American University of Beirut
Department of Electrical and Computer Engineering

EECE 210 – Electric Circuits
Fall 2018 (November 9) – Quiz 2
Version A

One A4 sheet with notes (no solutions)
No Programmable Calculators
No Wireless Devices

Only work written on this set of question sheets will be graded.

DURATION: 90 MINUTES

APPLY TIME MANAGEMENT!

TOTAL OF 100 POINTS

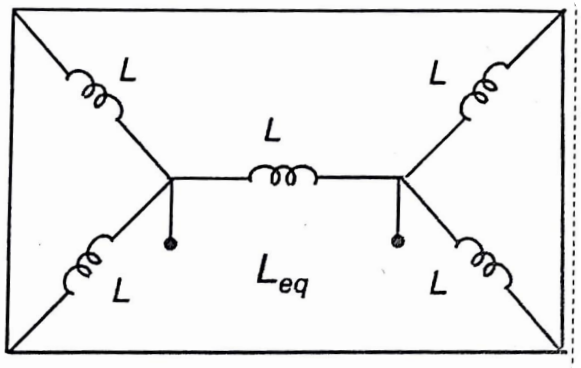
NUMBER OF PAGES: 9

NUMBER OF PROBLEMS: 8

NO QUESTIONS ASKED DURING THE QUIZ, EXCEPT FOR SIMPLE LOGISTICS SUCH AS EXTRA SCRATCH PAPER

Problem 1 (5 pts)

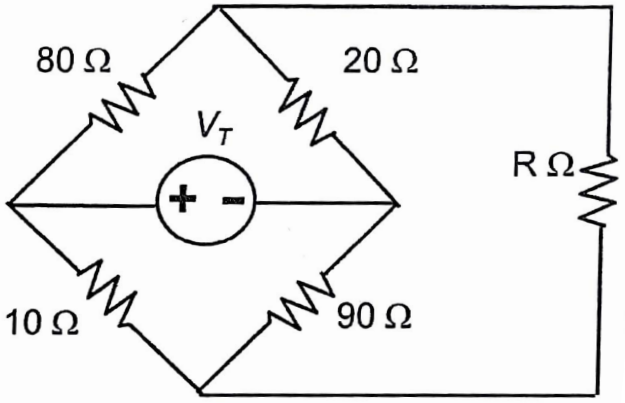
Find L_{eq} in the circuit below, if $L = 6\ H$. Circle the best answer.



3 H
4 H
6 H
1/3 H
1/4 H
1/6 H

Problem 2 (10 pts)

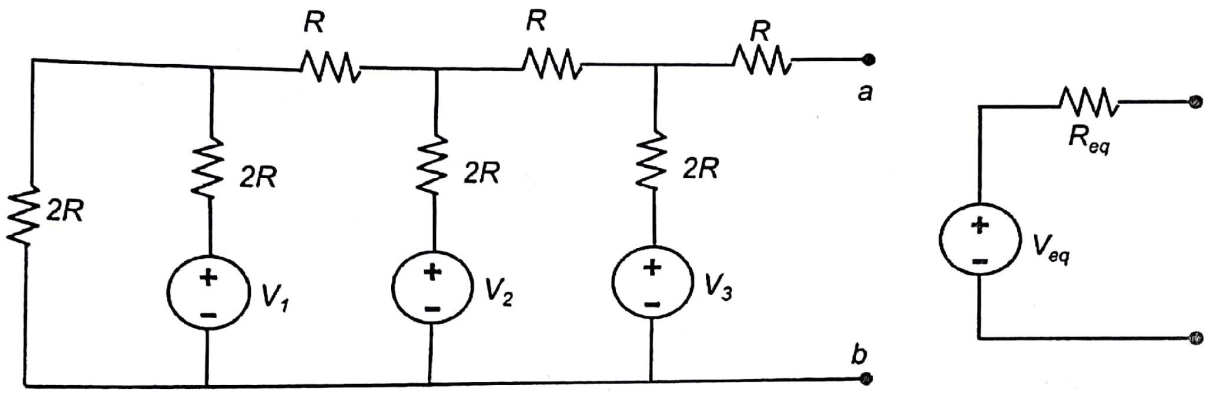
A. (5 pts) V_T=20 V, Find $|V_{Th}|$ in the circuit without R. Circle the best answer.



