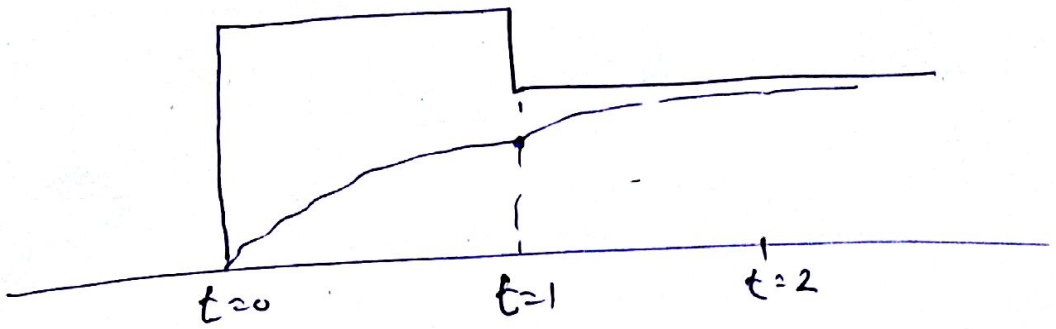
Student Name: Key University #: Serial #:

A pressure sensor converts pressure into voltage according to the transfer function $Vp = 0.9\ (p)^{1/2}$. The pressure suddenly goes up from 0 to 200 psi (beginning of the experiment), then after one second, it goes down to 150. The sensor has a time constant of 0.75 s.

1) Find the voltage reading after one second from the beginning of the experiment.
2) Find the voltage reading after two seconds from the beginning of the experiment.



$$V(t) = V_i + (V_f - V_i)(1 - e^{-\frac{t}{.75}})$$

$V_i = .9(0)^{1/2} = 0$

$V_f = .9(200)^{1/2} = 12.728\ V$

$$V(1) = 0 + (12.728 - 0)(1 - e^{-\frac{1}{.75}})$$

$$= 9.373\ V$$

$$V(t) = V_i + (V_f - V_i)(1 - e^{-\frac{t}{.75}})$$

$V_i = V(1) = 9.373\ V$

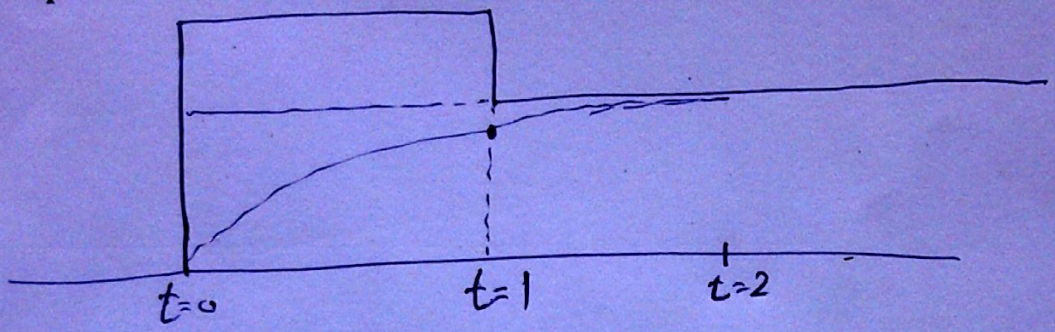
$V_f = .9(150)^{1/2} = 11.023\ V$

$$V(1) = 9.373 + (11.023 - 9.373)(1 - e^{-\frac{1}{.75}})$$

$$= 10.588\ V$$

A pressure sensor converts pressure into voltage according to the transfer function $Vp = 0.9\ (p)^{1/2}$. The pressure suddenly goes up from 0 to 200 psi (beginning of the experiment), then after one second, it goes down to 150. The sensor has a time constant of 0.5 s.

1) Find the voltage reading after one second from the beginning of the experiment.
2) Find the voltage reading after two seconds from the beginning of the experiment.



$$V(t) = V_i + (V_f - V_i)\left(1 - e^{-\frac{t}{.5}}\right)$$

$V_i = .9(0)^{\frac{1}{2}} = 0$

$V_f = .9(200)^{\frac{1}{2}} = 12.728\ V$

$$V(1) = 0 + (12.728 - 0)\left(1 - e^{-\frac{1}{.5}}\right)$$

$$= 11.005\ V \quad (*)$$

$$V(t) = V_i + (V_f - V_i)\left(1 - e^{-\frac{t}{.5}}\right)$$

$V_i = V(1) = 11.005\ V$

$V_f = .9(150)^{\frac{1}{2}} = 11.023\ V$

$$V(1) = 11.005 + (11.023 - 11.005)\left(1 - e^{-\frac{1}{.5}}\right)$$

$$= 11.020\ V$$