KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

ELECTRICAL ENGINEERING DEPARTMENT

EE 201 Major Exam II

TIME: 06:30P.M. – 08:00 P.M.

DATE: Monday December 18, 2006

Key Solution

Student's Name: _____

Student's I.D. Number: _____

Section Number: _____

Serial Number: _____

	Grade	Max. Grade
Problem 1		5
Problem 2		5
Problem 3		5
Total		15

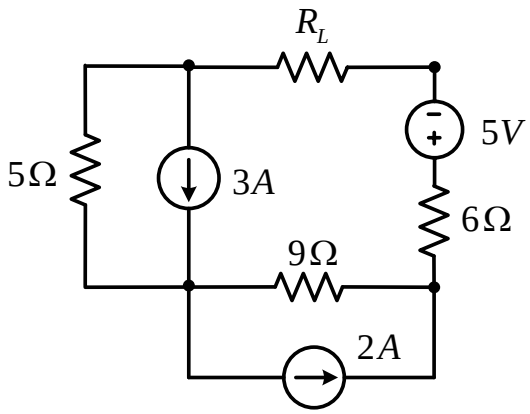
Problem 1 (5 Points)

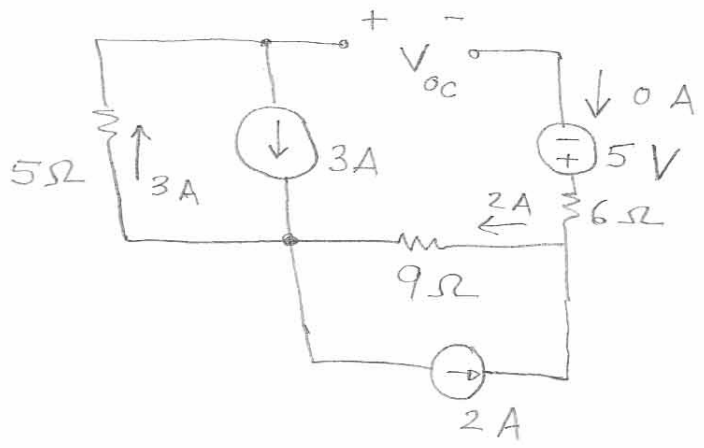
In the circuit shown, Find:

a) The value of the load resistor R_L that results in maximum power transfer.
b) The maximum power absorbed by R_L.

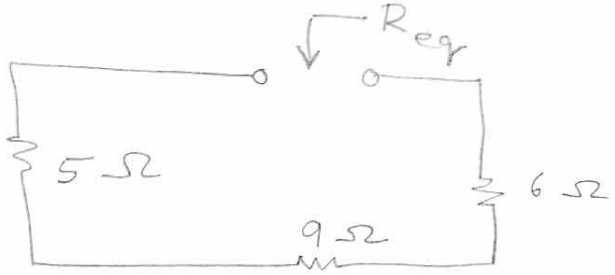
Answer:

(a) R_L =	
(b) P_{max} =	





$$V_{oc} = -3(5) - 2(9) + 5 = -28\,V$$



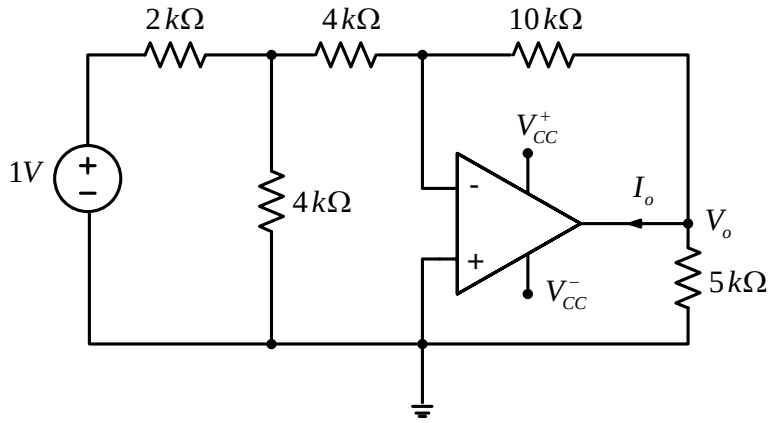
$$R_{eq} = 5 + 9 + 6 = 20\,\Omega = R_{th}$$

