QUESTION BANK – ECA 1

Academic Year	: **2018 – 2019**	Department	: **EEE**
Year/Semester	: **Ist Year/II nd semester**	Subject	: ECA-1

UNIT-1

1. (A) Obtain the expressions for star-delta and delta-star equivalence of resistive network

   (b) Find the value of resistance R, if the current is I=11 A and source voltage is 66 V as shown in fig

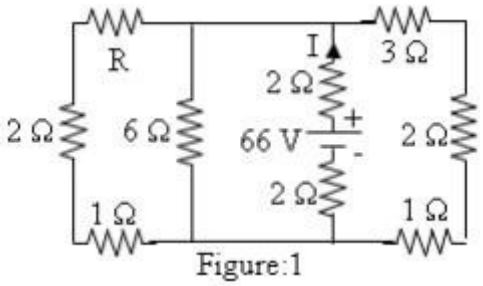


Figure:1

2. (A) State and explain KVL and KCL with the help of an example.

(b) Four 60 W, 110 V bulbs are to be operated from a 230 V source. Determine the value of resistance connected in series with the line so that the voltage across the bulb does not exceed 110 V.

(c) Two resistances when they are in series have an equivalent resistance of 9 ohms and when connected in parallel have an equivalent resistance of 2 ohms. Find the resistances and ratio of voltage and current sharing between the elements if the supply voltage is 50 V.

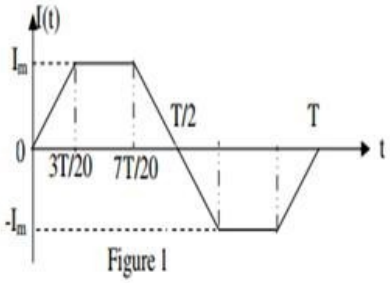


Figure I

3.(a) Find the average value, r.m.s value, form factor and peak factor for the wave form shown in figure:1.

(b) Use the nodal analysis to determine voltage at node 1 and the power supplied by the dependent current source in the network shown in figure:2.

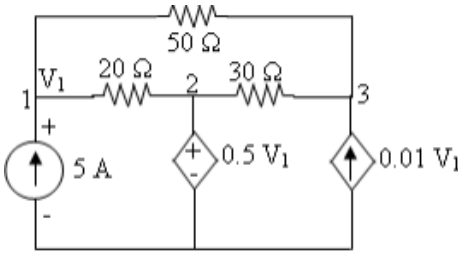


Figure:2

4. (a) Prove that pure capacitance when connected across an alternating source draws the current leading over voltage by 900. Show that power consumed by pure capacitance is zero

(b) Find the values of the voltages V1 and V2 in the circuit shown in figure:1.

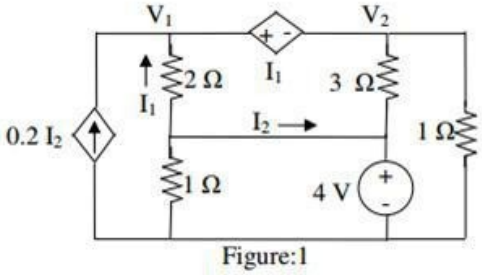


Figure:1

UNIT-2

1 (a) Write the properties of tie-set matrix and cut-set matrix.

(b) Draw the graph of the network shown in figure:2 and select a suitable tree to write a tie-set Schedule. Also find the three loop currents.

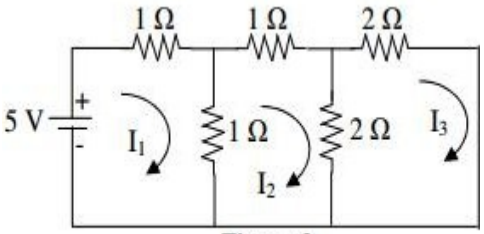


Figure:2

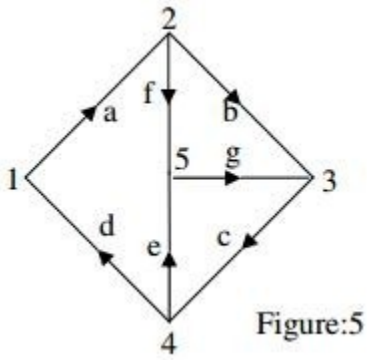


Figure:5

2 (a) find fundamental tie-set and cut-set matrix for the graph and its tree shown in figure:5.

