Universidad Tecnológica de Bolívar

FÍSICA ELÉCTRICA

RC CIRCUIT SIMULATION

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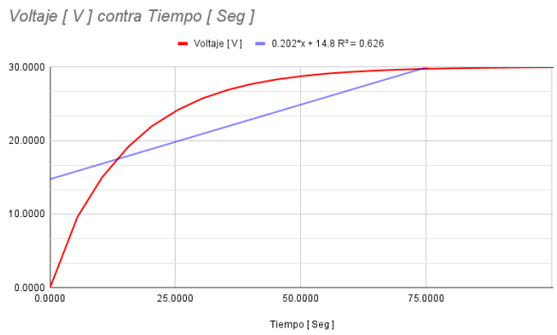
1. Datos experimentales

Constantes	
ε *(V)*	30
Resistencia *(Ω)*	80
Capacitancia *($\mathcal{F}$)*	0,2
RC *(τ) [Seg]*	16

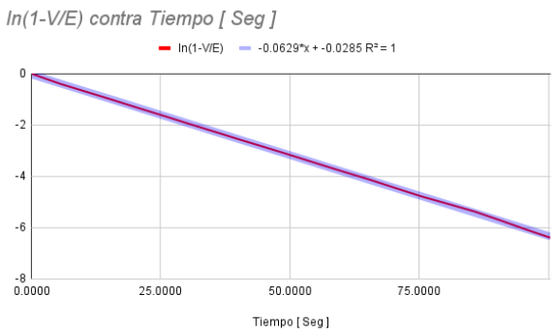
Carga	
Tiempo [**Seg**]	Voltaje [**V**]
0,0	0,0
5,5	9,65
10,4	15,01
15,6	19,15
20,2	21,9
25,4	24,13
30,4	25,73
35,5	26,89
40,3	27,7
45,3	28,31
50,4	28,77
55,5	29,11
60,3	29,34
65,5	29,52
70,3	29,65
75,5	29,75
80,3	29,81
85,6	29,86
90,5	29,9
95,5	29,93
100,4	29,95



▷ Linea de tendencia:

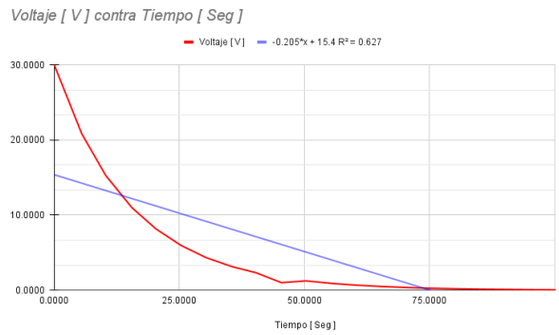
$0{,}202 \cdot x + 14{,}8 R^2 = 0{,}626$

Tiempo [**Seg**]	$\ln(1 - \frac{V}{\varepsilon})$
0,0	0
5,5	−0,3881164698
10,4	−0,6938140695
15,6	−1,017032302
20,2	−1,30933332
25,4	−1,631342748
30,4	−1,949583554
35,5	−2,266574655
40,3	−2,568288259
45,3	−2,876468853
50,4	−3,194183212
55,5	−3,517731198
60,3	−3,816712826
65,5	−4,135166557
70,3	−4,451019506
75,5	−4,787491743
80,3	−5,061928588
85,6	−5,367310238
90,5	−5,703782475
95,5	−6,060457419
100,4	−6,396929655



▷ Linea de tendencia:

$-0{,}0629 \cdot x - 0{,}0285 R^2 = 1$



▷ Linea de tendencia:

$-0{,}205 \cdot x + 15{,}4 R^2 = 0{,}627$

Descarga	
Tiempo [**Seg**]	Voltaje [**V**]
0,0	29,99
5,5	20,82
10,3	15,26
15,5	11,0
20,3	8,17
25,3	5,97
30,3	4,35
35,5	3,14
40,3	2,33
45,4	1,0
50,3	1,24
55,3	0,91
60,3	0,67
65,4	0,49
70,3	0,36
75,2	0,26
80,3	0,19
85,3	0,14
90,6	0,1
95,3	0,07
100,2	0,05

2. Charging a capacitor

2.1. Using the equations above what is the time constant τ? (Seg)

Usando la ecuación, $\tau = R \cdot C$, tenemos, $\tau = 80\Omega \cdot 0{,}2\mathcal{F} = 16Seg$

2.2. When t = τ what is the value of the voltage? (V)

Usando la ecuación,

$$V_c = \frac{q}{c} = \varepsilon(1 - e^{\frac{-t}{RC}}) \qquad (1)$$

$V_c = 30V(1 - e^{-1}) = 18,9636V$

2.3. What percentage of the battery voltage is the voltage across the capacitor at this time?

Usando la ecuación (1) despejada,

$$\frac{V_c}{\varepsilon} = 1 - e^{\frac{-t}{RC}} \qquad (2)$$

Si $\tau = RC$, $\frac{V_c}{\varepsilon} = 1 - e^{-1} = 0{,}6321\,\%$

2.4. When t = 2τ what is the value of the voltage? (V)

Según la ecuación (1), $V_c = 30V(1-e^{-2}) = 25{,}9399V$

Referencias

Videos de Referencia. (s.f.). https : / / drive . google . com / drive / folders / 1n7157nrmw1cFU - QVgO - UZnVsMojdDCpP?usp=sharing