a) $R_{th} = R_L = 20\,\Omega$

b) $P_{max} = \dfrac{V_{th}^2}{4R_{th}} = \dfrac{(28)^2}{4 \times 20} = 9.8\,W$

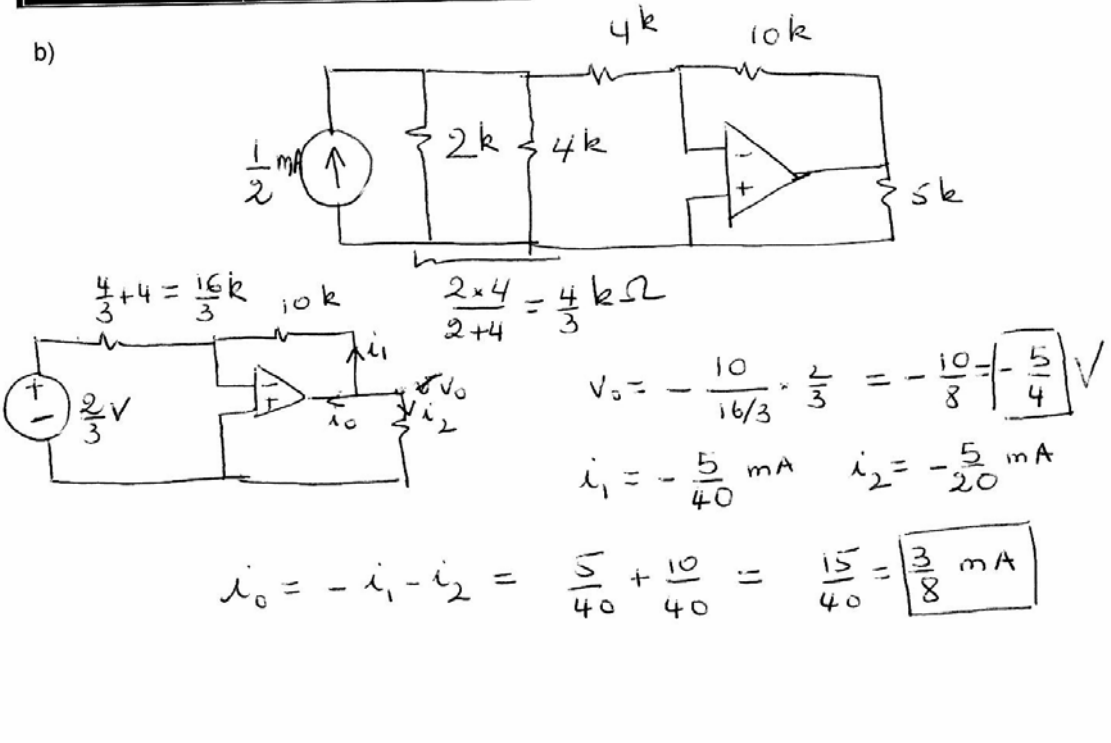
Problem 2 (5 Points)

a) Determine I_o and V_o for the circuit shown below (Assume the Op Amp does not saturate):



I_o =	$\frac{3}{8}$ mA
V_o =	$-\frac{5}{4}$ V

b)



Problem 3 (5 Points)

