國立臺灣科技大學答案卷

National Taiwan University of Science and Technology Answer Sheet

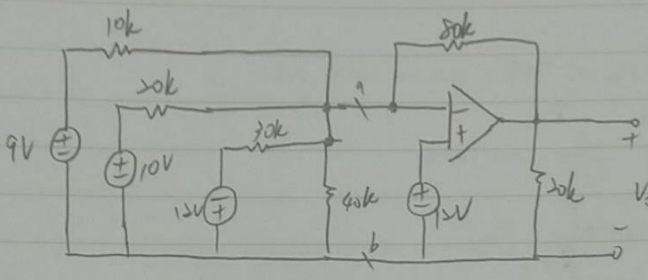
評分 Score	教師簽章 Signature of Lecturer
99	

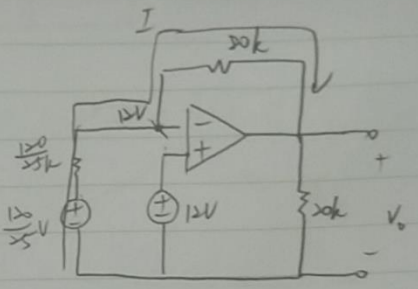
姓名/Name _____ 學號/Student ID _____ 班級/Class _____

科目/Course title 電路學 日期/Date 111.11.21

記分欄 從此處開始寫起。試卷用紙務須節用，非經主試認可不得續用其他紙張作答。/Please write from here.

1. $V_o = 132V$





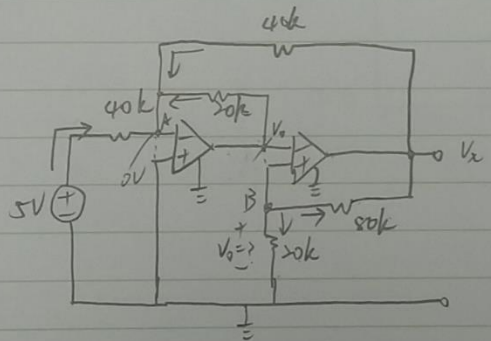
By 戴維寧:

$$V_{th} = \frac{\frac{9}{10k} + \frac{10}{20k} - \frac{12}{30k}}{\frac{1}{10k} + \frac{1}{20k} + \frac{1}{30k} + \frac{1}{40k}} = \frac{9\cdot 12 + 10\cdot 6 - 12\cdot 4}{12+6+4+3} = \frac{120}{55}\,V$$

$$R_{th} = \frac{1}{\frac{1}{10k} + \frac{1}{20k} + \frac{1}{30k} + \frac{1}{40k}} = \frac{120\,k}{12+6+4+3} = \frac{120}{55}\,k\Omega$$

$$V_o = -\frac{\frac{120}{55} - 12}{\frac{120}{55}k}\cdot 50k + 12 = 132V \quad \#1$$

2. $V_o = -\frac{5}{7}V$



By KCL:

@B: $\frac{5-0}{40k} + \frac{V_o - 0}{20k} + \frac{V_x - 0}{40k} = 0 \Rightarrow 5 + 2V_o + V_x = 0$ ($5V_o$)

@B: $\frac{V_o - 0}{20k} + \frac{V_o - V_x}{80k} = 0 \Rightarrow 4V_o + V_o - V_x = 0 \Rightarrow 5V_o = V_x$

$\Rightarrow \boxed{V_o = -\frac{5}{7}V}$ #2

可轉頁再寫。

記分欄　轉頁從此開始寫起。

3. $v_o(t) = -\frac{325}{324}\cdot\sin 324t$

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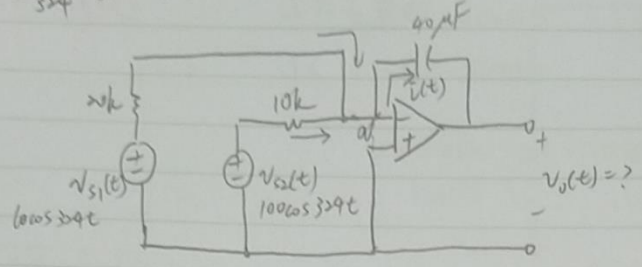

$q = CV$

$\frac{dq}{dt} = C\cdot\frac{dV}{dt} = i(t)$

$\Rightarrow v_c(t) = \frac{1}{C}\int i(t)\,dt$

$$v_o(t) = -v_c(t) = -\frac{1}{40\cdot10^{-6}}\cdot\int 3m\cdot\cos 324t + 10m\cdot\cos 324t\,dt$$

$$= -\frac{13\cdot10^{-3}}{40\cdot10^{-6}}\cdot\frac{1}{324}\cdot\sin 324t$$

$$= \boxed{-\frac{325}{324}\cdot\sin 324t\ V}\ (V)$$

#3

4.

