Code No: R21023 **R10** SET - 1

II B. Tech I Semester Supplementary Examinations, September – 2014
ELECTRICAL CIRCUIT ANALYSIS - I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) For the circuit shown in Figure 1a, determine the resistance between battery E-terminals. The value of each resistance in the circuit is 1 Ω.
   b) For the circuit shown in Figure 1b determine the total impedance, total current and phase angle.

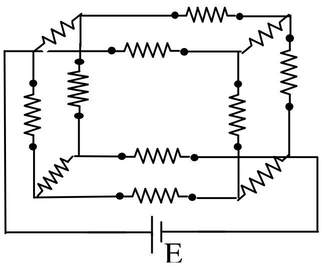

Figure 1a

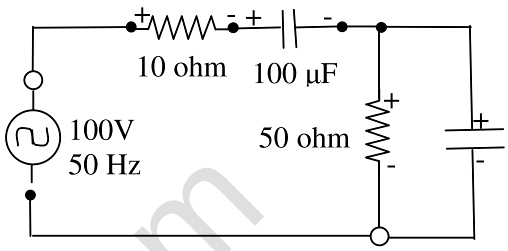

Figure 1b

   c) Determine the equivalent inductance of the circuit shown in Figure 1c between a and b terminals.

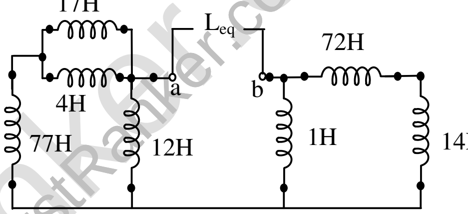

Figure 1c

2. a) Use nodal analysis to determine V_1 and the power being supplied by the dependent current source in the circuit shown in Figure 2a.
   b) Find R_{in} for the network shown in Figure 2b, by using Y-Δ and Δ-Y transformation?

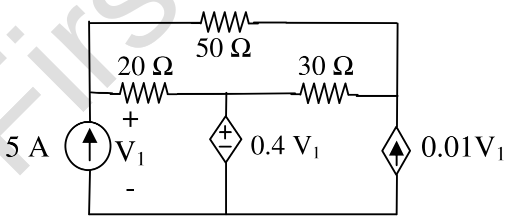

Figure 2a

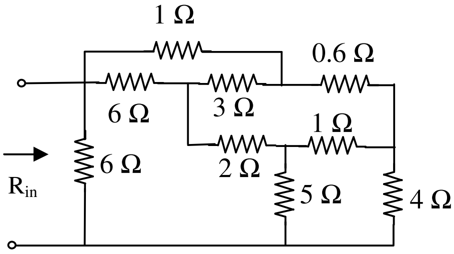

Figure 2b
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3. a) Show that power consumed by a pure capacitor and a pure inductor is zero.
   b) Determine the equivalent impedance between the terminals a-b of the network shown in Figure 3b, given an operating frequency of 5 rad/s.

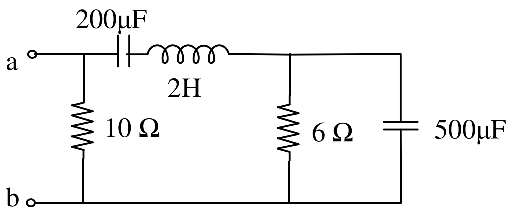

Figure 3b

4. a) Find the resonant frequency of the two terminal network shown in Figure 4a. Assume operating frequency of 50 Hz.

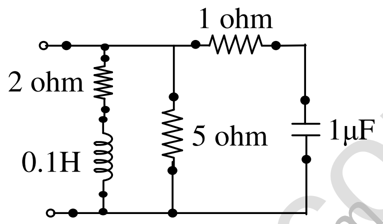

Figure 4a

   b) A variable frequency source of V=200 volt is applied to a series R-L circuit having R=10Ω and L=10 mH. Draw Z-locus and I-locus considering sample frequencies ω=0,500,1000,2000 and 5000 rad/sec.

