KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

ELECTRICAL ENGINEERING DEPARTMENT

Term151 EE 202

EXAM II

DATE: Sunday 8/11/2015

TIME: 6:00 PM-7:30 PM

SER #	**SOLUTION**
ID#	
Name	
Section#	

	Maximum Score	**Score**
Problem 1	20	
Problem 2	15	
Problem 3	15	
Total	**50**	

Problem 1:

Circle the correct answer only. No points will be given if more than one answer is selected for any part of the MCQ questions. The parts have equal weights.

a) With help of mesh analysis, find the value of R for the circuit in Fig. 1.

i) -1/3 Ω ii) -9/4 Ω iii) 1 Ω iv) 9 Ω v) 9/4 Ω

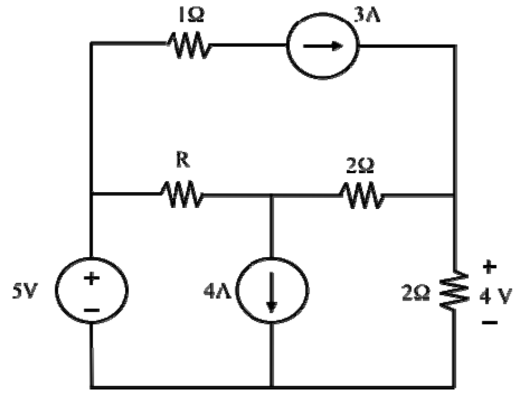


Fig. 1

b) With help of source transformation, find the voltage V_R shown in the circuit of Fig. 2:

i) 28/11 V ii) 5 V iii) 9/2 V iv) 2 V v) 14/11 V

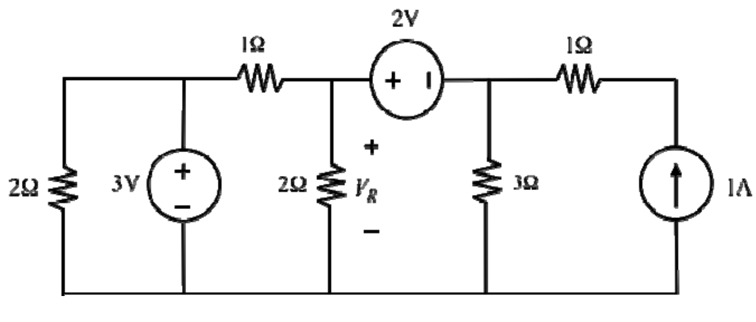


Fig. 2

c) Find the Thevenin's equivalent circuit (values for V_{TH} and R_{TH}) between a-b by successive source transformations for the circuit in Fig. 3

i) 4 V and 4/3 Ω ii) 12 V and 10/3 Ω iii) 15 V and 5 Ω iv) 4 V and 10/3 Ω

v) 12 V and 4/3 Ω

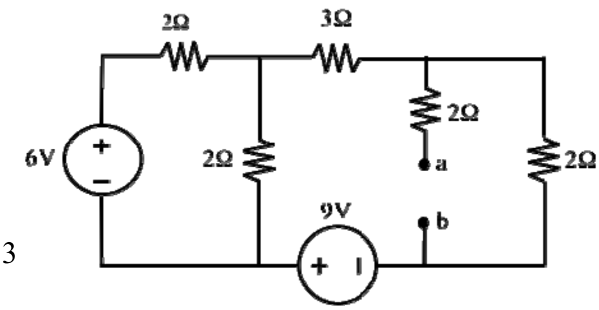
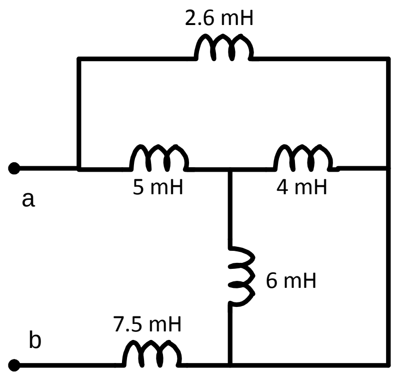


Fig. 3

d) The equivalent inductance between terminals ab of the circuit in Fig. 4 is:

i) 9.424 mH ii) 4.44 mH iii) 5.5172 mH iv) 11.6029 mH v) 15.012 mH

Fig. 4



e) For the circuit and the voltage shown in Fig. 5, the inductor has no stored energy at t = 0. Determine the current $i_s(t)$ at t = 1.5 s is:

i) 0.750 A ii) 3 A iii) 0.875 A iv) 1.25 A v) None of the above

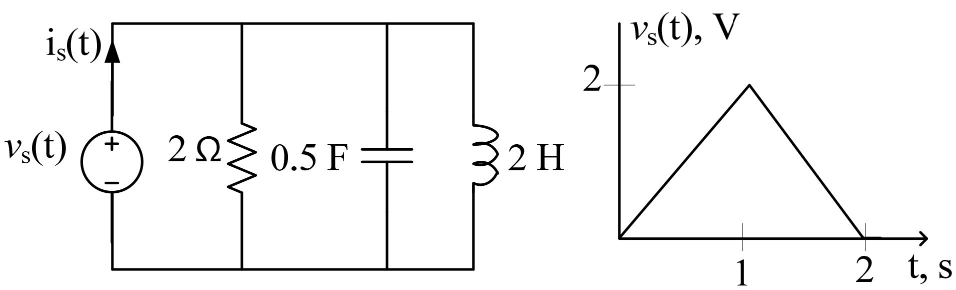


Fig. 5

f) Given the current $i_s(t) = 10te^{-5t}$ A in the circuit of Fig. 6, then the voltage $v_L(t)$ in volts is:

i) $v_L(t) = -e^{-5t}(5t-1)$ ii) $v_L(t) = -5te^{-5t} - 1$ iii) $v_L(t) = e^{-5t} - 5t$

iv) $v_L(t) = e^{-5t}(1-5t)$ v) $v_L(t) = e^{-5t}(5t-1)$

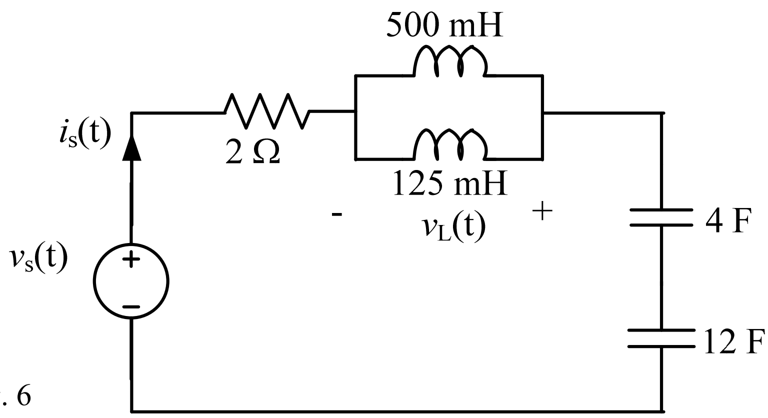


Fig. 6

g) For the circuit in Fig. 7, **using the superposition principle** , knowing that the voltage across the 5 Ω (due to the independent voltage source) $V_x^{'} = 5$ V, and the voltage across the 5 Ω (due to the independent current source) $V_x^{''} = 20$ V. Then , the power dissipated by the 5 Ω is:

i) 25 W ii) 50 W iii) 85 W iv) 125 W v) None of the above

h) For the circuit in Fig. 7, the current *I* is:

i) -1 ii) -2 iii) 4 iv) -4 v) 1

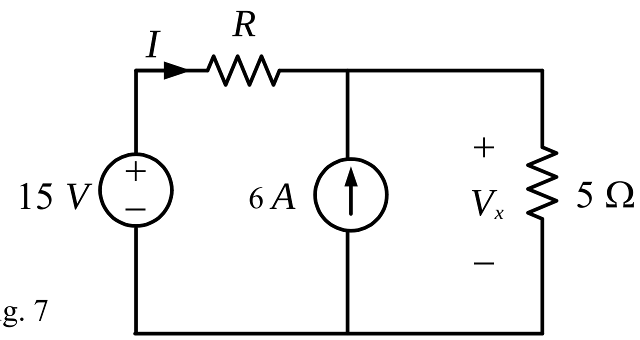


Fig. 7

i) For the circuit in Fig. 8, **using the superposition principle**, the voltage $V_x^{'}$ across the 5 Ω due to the 12 V independent voltage source is:

i) 2 V ii) 4 V iii) 6 V iv) 8 V v) None of the above

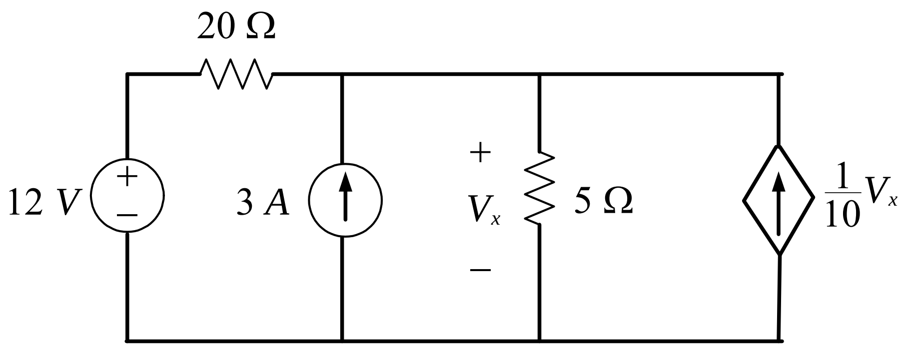


Fig. 8

j) For the circuit in Fig. 8, the voltage $V_x^{''}$ across the 5 Ω due to the 3 A independent current source is:

i) 5 V ii) 10 V iii) 15 V iv) 20 V v) None of the above

Problem 2:

For the circuit shown in Fig 9.
a) Use mesh equations method to determine the Thevenin's voltage across terminals A and B in the circuit shown in Fig. 9. (4 points)
b) Determine the value of the load resistor connected betwwen terminal AB that results in maximum power transfer to it. (3 points)
c) Draw the Norton's equivalent of the circuit as seen between terminals A and B (3 points)
d) For the linear circuit shown in Fig. 10, the Thevenin's voltage between terminal C and D is 15.5 V, and the Thevenin's equivalent resistor is 7 Ω. If two loads are available in the market, one requiring a minimum of 7 W and the other a minimum of 10 W to operate properly, which one should be used between terminal C and D for the load to operate properly without any changes in it? (5 points)

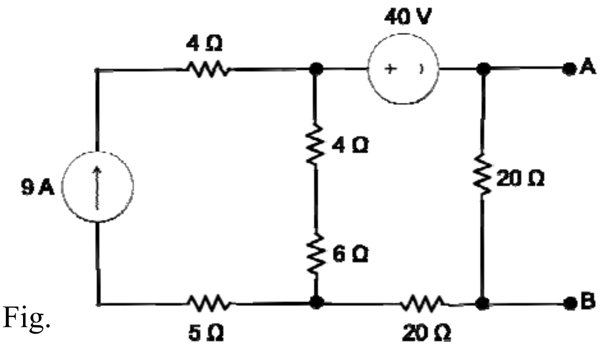
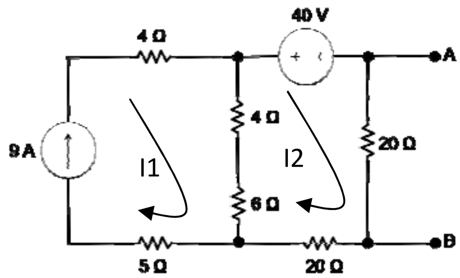


Fig.

a) $50 I2 - 10I1 + 40 = 0$

$I2 = 1$ A

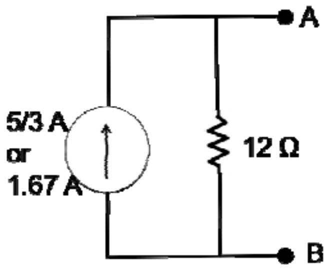
$VTH = 20I2 = 20$ V



b) RLoad= RTH = (4 + 6 +20) // 20

= 30 // 20 = 12 Ω

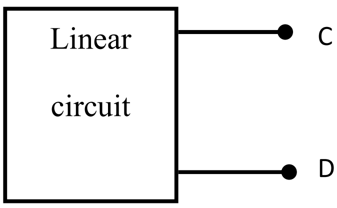
c)



d) $P_{max} = V_{TH}^2/4R_{TH} = (15.5)^2/(4x7) = 8.58$ W

The load with 7 W must be chosen.

Fig. 10



Problem 3:

For the circuit shown in Fig.10:

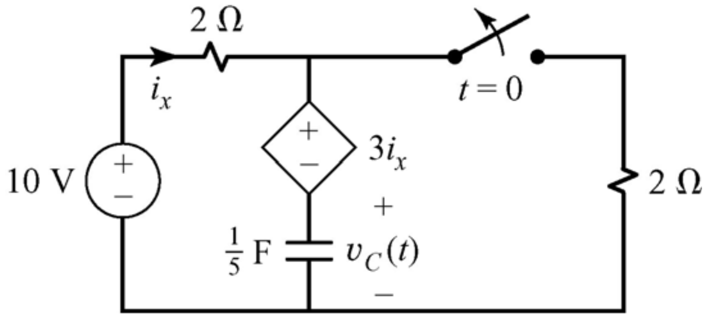
a) Determine the initial voltage of the capacitor $v_c(0^+)$. (3 points)

b) Determine the equivalent resistor connected to the capacitor for $t > 0$. (5 points)

c) Determine the time constant for the response for $t > 0$. (2 points)

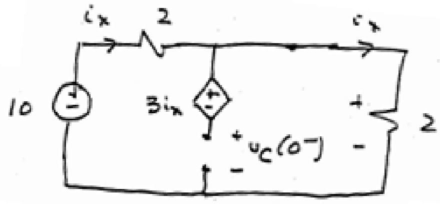
d) Determine the final value for the voltage $v_c(t)$. (3 points)

e) Write the expression for the response $v_c(t)$ for $t > 0$ (2 points)



a)

$i_x = \frac{10}{2+2} = 5/2$ A



∴ $v_c(0^-) = v_c(0^+) = 2i_x - 3i_x = -i_x = -5/2$ V

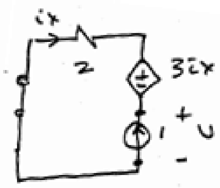
b)

$R_{TH} = v/1$ $\quad i_x = -1$

∴ $v = -3i_x - 2i_x$

$= -5i_x = 5$

∴ $R_{TH} = 5\Omega$

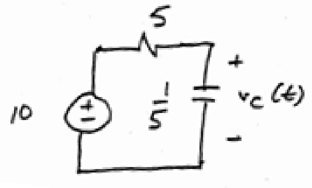


c)

$T = R_{TH} = 1$

d)

$v_{cf} = 10$



e)

∴ $v_c(t) = (-\frac{25}{2} e^{-t} + 10)$ V $\quad t > 0$