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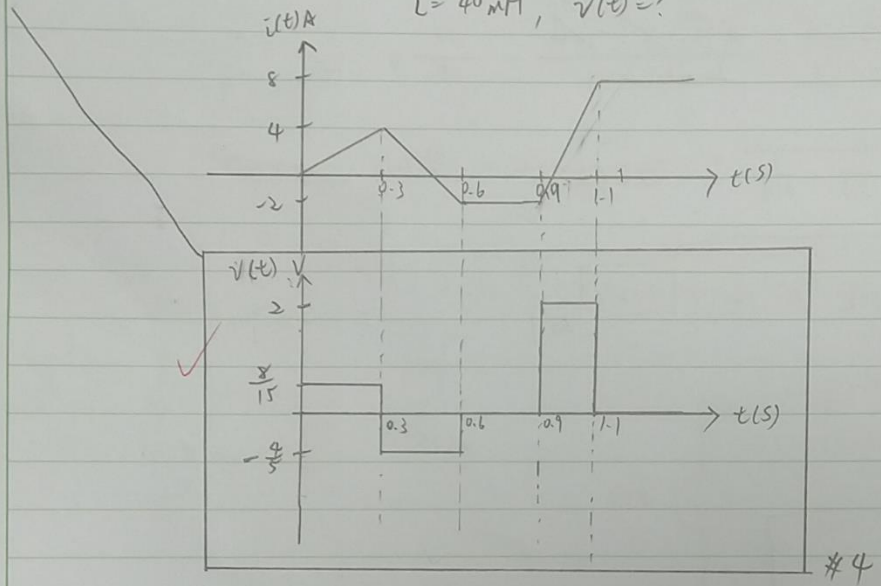

$$v(t) = L\cdot\frac{di}{dt} = \begin{cases} 4\cdot10^{-2}\cdot\frac{4}{0.3} = \frac{8}{15}V, & 0\le t<0.3s \\ 4\cdot10^{-2}\cdot\frac{-6}{0.3} = -\frac{4}{5}V, & 0.3\le t<0.6s \\ 4\cdot10^{-2}\cdot 0 = 0V, & 0.6\le t<0.9s \\ 4\cdot10^{-2}\cdot\frac{10}{0.2} = 2V, & 0.9\le t<1.1s \\ 4\cdot10^{-2}\cdot 0 = 0V, & t\ge 1.1s \end{cases}$$

$-0.8\cdot-\frac{2}{3}$　$-0.8\cdot$　2

$= \frac{1.6}{3}$

0.53

#4

5. $C = \frac{2}{78125} = 25.6\,\mu F$

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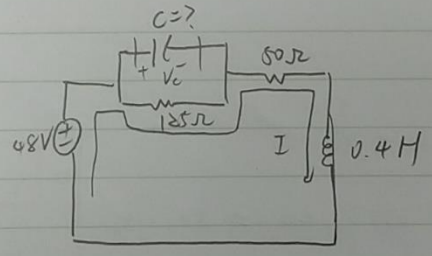

when $t = \infty$:

$$I = \frac{48}{125+50} = \frac{48}{175}\,A$$

$$V_c = 48\cdot\frac{125}{125+50} = \frac{48\cdot5}{7}\,V$$

If $W_c = W_L$:

$$\frac{1}{2}\cdot C\cdot V_c^2 = \frac{1}{2}L\cdot I^2 \Rightarrow C\cdot\left(\frac{48\cdot5}{7}\right)^2 = 0.4\cdot\left(\frac{48}{175}\right)^2 \Rightarrow \boxed{C = 0.4\cdot\left(\frac{48}{175}\right)^2\cdot\left(\frac{7}{48\cdot5}\right)^2 = \frac{2}{78125} = 25.6\,\mu F}$$

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