5. a) A magnetic circuit consists of an iron ring of mean circumference 80 cm with cross-sectional area of 12 cm^2 throughout. A current of 2A in the magnetizing coil of 200 turns produce a total flux of 1.2 m Wb in the iron. Calculate:
   i) the flux density in the iron
   ii) the absolute and relative permeability of iron.
   iii) the reluctance of the circuit.
   b) Two coils have a mutual inductance of 0.4 H, if the current in one coil is varied from 4A to 2A in 0.5sec, calculate
   i) The average e.m.f induced in the second coil
   ii) The rate of change of flux linked with the second coil assuming that it is wound with 300 turns.

Code No: R21023 **R10** SET - 1

6. a) Construct the dual of the network shown in Figure 6a.
   b) Draw the oriented graph of network shown in below Figure 6b and also write the incidence matrix.

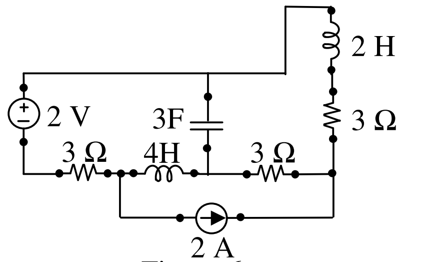

Figure 6a

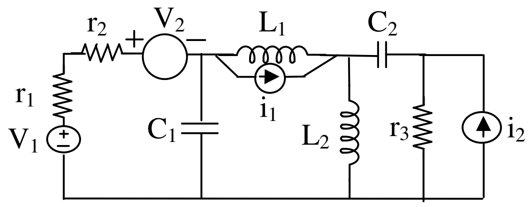

Figure 6b

7. a) Determine the maximum power which can be absorbed by a pure resistive load when placed across the output terminals A, B of the network shown in Figure 7a.
   b) Determine the Thevenin's equivalent of network shown in Figure 7b; compute the power delivered to the load resistor R_L.

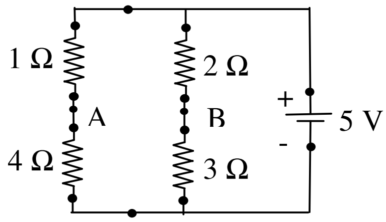

Figure 7a

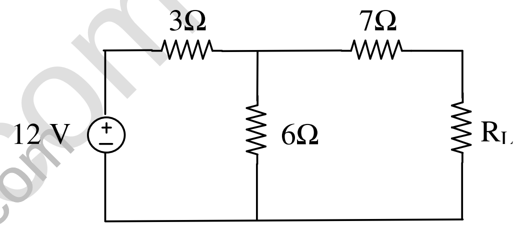

Figure 7b

8. a) Verify the reciprocity theorem for the following circuit shown in Figure 8a.
   b) Calculate the change in the current in the circuit shown in Figure 8b, by compensation theorem, when the reactance has changed to j35Ω.

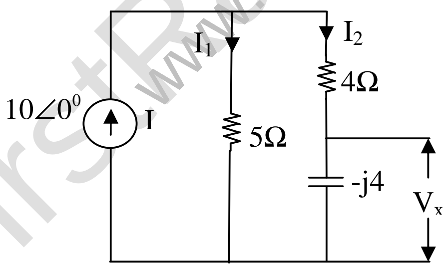

Figure 8a

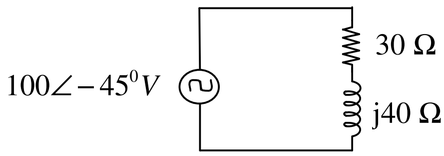

Figure 8b

Code No: R21023 **R10** SET - 2

II B. Tech I Semester Supplementary Examinations, September – 2014
ELECTRICAL CIRCUIT ANALYSIS - I
(Electrical and Electronics Engineering)

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1. a) Determine the value of voltage V and the power supplied by the independent current source for the circuit shown in figure 1a
   b) For the circuit shown in figure 1b, find i_1, i_2, i_3 and i_4.