(b) Explain the procedure for obtaining fundamental cut-set matrix of given network.

3.(a) Describe the procedure to construct the dual of a network with an example.

(b) For the network graph shown in figure:2, draw all possible trees. For any one of these trees, prepare a cut-set schedule and obtain the relation between tree-branch voltages and branch voltages.

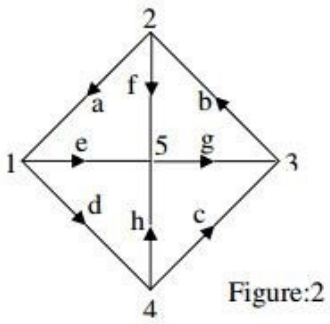


Figure:2

Twigs				Links		
1	2	3	4	5	6	7
1	0	0	0	-1	0	0
0	1	0	0	1	0	1
0	0	1	0	0	1	1
0	0	0	1	0	1	0

4.(a) Explain the procedure for obtaining fundamental tie-set matrix of given network.

(b) (b) Draw the oriented graph of a network with fundamental cut-set matrix as shown above:

Also find number of cut-sets and draw them.

UNIT-3

1.(a) Two identical coupled coils have an equivalent inductance of 80 mH when connected series aiding and 35 mH in series opposing. Find L1, L2, M and K

(b) A ring has a mean diameter of 21 cm and cross sectional area of 10 cm2. The ring is made up of semi-circular sections of cast iron and cast steel with each joint having reluctance equal to an air gap of 0.2 mm. Find the ampere turns required to produce a flux of 0.8 milli Wb. The relative permeability of cast steel and cast iron are 800 166 respectively. Neglect fringing and leakage effects.

2.(a) Two coupled coils with respect to self inductances L1 = 0.6 H, L2 = 0.4 H having a K = 0.4.

Coil 2 has 100 turns. The current in coil 1 is I1 = 10 sin200t Amperes. Determine the voltage at coil 2 and maximum flux set up by coil 1.

(b) What is a magnetic circuit? Compare magnetic circuit with an electric circuit.

(c) Derive the relation between self inductance, mutual inductance and coefficient of coupling.

3.(a) Explain the importance of dot convention in coupled circuits.

(b) State and explain Faraday's laws of electromagnetic induction.

(c) With respect to series resonant circuit, prove that bandwidth is inversely proportional to the Q-factor at resonance.

4 a) Define: (i) Flux (ii) m.m.f (iii) Reluctance (iv) Magnetic field intensity.

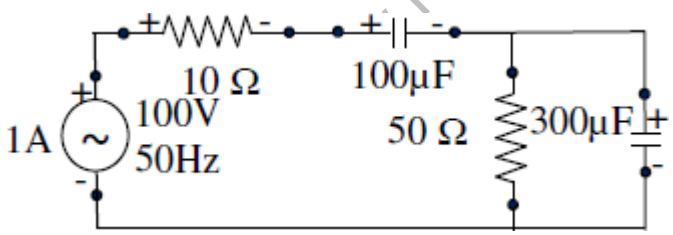
(b) A coil is wound uniformly with 400 turns over an iron ring having a mean circumference of 50 cm and a cross section of 0.4 cm2. If the coil has resistance of 10 ohm and is connected across a 50 V DC supply, calculate the m.m.f of the coil, magnetic field strength, magnetic field density, total flux and reluctance of the ring.

5.(a) A mild steel ring has a mean circumference of 600 mm and a uniform cross-sectional area of 350 mm2. Calculate the m.m.f required producing a flux of 600Wb when an air gap of 1mm length is now cut in ring. Also determine the flux produced if m.m.f remains constant. Given relative permeability of mild steel is 1200.

