6.

(a) What are the voltage and current amplitudes of the first outgoing wave?

$$V_{0,1} = \boxed{5V}$$
$$i_{0,1} = V_{0,1}/Z_0 = \boxed{100mA}$$

(b) Determine the generator voltage, V_G.

$$V_G = 2V_{0,1} \quad (\text{since } R_G = Z_0)$$
$$= \boxed{10V}$$

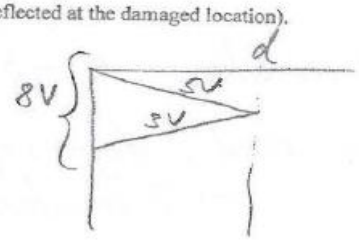
(c) Determine distance d at which the cable is damaged.

$$2t_0 = 6\mu sec = \frac{2d}{v_p} \quad (\text{roundtrip time})$$

$$\Rightarrow d = 3\mu sec \cdot v_p = 3\mu sec \; 200 \frac{m}{\mu sec} = \boxed{600m}$$

(d) Determine the voltage of the returning wave (reflected at the damaged location).

$$V_{0,1} + V_{r,1} = 8V$$
$$\Rightarrow V_{r,1} = 8V - 5V = 3V$$



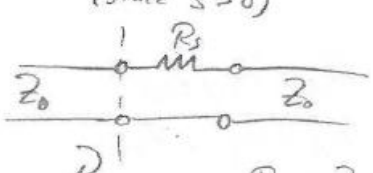
(e) What is the reflection coefficient at the location of the damaged cable?

$$\rho = \frac{3V}{5V} = \boxed{0.6}$$

(f) How would you model the damaged section of the cable?

→ series resistance (since $\rho > 0$)

(other networks are also possible since we only know how much is reflected but not how much is transmitted)



$\rho = 0.6$

$$\frac{R_L - Z_0}{R_L + Z_0} = 0.6 \Rightarrow R_L = Z_0 \frac{1+0.6}{1-0.6} =$$
$$= 50\Omega \frac{1.6}{0.4} = 200\Omega$$

$$R_L = R_s + Z_0 \Rightarrow \boxed{R_s = 150\Omega}$$