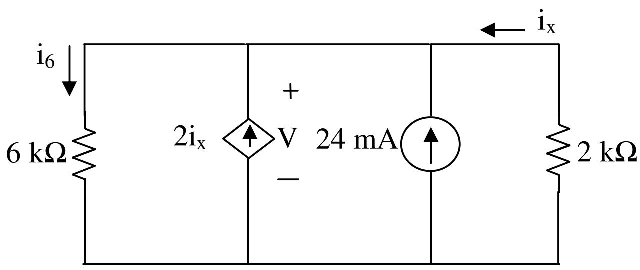

Figure 1a

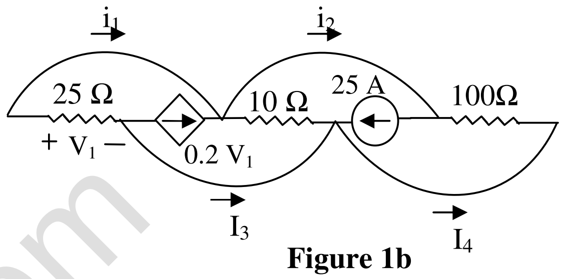

Figure 1b

2. a) Given the circuit as shown in Figure 2a, determine resistance between the terminals A, B.
   b) Use nodal analysis to find the voltage V_X in the circuit shown in Figure 2b.

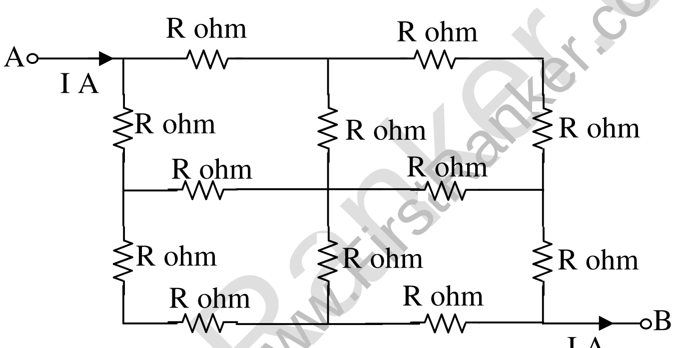

Figure 2a

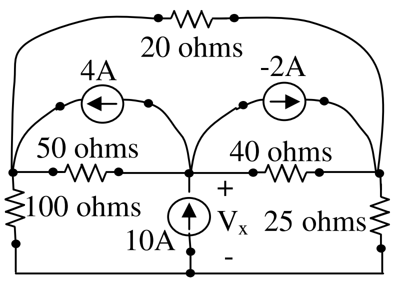

Figure 2b

3. a) Determine the effective value of the wave form shown in Figure 3a.
   b) A capacitor of 200μF is connected across a 220V, 50Hz supply. Calculate (i) the reactance of the capacitor (ii) r m s value of current (iii) the maximum current.

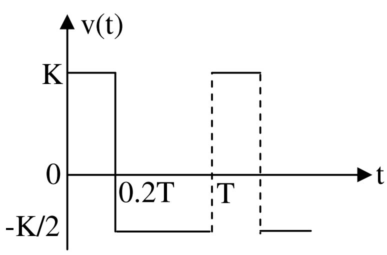

Figure 3a
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Code No: R21023 **R10** SET - 2

4. a) In the network shown in the figure 4a find the value of C for resonance to take place when ω=500 rad/sec determine the branch currents.

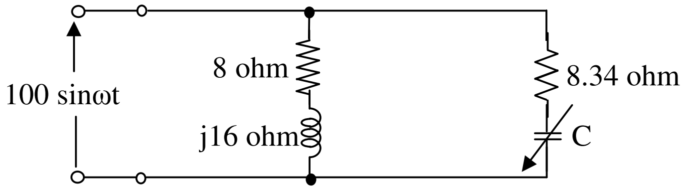

Figure 4a

b) A series RC circuit having variable R and C=20 µf is supplied from AC source having voltage V=200 Volt at ω=2000 rad/sec. Draw I - locus for sample values of R=0,5,15,25,35,50Ω.