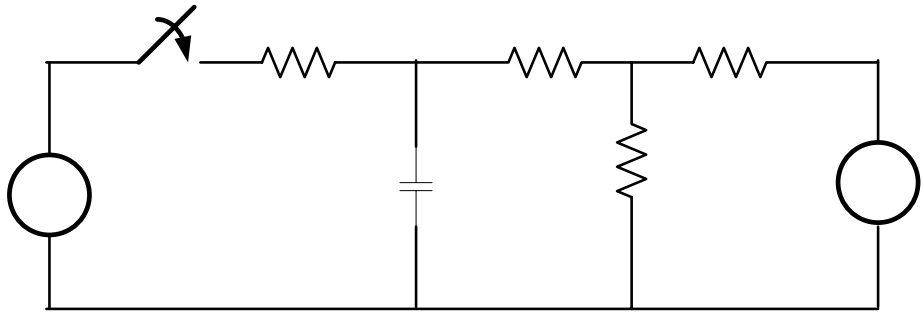
Problem 3

In the circuit shown, the switch remains open for a long time. It is suddenly closed at $t = 0$. Find:

a) $V_c(t)$ for $t < 0$.

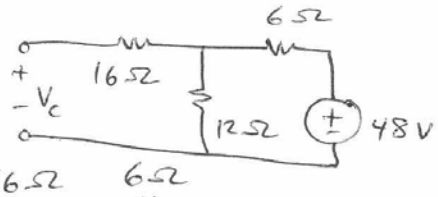
b) $V_c(t)$ for $t \geq 0$.

c) Calculate the power absorbed by the capacitor at $t = 20\ ms$.

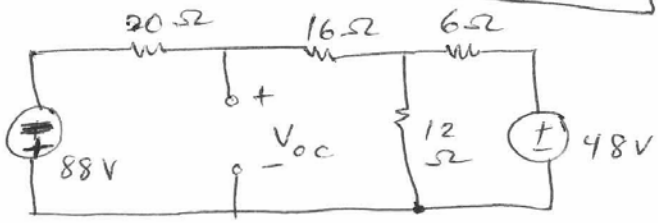


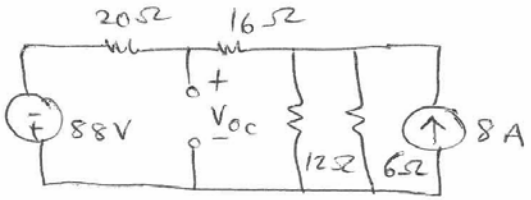
$t = 0$

a) $t < 0 \Rightarrow V_c = \frac{12}{18} \times 48 = 32\ V$

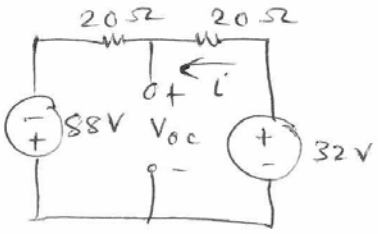


b) $t > 0$





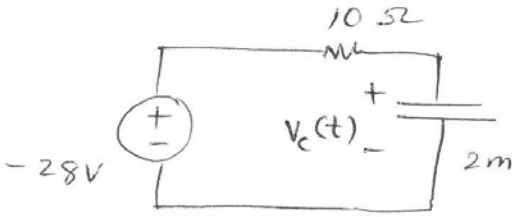
$\Rightarrow$



$$i = \frac{32+88}{40} = \frac{120}{40} = 3A$$

$$\therefore V_{oc} = -20i + 32 = -60 + 32 = -28V$$

$$R_{eq} = 20 // 20 = 10\ \Omega$$



$$\Rightarrow V_c(t) = -28 + 60e^{-50t}$$

c) $i_c(t) = 2 \times 10^{-3}\left(-3000\, e^{-50t}\right) = -6\, e^{-50t}$

$$\therefore P_c(t) = i_c(t)\, v_c(t) = -6\left(-28 + 60\, e^{-50t}\right) e^{-50t}$$

$$P_c(0.02) = -6\left(-28 + 60\, e^{-1}\right) e^{-1}$$

$$= 13.08\ W$$