UNIT-4

1(a) A resistance R, L=0.02H and capacitance C connected series. When a voltage V=200cos (2000t-20) volts is applied to the series combination, the current flowing is 5sqrt (2) cos(2000t-65) amps, find R C.

. b) For the circuit shown in Figure, determine the total impedance, total current and phase angle



c) Discuss about Power triangle and power factor in ac circuits

2. (a) Explain the procedure to draw the locus diagram of R-L series circuit when L is varying?

(b) A coil of inductance 0.0805 H takes a current of 5 A when connected in series with a 50 Floss-free capacitor across a 240 V, 50 Hz supply. Calculate (i) resistance of the coil (ii)power factor of the coil (iii) the overall power factor. Sketch the phasor diagram.

(c) Define form factor and peak factor of an alternating quantity.

3.(a) Explain the procedure to draw the locus diagram of R-C series circuit when 'C' is varying.

(b) An R- L circuit has R= 1 ohms, L=0.00955 H. Calculate the value of series capacitor which converts the circuit to a R-L-C series circuit taking double the value of original current. Assume 50 Hz supply. Supply voltage is kept constant

(c) Explain why current leads the voltage by 90$_0$ in case of ideal capacitor.
(D) Define active and reactive power of alternating quantity and write their expressions

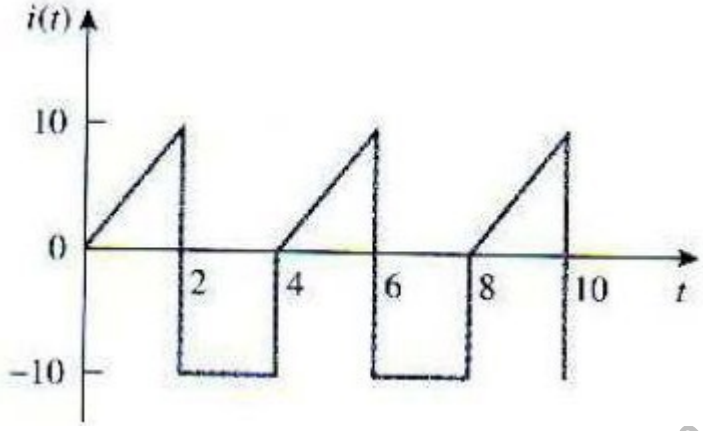
4(a) A coil having a resistance of 20 ohms and an inductance of 0.2 H is connected in series with a 50 _F capacitor across a 250 V, 50 Hz supply. Calculate (i) the current (ii) the power (iii) the power factor (iv) the voltage across the coil and capacitor. Draw the phasor diagram showing the current and various voltages.

(b) Explain why current lags the voltage by 90$_0$ in case of ideal inductor.

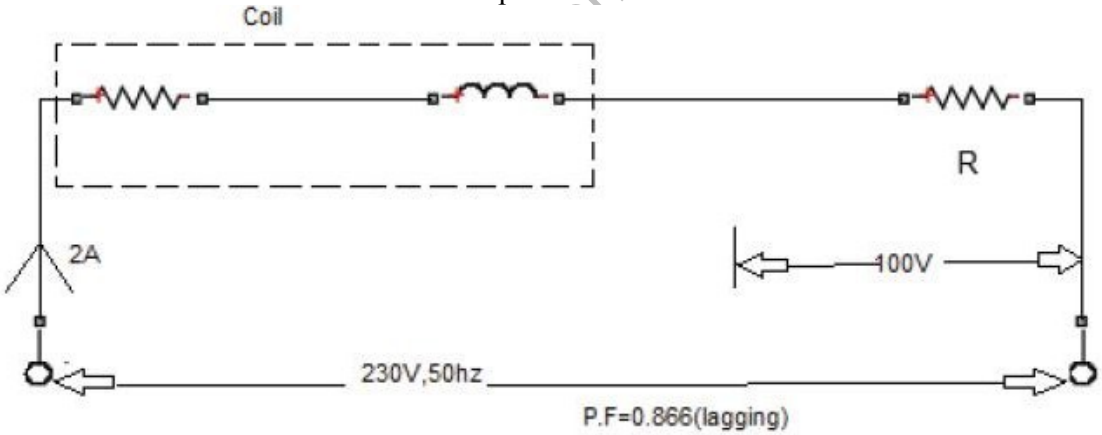
(c) What is power factor? What is its significance?

