**Name:**
**ID:**
**Section:**

**EE 281 - Midterm Examination 2**
**December 8th, 2014**

**1) a)** Find the Thevenin equivalent of the given circuit. (8 pts)

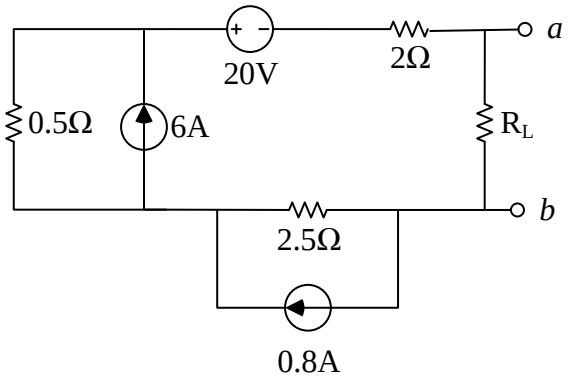


**Fig** 1.1

**b)** Connect a resistor between the terminals ***a*** and ***b***, as seen in Fig 1.2. Find the power dissipated by $R_L$, for $R_L$= 2.5Ω, $R_L$= 5Ω, $R_L$= 7.5Ω. (9 pts)

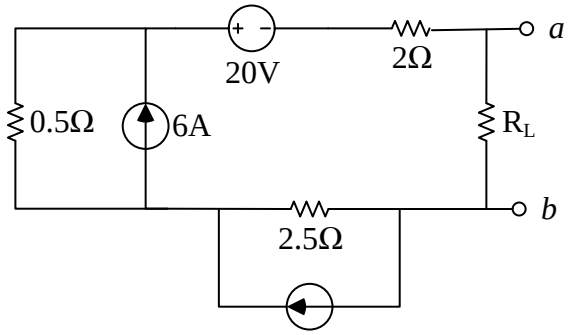


**Fig** 1.2

**c)** Comment on the results (3 pts)

**2) a)** Write the node voltage equation for the essential node voltages, $v_1$ and $v_2$, using only the given parameters (represent $v_0$ in terms of $v_1$ and $v_2$). (10 pts)

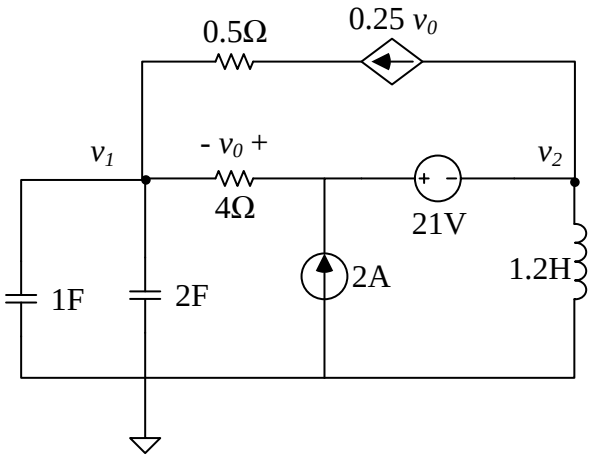


**Fig.** 2.1

**b)** Write the two mesh current equations necessary to analyze the given circuit, using only the given parameters. (10 pts)

**3)**

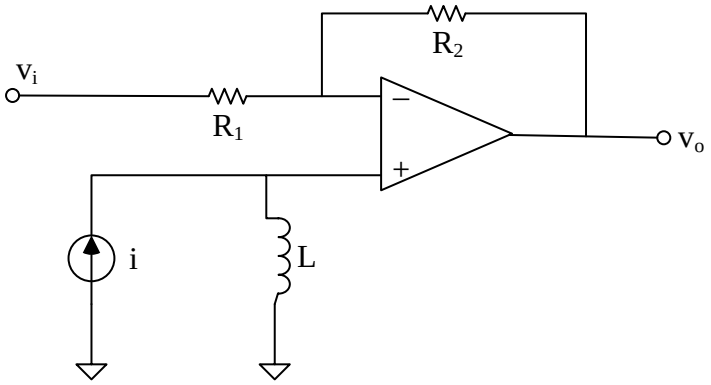


**Fig.** 3.1

**a)** Find $v_0$ in terms of $v_i$, $R_1$, $R_2$, $i$, $L$. (10 pts)

**b)** Assume;

$Vss = 10V$ (Voltage at which the OpAmp goes into positive saturation region)

$V_{dd} = -10V$ (Voltage at which the OpAmp goes into negative saturation region)

$v_i = 5V$

$R_1 = 1k\Omega$

$R_2 = 3k\Omega$

$L = 0.5H$

$i = 0.1t^2$ ($t$ is time in seconds)

Find the time instants at which;

i) the OpAmp leaves the negative saturation region

ii) the OpAmp goes into the positive saturation region. (20 pts)

**4)** Consider the given circuits and voltage sources. Connect those components such that resulting output voltage will be;

$$v_0 = -10\left(\int v_1(\tau)d\tau + v_2 + \frac{dv_3}{dt}\right)$$

Show all your work for full credit, including derivation of the input-output relations of the OpAmp circuits. (30 pts)