Ethan Wong
505319[illegible]
12/17/2021

ECE 3 Fall 2021 Final

1. A
2. A
3. C
4. D
5. A
6. C
7. $V = 12[\cos(35°) + j\sin(35°)]$

$Z_{tot} = R_{700\Omega} \| Z_L + Z_C + R_{400\Omega}$

$= 700 \| jwL + \frac{1}{jwC} + 400$

$= \frac{700(jwL)}{700 + jwL} + \frac{1}{jwC} + 400$

$= \frac{700(j \cdot 2000 \cdot 0.3)}{700 + (j \cdot 2000 \cdot 0.3)} + \frac{1}{j(2000)(4 \times 10^{-6})} + 400$

$Z_{tot} = 696.47 + 220.88j$

$i_C = \frac{V}{R} \rightarrow \frac{12[\cos(35°) + j\sin(35°)]}{696.47 + 220.88j}$

$= 0.0156 + j0.0049$

$i_C = 0.0156 + j0.0049$

$i_C = 0.0163 \angle 30°$

$I = C\frac{dv}{dt}$

$I = (4 \times 10^{-6})($

8. a) $20k\Omega$ and $60k\Omega$ in parallel $= 15k\Omega$

$-40V + (15k\Omega)(0.01A) - V_c(0^-) = 0$

$-40V + 150 - V_c(0^-) = 0$

$\boxed{V_c(0^-) = 110\ V}$

b) 0 A

b) 0 A

c) 0 V

d) $V = IR \quad I = \frac{V}{R} \quad I = \frac{40}{75} = 2.67\ V$

e) 75 V

f) 0 A

Ethan Wong

$I = \frac{V}{R}$

9. $R_{in} = \frac{V_s}{I_s}$

V_{out} is the node on the far right

① $\frac{V_n - V_{out}}{1000} + I_s + \frac{V_n}{1000} = 0$

② $\frac{V_p - V_{out}}{3300} + I_s + \frac{-V_p}{1000} = 0$

$V_s = 1000 \,||\, 3300$

$V_s = 767.44\,\Omega$

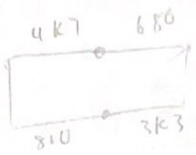
$I_s = 5A$

$V_p = 5V$ $\quad V_{out} = 3V$

$V_n = \frac{V_{out}}{1000} = 0.003$

7. $R_{in} =$

$R_{in} = 1.53\,m\Omega$



10. ① 4K7 is in series with (680 and 1000 are in parallel)
   ↳ 4700 + 404.76 = 5104.76 Ω
   ② 3K3 and 810 are in series
   ↳ 4110 Ω
   ① and ② are in parallel
   R_{tot} = 2276.84 Ω
   $I = \frac{V}{R}$ $\frac{12}{2276}$ = .00527 A → 5.27 mA

$V = IR$

$I = \frac{V}{R}$

11. $i_x = \frac{V_1 - V_2}{100}$

$V = 10[\cos(-20°) + j\sin(-20°)] = 9.4 - j3.4$

V_1: $\frac{V_1 - V}{4.7\times10^{-6}} - 10i_x + 1_x = 0$

V_2: $\frac{V_2}{250} - 1 - i_x = 0$

$i_x = \frac{V_1 - V_2}{100}$

Say $V_1 = 0$, $V_2 = V_{oc}$

$\frac{V_2}{250} - i_x = 1$

$1 + \frac{V_1 - V_2}{100} = \frac{V_2}{250}$

$1 + \frac{0 - V_2}{100} = \frac{V_2}{250}$ $\quad V_2 = -166\,V$

Have to use short circuit method

$-1 - i_x + \frac{V_2}{250} + I_{sc} = 0$

$I_{sc} = 1 + \frac{V_1 - V_2}{100} - \frac{V_2}{250}$

$\frac{V_1 - V}{4.7\times10^{-6}} - 10\left(\frac{V_1 - V_2}{100}\right) + \frac{V_1 - V_2}{100} = 0$

$V_1 = 9.4 - 3.4j$

$I_{sc} = 1 + \frac{(9.4 - 3.4j) + 166}{100} - \frac{166}{250}$

$I_{sc} = 2.09 - 0.034j$

$R_{th} = \frac{V_{oc}}{I_{sc}} = \frac{10.5}{2.09 - 0.034j} = 5.022 + 0.817j$

$\boxed{R_{th} = 5.022 + 0.817j}$