Solution

Student name: _____

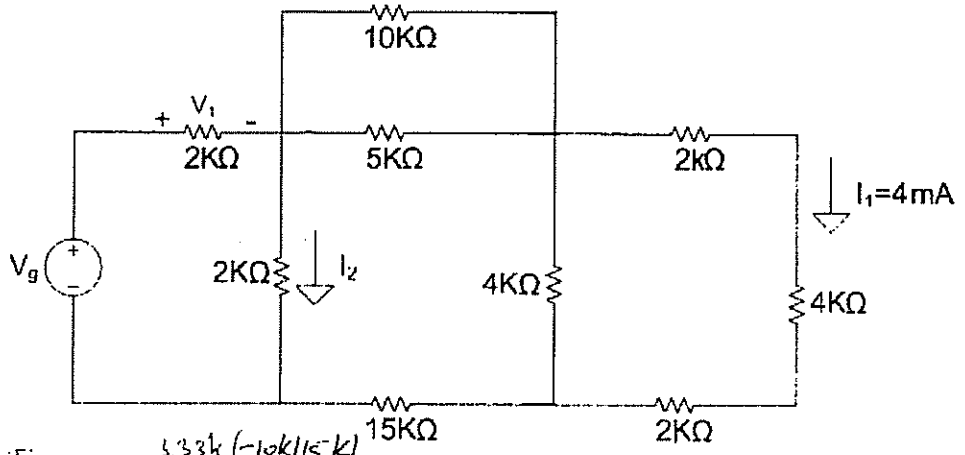
ID number: _____

University of Toronto
Department of Electrical & Computer Engineering
ECE110S – Electrical Fundamentals
Quiz 2A – February 13, 2008, 4:30-5:00 PM

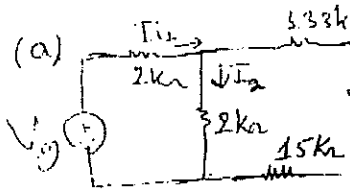
($e = 1.6 \times 10^{-19}$ C, $\varepsilon_0 = 8.85 \times 10^{-12}$ F/m, $\mu_0 = 4\pi \times 10^{-7}$ H/m, g=9.81N/kg)

Instructions: Non-programmable calculators allowed. No other aids. Answer in the space provided on these sheets. The back sides of these sheets can be used as well. For full marks you must show methods, state UNITS and compute numerical answers when requested. **Please write in PEN, not pencil.**

1. For the circuit below use circuit reduction, voltage division, current division, KCL, KVL and Ohm's law to calculate:
(a) Voltage V_g. **(4 marks)**
(b) Current I_2. **(3 marks)**
(c) Voltage V_1. **(3 marks)**



(a)



$I_3 = \frac{12}{4} I_1 = 12\text{mA}$

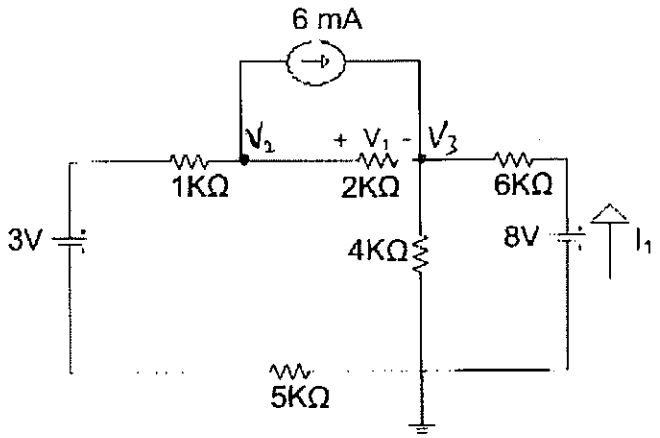
$I_4 = \frac{23}{2} I_3 = 138\text{mA}$ } by current division

$V_g = 2 I_4 + 21 I_3 = 528\text{V}$

(b) $I_2 = \frac{21}{23} I_4 = 126\ \text{mA}$

(c) $V_1 = (2)(I_4) = 276\text{V}$

2. In the circuit below, use the Node Analysis to calculate:
(a) The voltage V_1. **(4marks)**
(b) The current I_1. **(3 marks)**
(b) The power delivered or absorbed by the 8V voltage source. **(3 marks)**



(a) $\frac{V_2-3}{6}+\frac{V_2-V_3}{2}+6=0 \iff V_2-3+3V_2-3V_3=-36 \iff 4V_2-3V_3=-33$ (1)

$-6+\frac{V_3-V_2}{2}+\frac{V_3}{4}+\frac{V_3-8}{6}=0 \iff -6V_2+11V_3=89$ (2)

$V_2=-3.81V$, $V_3=5.92V$ so $V_1=V_2-V_3=-9.73V$.

(b) $I_1=\frac{8-V_3}{6}=\frac{8-5.92}{6}\simeq 0.347\,mA$

(c) $P_{(delivered)}=(8)(I_1)=2.77\,mW$