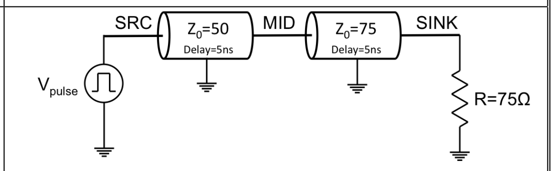
$$V_r = V_i\left(\frac{R - Z_0}{R + Z_0}\right) \qquad V_t = V_i\left(\frac{2R}{R + Z_0}\right) \qquad Z_0 = \sqrt{\frac{L}{C}}$$

1. Transmission Line Termination Fill in the table below and match the following transmission line circuits (1-5) with the correct pulse propagation plot (a-d) for sending a pulse down the transmission lines to a resistive load. There is intentionally one less plot than circuit. The effective resistance seen into the source is a short circuit.

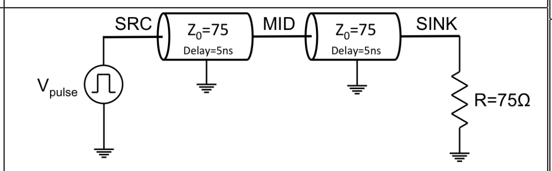
1)



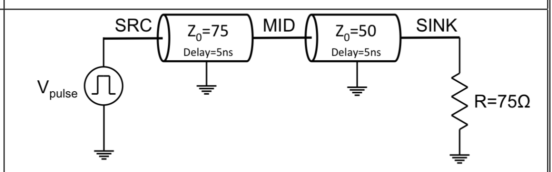
2)



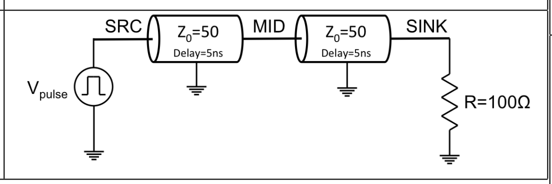
3)



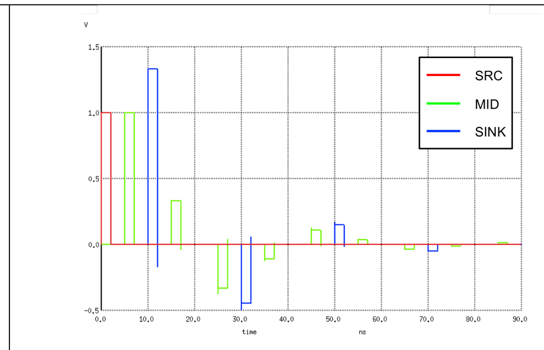
4)



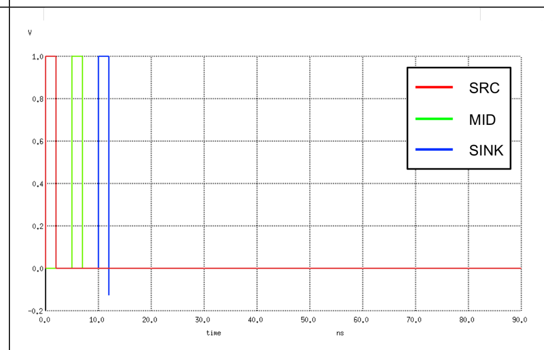
5)



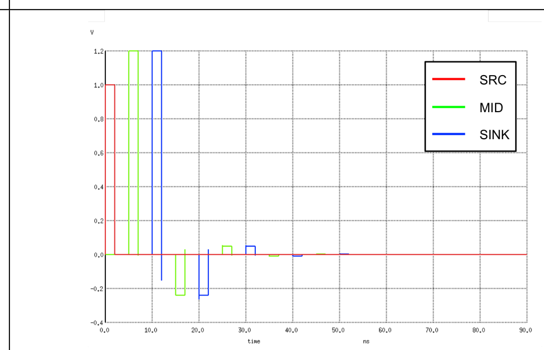
A)



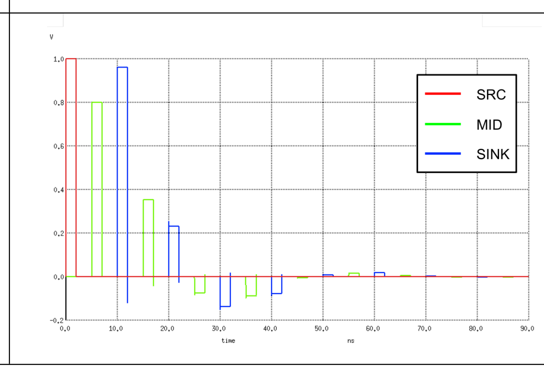
B)



C)



D)



2. Consider a 25 meter long Category-5e cable with $w = 0.64c$ (Speed of light $c = 3 \times 10^8$m/s) used for 1 Gigabit ethernet. Each of the 4 cable pairs supports bits at 250Mb/s.

   (a) How long (in nanoseconds) does it take for a bit to travel the 25 meter length of the cable?

   (b) How long (in nanoseconds) between introducting bits onto the cable?

   (c) How many bits are on each wire pair "in the cable" at any point in time?

3. What effects limit throughput of bit pipelining on a transmission line?

4. What happens if there is a resistance $R = 0.2\Omega$ every meter of an otherwise lossless 100Ω transmission line (Category-5e cable)?

   (a) Voltage impact at each meter?

   (b) How long can cable be before voltage reduced by one half?

5. What happens when impedance of line changes? (Z_0=75Ω to Z_1=50Ω). All transmission lines same length.