5. a) Calculate the inductance of a solenoid of 2000 turns wound uniformly over a length of 40 cm on a cylindrical paper tube of 5cm in diameter. Air is the medium. Calculate the e.m.f induced when a current increasing at the rate of 200A/sec flows through the winding.
b) Derive an expression for co-efficient of coupling in a magnetic circuit.
c) Explain about dot convention in magnetic circuits.

6. a) For the network shown in Figure 6a, obtain the fundamental cut-set matrix.
b) Construct the dual of the network shown in Figure 6b.

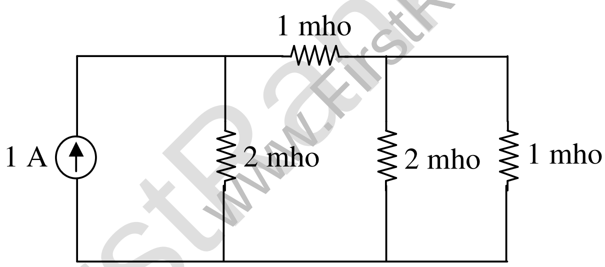

Figure 6a

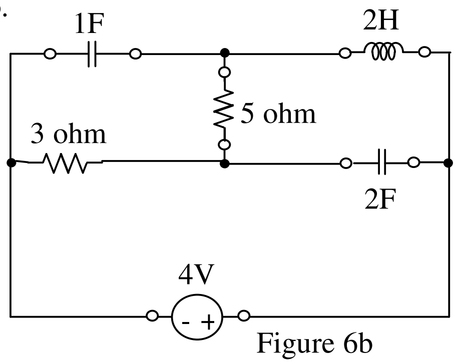

Figure 6b

Code No: R21023 **R10** SET - 2

7. a) Use Thevenin's theorem to find the current through the 2Ω resistor in the circuit shown in below Figure 7a.

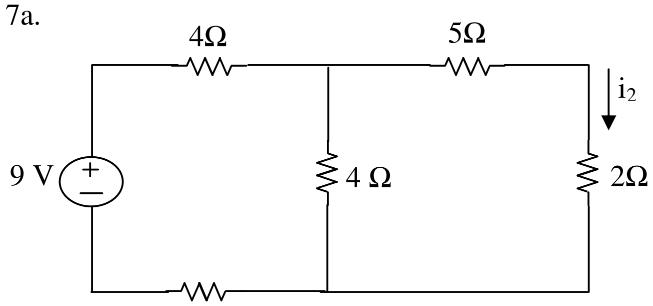

Figure 7a

b) By using super position therom calculate the current through (2+j3)ohm impendence branch of the circuit in Figure 7b.

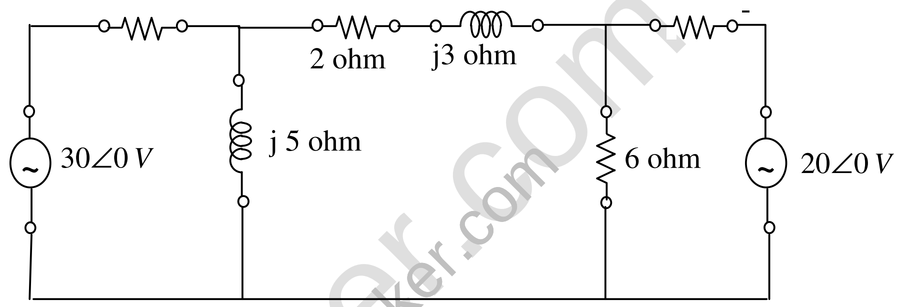

Figure 7b

8. a) Verify the reciprocity theorem for the following circuit shown in 8a.
b) Find the current I of the circuit shown in 8b using superposition theorem

