Addis Ababa University

Addis Ababa Institute of Technology

Center of Information Technology and Scientific Computing

Department of Software Engineering

Course: Fundamentals of Electrical Circuits

Final -Exam for 1st Year 2nd Semester Software Engineering

Weight: 40 %   **Time Allotted: 3.00 hrs.**

Full Name:_____**ID.No:** _____

Section: _____

Instructions: Please Read Carefully Before Proceeding.

1. *Read all of the instruction and all of the question before beginning the exam*
2. *This is a closed book, closed-notes examination.*
3. *There are 11 questions and Two bonus in this exam, totaling 40 points*
4. *On all the problems, please show your work clearly, to get full credit*
5. *Non – programmable Calculators are allowed, but borrowing is not allowed*
6. *Your mobile phones must be turned off during the exam*
7. *Write your name and ID number on this page.*
8. *Please attempt each of the question rather than leaving unanswered or blank.*
9. *When you are told that time is up, please stop working on the test*
10. **This exam contains 8 pages, including this one. Thus, you must check that everything is complete.**
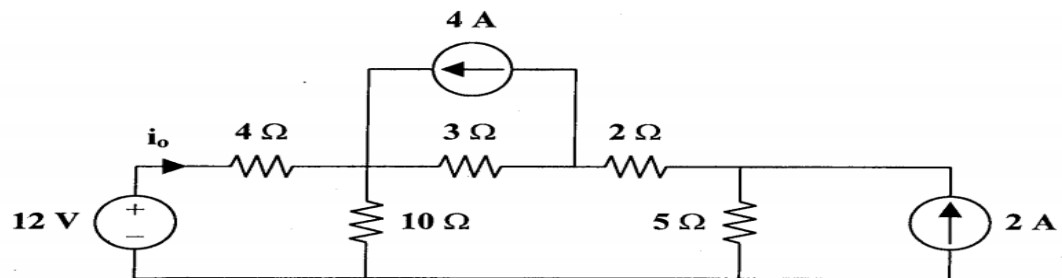
Prepared By: Dr.Mani Sarma Vittapu.

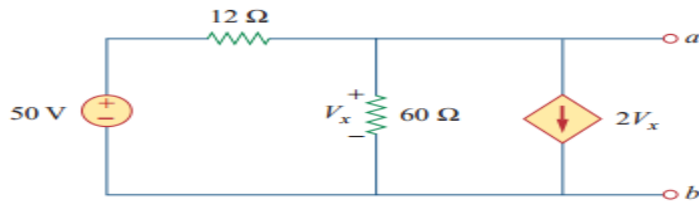| Question	1	2	3	4	5	6	7	8	9	10	11
Maximum Marks	5	5	3	5	5	5	4	3	5	2	3
Earned Marks											
Total											

Good Luck!

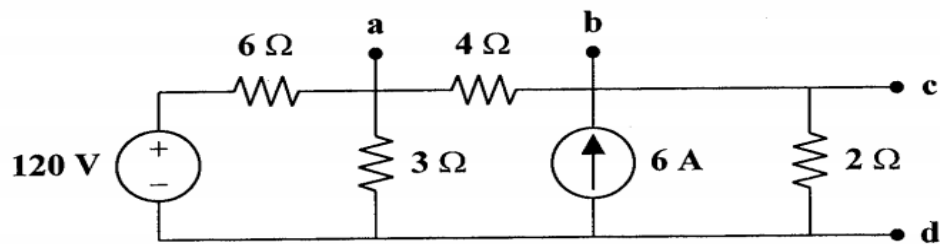1. Apply **Superposition principle** to find **Vo** in the circuit given below.(5 points)
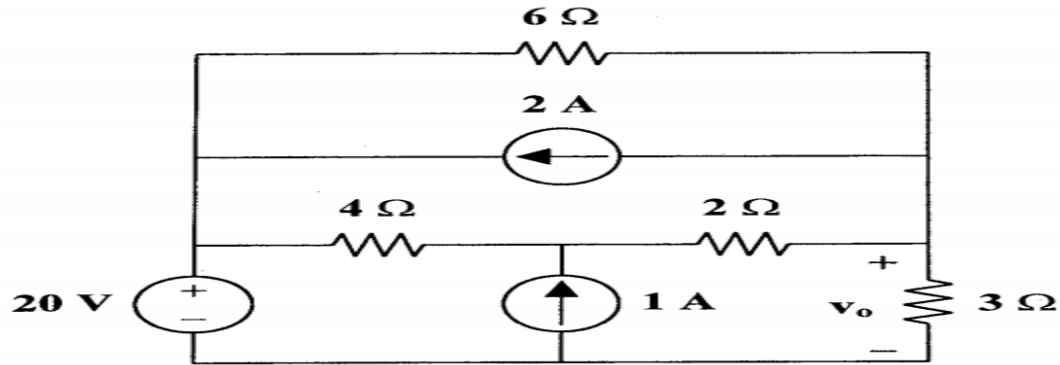
2. For the circuit given below find the i_0 using **Source Transformation**,(5 points)