1 V
7 V
10 V
14 V
20 V
25 V
28 V
40 V

B. (5 pts) Find the value of R for maximum power transfer.

10 Ω
20 Ω
25 Ω
30 Ω
35 Ω
40 Ω
50 Ω
75 Ω



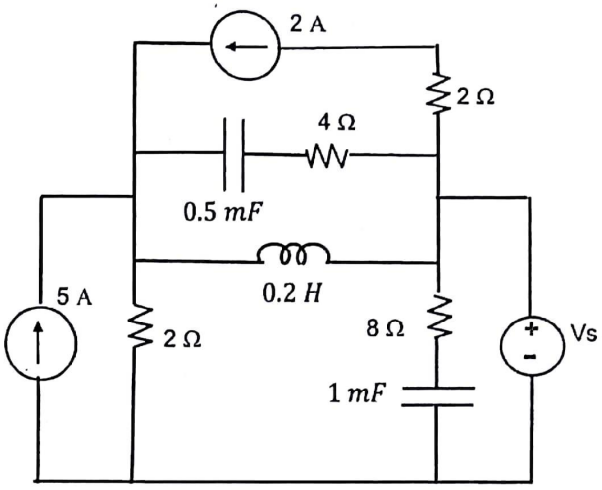
Problem 3 (5 pts)

The circuit on the left hand side is replaced by an equivalent circuit as shown on the right. Use multiple source transformations to find an expression for V_{eq} in terms of R, V_1, V_2, and V_3:

$V_1/2+ V_2/2+ V_3/2$
$V_1/2+ V_2/4+ V_3/8$
$V_1/8+ V_2/4+ V_3/2$
$V_1/4+ V_2/2+ V_3$
$V_1+ V_2+ V_3$
$(V_1/8+ V_2/4+ V_3/2)/R$
$(V_1/2+ V_2/2+ V_3/2)/R$
$(V_1/2+ V_2/4+ V_3/8)/R$

Problem 4 (15 pts)

A. (5 pts) The circuit is in DC steady state. V_s=80 V. Find the energy stored in the 1mF capacitance. Circle the best answer.



0 J,
0.8 J,
1.8 J,
3.2 J,
16.9 J,
17.7 J,
52.9 J,
54.7 J,
108.9 J,
112.1 J

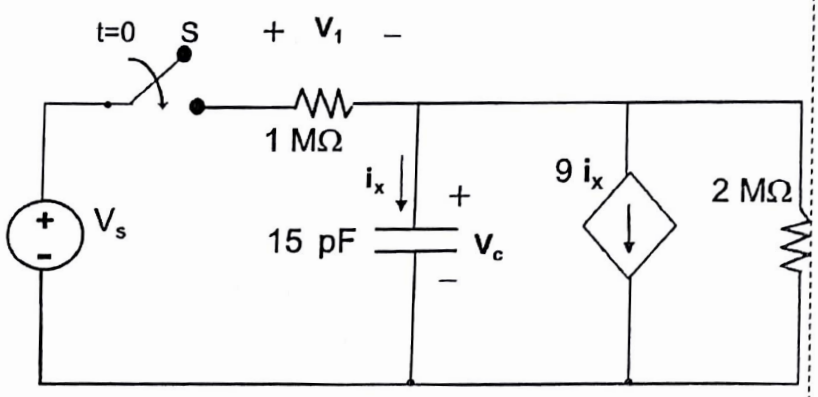
B. (5 pts) Find the energy stored in the 0.5mF capacitance. Circle the best answer.

0 J,
0.8 J,
1.8 J,
3.2 J,
16.9 J,
17.7 J,
52.9 J,
54.7 J,
108.9 J,
112.1 J

C. (5 pts) Find the energy stored in the inductance. Circle the best answer.

0 J,
0.8 J,
1.8 J,
3.2 J,
16.9 J,
17.7 J,
52.9 J,
54.7 J,
108.9 J,
112.1 J

Problem 5 (15 pts)



A. (5 pts) The switch has been open for a long time and closes at t=0. V_s=20 V. Find $v_1(0^+)$ (voltage over the 1 MΩ resistance). Circle the best answer.