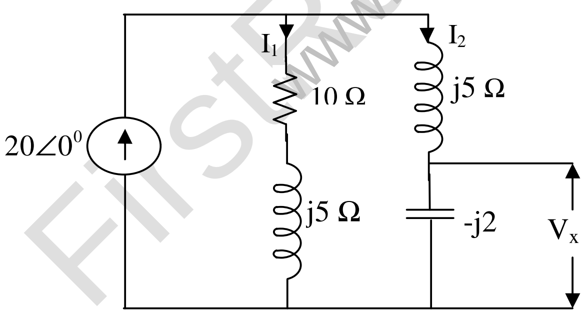

Figure 8a

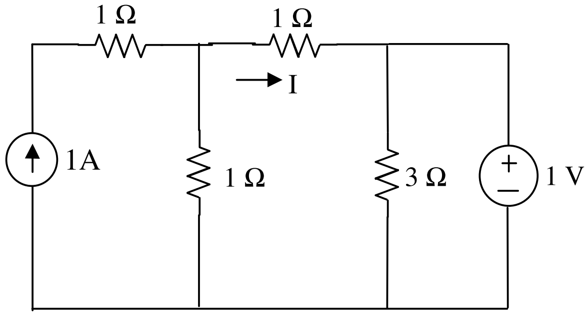

Figure 8b

Code No: R21023 **R10** SET - 3

II B. Tech I Semester Supplementary Examinations, September – 2014
ELECTRICAL CIRCUIT ANALYSIS - I
(Electrical and Electronics Engineering)

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1. a) Explain in detail about dependent and independent sources.
   b) Show that volt-ampere relationship of R, L and C are linear.
   c) Using source transformation, determine the power dissipated by the 5.8 kΩ resistor shown in Figure 1b.

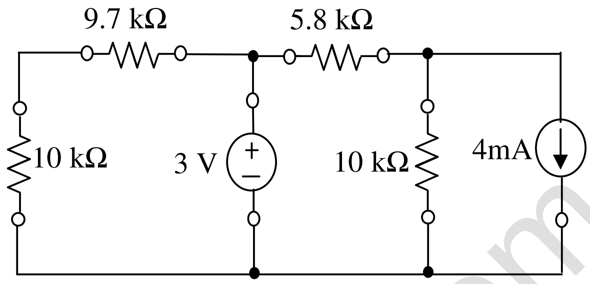

Figure 1b

2. a) Find the R_{a-b} for the resistive network as shown in Figure 2a.
   b) For the circuit shown in Figure 2b below, compute the voltage across each current source.

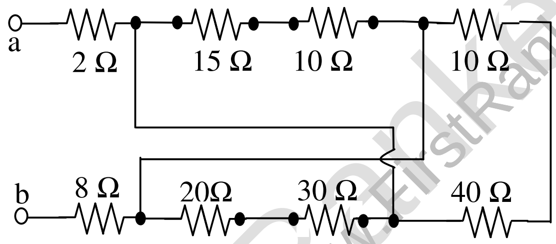

Figure 2a

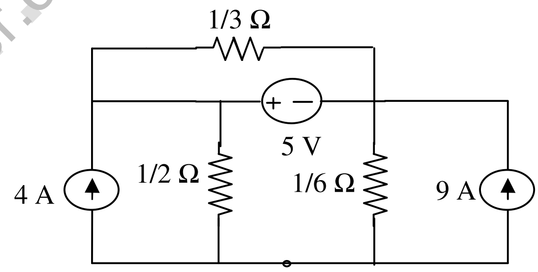

Figure 2b

3. a) A resistance of 12Ω, an inductance of 0.15H and capacitance of 100μF are connected in series across 200V, 50Hz supply. Calculate: a) current b) Power factor of the current c) Voltage drop across resistance, inductance and capacitance d) Draw the complete phasor diagram of the circuit.
   b) Obtain expressions for the time-domain currents i_1 and i_2 in the circuit shown below

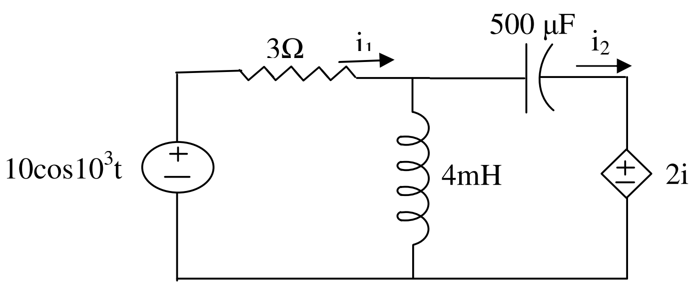

Figure 3b
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Code No: R21023 **R10** SET - 3

4. a) A coil of 2.2Ω resistance and 0.01H is connected in series with a capacitor across 220V mains. Find the value of capacitance such that the maximum current flows in the circuit at a frequency of 100Hz. Also, find the current and voltage across the capacitor.
   b) Show that the locus of current of a series circuit consisting of resistance and inductance with resistance varies and inductive reactance fixed, when supplied by a constant ac voltage source, lies on a circular path.