3. Obtain the Thevenin and Norton Equivalent circuits for the circuit given below seen from the a-b terminals.(3points)


4. Obtain the Norton Equivalent when viewed from the terminals given (5 points)
   A) a-b   B) c-d

5. For the circuit given below (5 point)
   a) Obtain the Thevenin Equivalent(2 Points)
   b) Calculate the current when RL=8Ω (1 Point)
   c) Find RL for maximum power deliverable to RL (1 point)
   d) Determine the maximum power (1 Point)
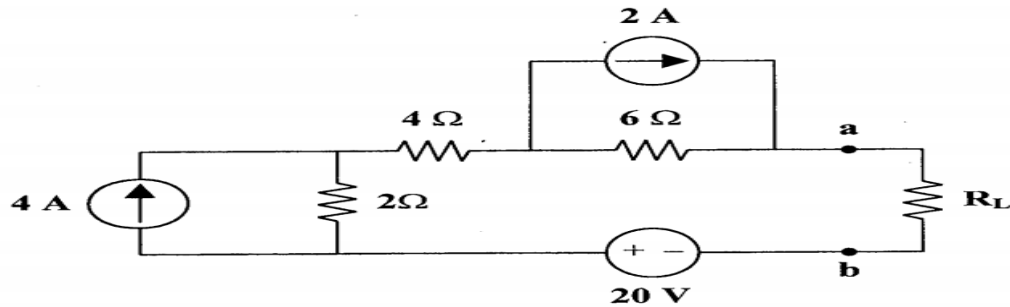
6. Consider the following circuit with $v(t) = 12e^{-3t}mV$ for t>0 and i1(0) = -10mA. Find (5 points).

   a) i2(0)   b) i1(t)   c) i2(t)
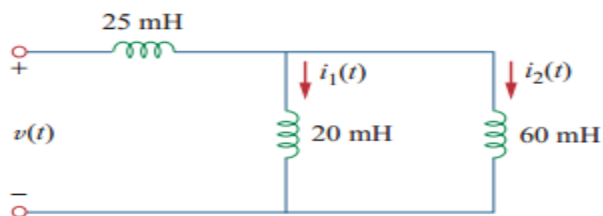
7. Find the equivalent Capacitance at the terminal a-b of the following circuit. (4 points)

$40\ \mu F$

$10\ \mu F$ $10\ \mu F$

$35\ \mu F$ $5\ \mu F$

$20\ \mu F$

$15\ \mu F$ $15\ \mu F$

a   b
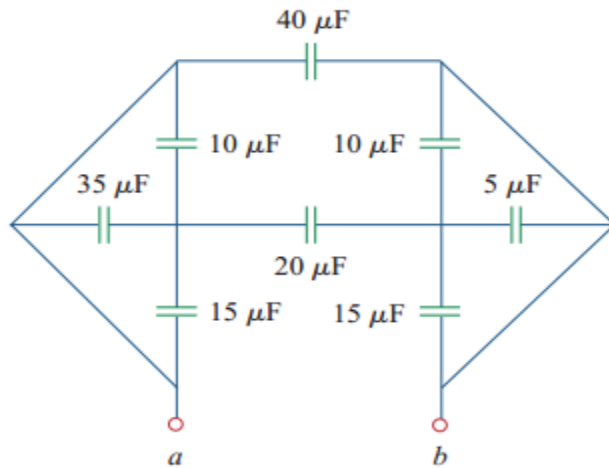
8. Find the **amplitude**, **frequency**, and **phase angle** of each of the given sinusoids. (3 Points)

   a. $V(t) = -5\sin(10t-45)$

   b. $I(t) = -2.5\cos(2\pi t)$

9. An RLC circuit with resistance (R=20Ω), capacitance of (C=20mF) and inductance of (L=20mH) which are connected in series, is exposed to frequency of 50Hz, with peak voltage (Ɛm=100V) source. Then, (5 points)

    a) What is the total impedance of the circuit?

    b) What is the phase angle?

    c) What is the power delivered? And the power factor?

    d) How much capacitance be added to maximize the power in the circuit?

10. (**Bonus**) Determine *Leq*(**equivalent inductance**) that may be used to represent the inductive network (2 Points)
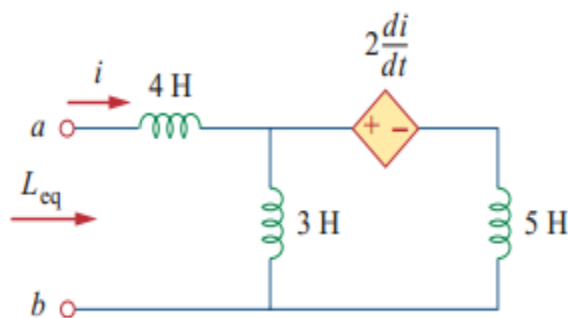
11. (Bonus) Explain generation of Sinusoidal wave? (3 points)

   Problem: Find the **amplitude**, **frequency**, and **phase angle** of each of the given sinusoids.

        c. **V(t) = -5sin(10t-45)**

        d. **I(t) = -2.5cos(2πt)**