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Faculty of Engineering and Technology

Electrical and Computer Engineering Department

ENEE2110

ELECTRIC CIRCUITS LAB

Experiment.5 Prelab

**FIRST ORDER CIRCUITS**

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**Part A: Step response of First-order RC circuit**

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**Figure 1:5.5**

1. Calculate VC (t) using the general solution formula, show calculation of time constant (τ).

$V\_{c}\left(0^{+}\right)=0 initial voltage$

$$V\_{c}\left(\infty \right)=6 final voltage $$

$$τ=R×C$$

$$τ=10000×0.1uF$$

$$τ=0.001s$$

$$V\_{c}\left(t\right)=V\_{c}\left(\infty \right)+\left[V\_{c}\left(0^{+}\right)-V\_{c}(\infty )\right]e^{^{-t}/\_{T}}$$

$$V\_{c}\left(t\right)=6+\left[0-6\right]e^{\frac{-t}{0.001}}$$

$$V\_{c}\left(t\right)=6-6e^{-1000t}$$

1. Use PSPICE to do transient analysis of the circuit. Show VC(t) and use cursors to measure time constant (𝛕).



  



Charging cycle $V\_{o}×0.63=3.78$

$$τ=11-10=1ms$$

 Discharging $V\_{o}×0.37=2.22$

1. For the same circuit show VR(t) using a differential voltage marker, and use cursors to measure time constant (𝛕).





 Discharging cycle $V\_{o}×0.37=2.22$

$$τ≈1ms$$

**Part B: Step response of First-order RL circuit**

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1. Calculate VL (t) using the general solution formula, show calculation of time constant (τ).

$$v\_{l}\left(\infty \right)=0$$

$$v\_{l}\left(0\right)=v\_{in}=6$$

$$τ=\frac{L}{R}=\frac{1}{1000}=1ms$$

$$v\_{L}\left(t\right)=v\_{L}\left(\infty \right)+[v\_{L}\left(to\right)-v\_{L}\left(\infty \right)]e^{{-t}/{to}}$$

$$v\_{l}(t)=6e^{1000t}$$

2. Use PSPICE to do transient analysis of the circuit. Show VL(t) and use cursors to measure time constant (𝛕).



Discharging cycle $V\_{o}×0.37=2.22$

 $τ≈11.007-10 ≈1ms$

1. For the same circuit show VR(t) using a differential voltage marker, and use cursors to measure time constant (𝛕).





 Charging $V\_{o}×0.63=3.78$

$$τ=1ms$$

Discharging $V\_{o}×0.37=2.22$