5. a) Two magnetically coupled coils have 500 and 1000 turns respectively. A current of 1A in coil 1 produces a flux of 0.5mWb links all turns of the coil 1 only and a mutual flux of 0.7mWb. Find L_1, L_2.
   b) A Current of 10A through a coil of 200 turns produces a flux of 2mWb. If this current is reduced to 2A in 0.1 sec, calculate the average e.m.f induced in the coil, assuming flux to be proportional to current.

6. a) Draw the directed graph, tree and show the loops for the network shown in Figure 6a below.
   b) Construct the dual of the network shown in Figure 6b.

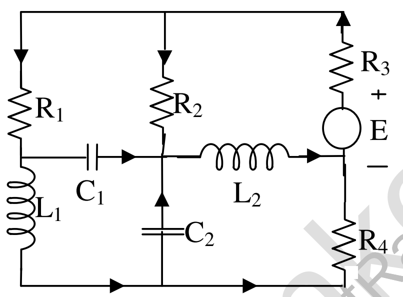

Figure 6a

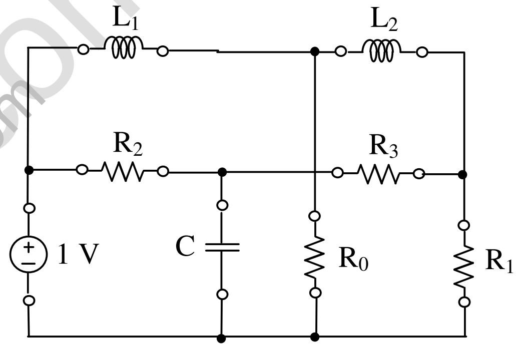

Figure 6b

7. Determine the maximum power which can be absorbed by a pure resistive load when placed across the output terminals a, b of the network shown in Figure 7.

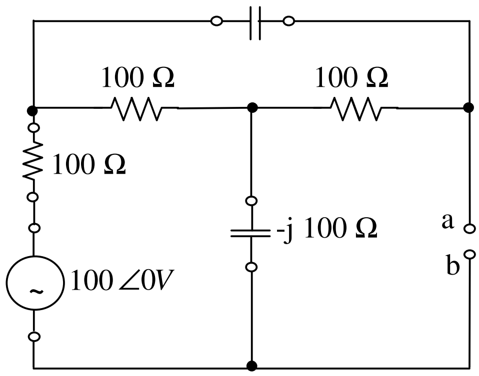

Figure 7

Code No: R21023 **R10** SET - 3

8. a) Verify the reciprocity theorem for the network shown in below Figure 8a by interchanging V and R_L.
   b) For the circuit shown Figure 8b below, use superposition to obtain the voltage across each current source.

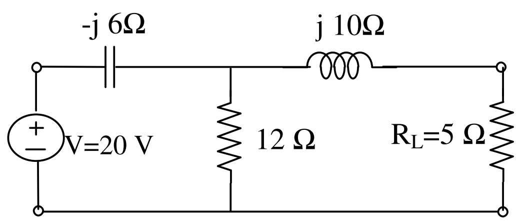

Figure 8a

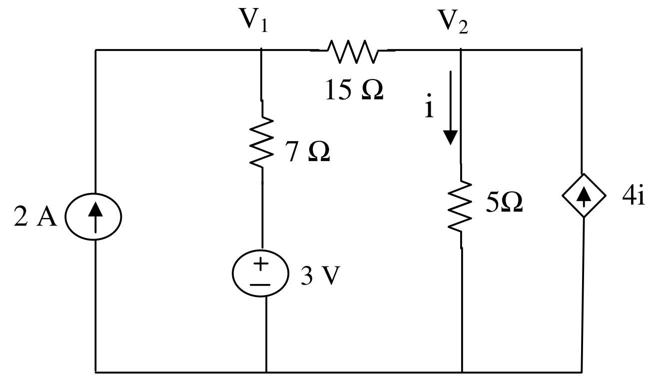

Figure 8b

Code No: R21023 **R10** SET - 4

II B. Tech I Semester Supplementary Examinations, September – 2014
ELECTRICAL CIRCUIT ANALYSIS - I
(Electrical and Electronics Engineering)

