

ID:

Name:

Brac University

Semester: Summer 2023

Course Code: CSE250

Circuits And Electronics

Section: 23

Faculty: PRM

Set

A



Inspiring Excellence

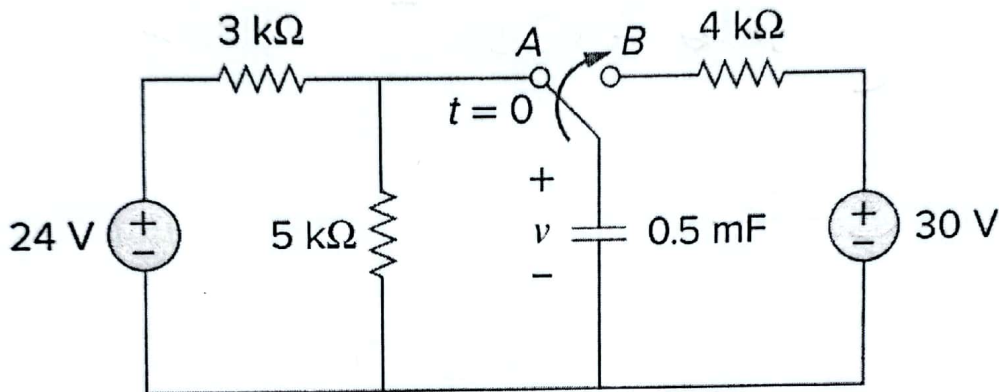
Assessment: Quiz-4

Full Marks: 20

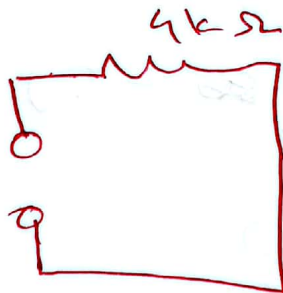
- ✓ No washroom breaks. Phones must be turned off. Using/carrying any notes during the exam is not allowed.
- ✓ At the end of the exam, the answer script must be returned to the invigilator.
- ✓ All questions are compulsory. Marks allotted for each question are mentioned beside each question.
- ✓ Symbols have their usual meanings.

■ Question 1 of 1 [CO3] [20 marks]

Calculate the time constant. Calculate $v(t)$, $i_C(t)$ and $i(t)$ across the $5k\Omega$ resistance for $t < 0$ and $t > 0$ and the energy stored in the capacitor at $t = 10\text{ms}$.



For $R \Rightarrow$



$$\therefore R = 4k\Omega$$

$$\tau = RC = 4k \times 0.5m = 2s$$

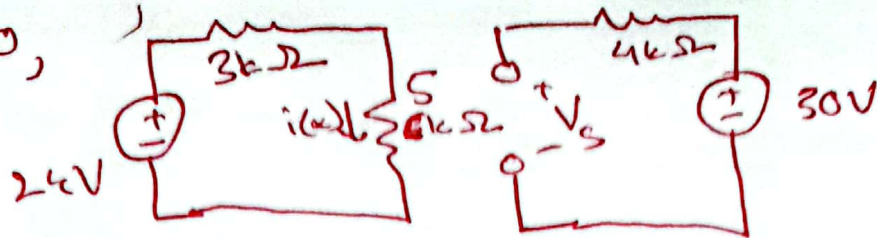
For $t < 0$,

$$V_0 = \frac{5}{3+5} \times 24 = 15V$$

$i_C(0) = 0A$ (As capacitor is open)

$$i(0) = \frac{24}{5+3} = 3A$$

For $t > 0$,



$$i(\infty) = \frac{24}{3+5} = 8A$$

$$V_s = 30V$$

$$\therefore v_c(t) = \begin{cases} 15V, & t \leq 0 \\ 30 - 15e^{-\frac{t}{2}}, & t > 0 \end{cases}$$

$$i_c(t) = C \frac{dv_c}{dt}$$

$$= \begin{cases} 0, & t \leq 0 \\ \frac{0.5}{1000} (\cancel{30} - 15) \times (-\frac{1}{2}) e^{-\frac{t}{2}}, & t > 0 \end{cases}$$

$$= \begin{cases} 0, & t \leq 0 \\ 3.75 \times 10^{-3} e^{-\frac{t}{2}}, & t > 0 \end{cases}$$

$$i(t) = 3.75 \times 10^{-3} A, \text{ for all } t$$

$$v_c(t=10ms) = 30 - 15e^{-\frac{1}{2} \times \frac{10}{1000}} = 15.07V$$

$$\therefore W = \frac{1}{2} CV^2 = \frac{1}{2} \times \frac{0.5}{1000} \times 15.07^2 = 0.057J$$