0 V
6.7 V
16.7 V
20 V
26.7 V
50 V
66.7 V
80 V

B. (5 pts) Find $i_x(0^+)$. Circle the best answer.

0 A
2.0 μA
5.0 μA
6.67 μA
8.0 μA
16.67 μA
20.0 μA
26.67 μA
50.0 μA
80.0 μA

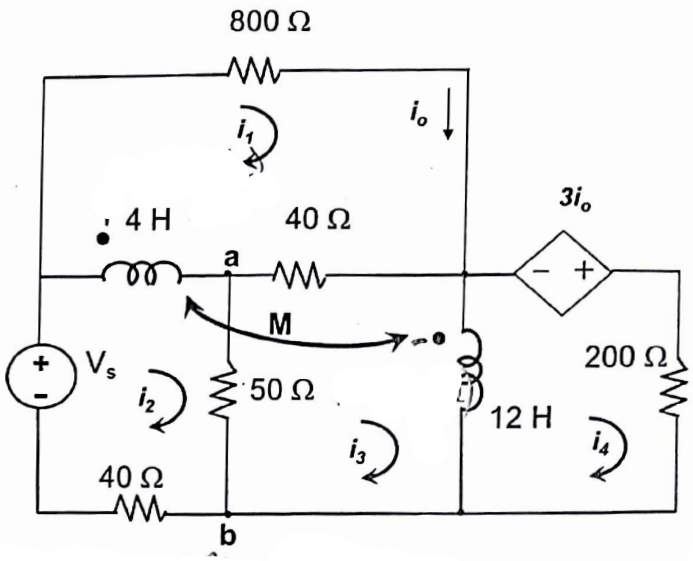
C.(5 pts) Find $v_1(\infty)$(voltage over the 1 MΩ resistance). Circle the best answer.

0 V
6.7 V
16.7 V
20 V
26.7 V
50 V
66.7 V
80 V

Problem 6 (17 pts)

For the circuit below, $V_s = 10V$.

a) (8 pts) Write expressions for each mesh in the circuit in terms of the mesh currents, M and V_s (i.e. 4 expressions). Note to simplify each expression (group like variables).

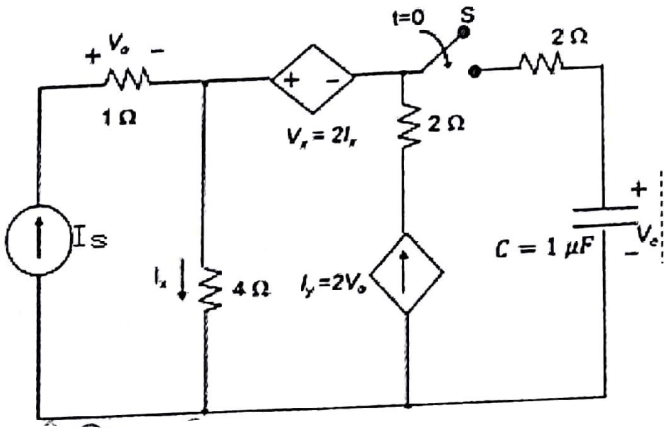


b) (5 pts) Redraw the circuit for when $t \to \infty$,

c) (4 pts) In the circuit of b), remove the 50 Ω resistor, and then find the Thevenin equivalent circuit with respect to terminals a-b.

Problem 7 (17 pts)

I_s= 5A. Find the voltage $V_c(t)$ if the capacitor was uncharged before the switch is closed. (Hint: find the Thevenin or Norton equivalent circuit connected to the capacitance.)



Problem 8 (16 pts)

Let V_1=8 Volts. If you are told that for some value of V_2=M volts, the output voltage V_x= 1 Volts, Find V_x if the voltage V_2 is doubled to 2M volts.