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1. a) Determine the power dissipated by the R=1Ω resistor using source transformation for the circuit shown in Figure 1(a)
   b) Determine the equivalent capacitance C_{eq} of the circuit shown in Figure 1(b).

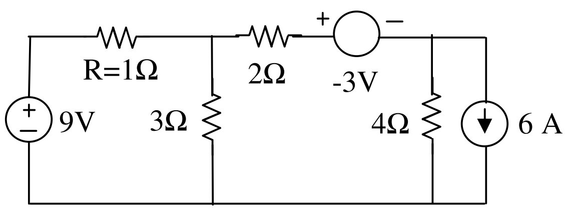

Figure 1(a)

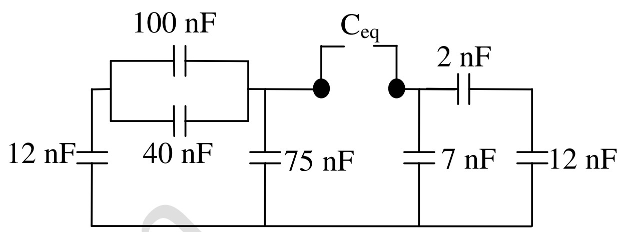

Figure 1(b)

2. a) The network in Figure 2(a) stores 534.8 μJ of energy when a voltage of 2.5V is connected to terminals ‘a’ and ‘b’, what is the value of C_x. All capacitance values are in μF.
   b) Use mesh analysis to find 40 ohms resistance in the circuit shown in Figure 2(b).

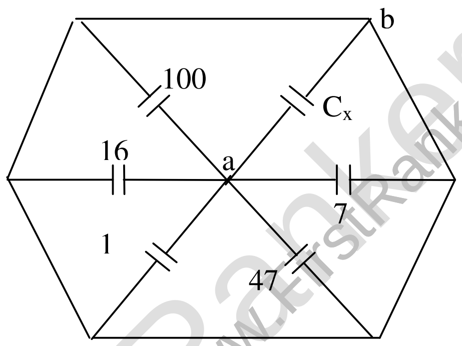

Figure 2(a)

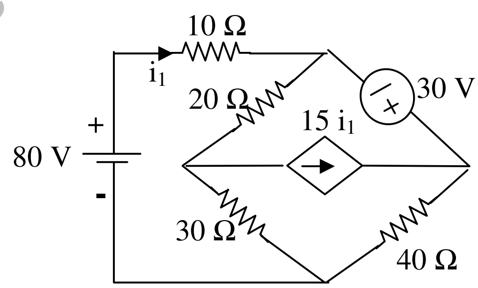

Figure 2(b)

3. a) An impendence of (4 - j10) Ω is connected in parallel with an impendence (6+j8) Ω. The circuit is fed from a 230V, 50 Hz supply. Find the current in each branch, total circuit current, circuit impendence, power factor, active power, reactance power and apparent power.
   b) Find the current delivered by the source for the circuit shown in Figure 3 Take $V_s(t)$=40 sin3000t volts.

4. a) Determine the resonant frequency of the circuit shown in Figure 4(a).
   b) Explain procedure to draw the locus diagram of R-C series circuit when ‘C’ is varying.

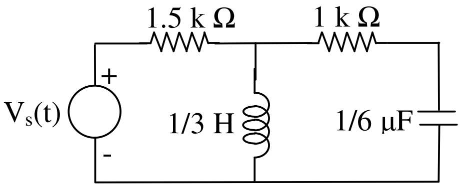

Figure 3

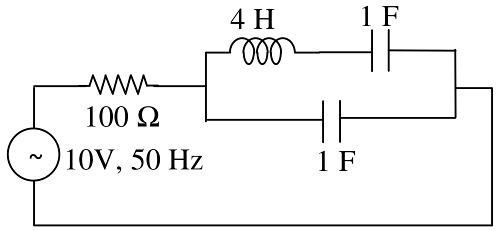

Figure 4(a)
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Code No: R21023 **R10** SET - 4

5. a) If the two identical coils have an equivalent inductance of 0.08H in series aiding and 0.035H in series opposing. What are the values of L_1, L_2, M and K.
   b) An iron ring of 10 cm mean diameter having a cross sectional area of 60 cm^2 is wound 200 turns of wire. Calculate the exciting current required to establish a flux density of 1 Wb/m^2 if the relative permeability of iron is 1000. What is the value of energy stored?

6. a) Construct the dual of the network shown in Figure 6(a).
   b) How many trees are possible for the graph of the network of Figure 6(b). Draw all the trees possible.

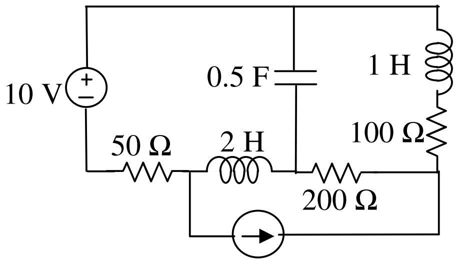

Figure 6(a)

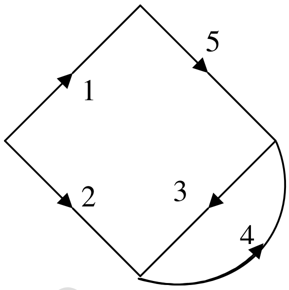

Figure 6(b)

7. a) In the network shown in Figure 7(a), Find the value of Z_L so that the power transfer from the source is maximum. Also find P_{max}.
   b) Find the Thevenin's equivalent circuit across the terminals a-b for the circuit shown in Figure 7(b). Take $V_1 = 100\angle 0^0 V$ and $V_2 = 100\angle 90^0 V$.

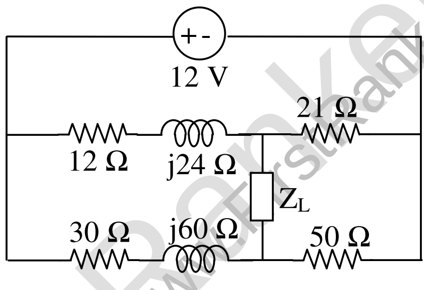

Figure 7(a)

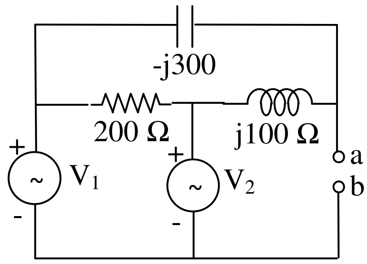

Figure 7(b)

8. a) State whether the following network shown in Figure 8(a) is reciprocal or not.
   b) Use superposition to find the value of V_x in the circuit shown in Figure 8(b).

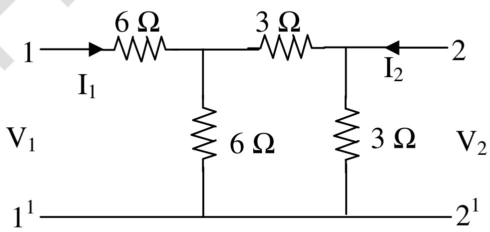

Figure 8(a)

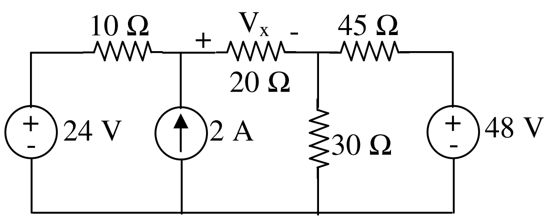

Figure 8(b)