5(a) The resistance of a coil is 140Ω and its inductance 0.85 H. Determine the current, the p.f. and the circuit impedance when the coil is connected to 120 V 60 Hz supply.

(b) Find the RMS value of the current waveform of Figure . If the current flows through a 9 ohm resistor, calculate the average power absorbed by the resistor

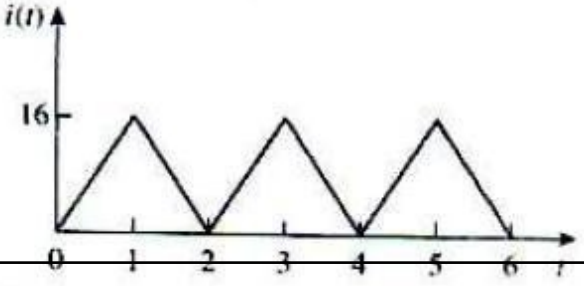


(c) A choke coil and a resistor are connected in series across a 230V, 50 Hz ac supply as shown in below Figure 6. The circuit draws a current of 2A at 0.866 lag p.f. The voltage drop across the resistor is 100V. Calculate the p.f of the choke coil



6(a) A coil has an impedance of 320+600j The current through the coil is (3-5j) mA Find the voltage of the coil,active and reactive power of the coil

(b) Find the RMS value of the current waveform of Figure 4. If this current flows through a 9ohm resistor, calculate the average power absorbed by the resistor.

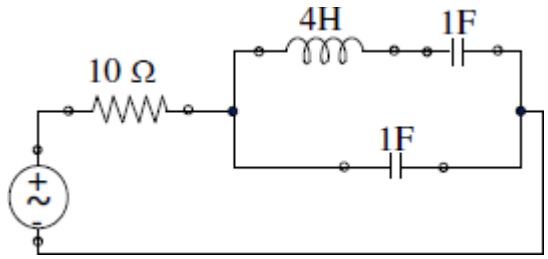


UNIT-5

1 (a) A Coil with R= 10 ohm and L =0.2 H is in series with a capacitor of 20 micro Farad. Determine the Resonant Frequency, Q-factor and Band width.

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 current locus for sample values of R=0,5, 15, 25, 35, 50_.

c) Determine the resonant frequency of the circuit shown below Figure



2.(a) Show that average power consumed by a pure inductor and a pure capacitor is zero.

(b) A coil of inductance L and resistance R in series with a capacitor is supplied at a constant voltage from a variable frequency source. If the frequency is _r, find in terms of L, R and _r the values of those frequencies at which the circuit current would be half as much as that at resonance. Hence or otherwise determine the bandwidth and selectivity of the circuit

(c) Why the net voltage across L and C in a series R-L-C series circuit under resonance is zero 3.

(a) A series RLC circuit with R=100□ , L = 0.5H, C=40_F has an applied voltage of 100□ 0₀with variable frequency. Calculate the resonance frequency, current at resonance and voltage across R, L, and C. Also calculate the Q-factor, upper and lower cutoff frequencies

(b) Why the current in AC series R-L-C circuit at resonance is maximum

.

4.

(a) Define resonance and bandwidth

(b) A Coil with R= 10 ohm and L =0.2 H is in series with a capacitor of 20 micro Farad. Determine the Resonant Frequency, Q-factor and Band width

5 An RLC series circuit with a resistance of 10 _, inductance of 0.2H and a capacitance of 40 μF is applied with a 100 V supply at variable frequency. Find the following with respect to the series resonant circuit

(a) Frequency at which resonance takes place

(b) Current

(c) Power

(d) Power factor

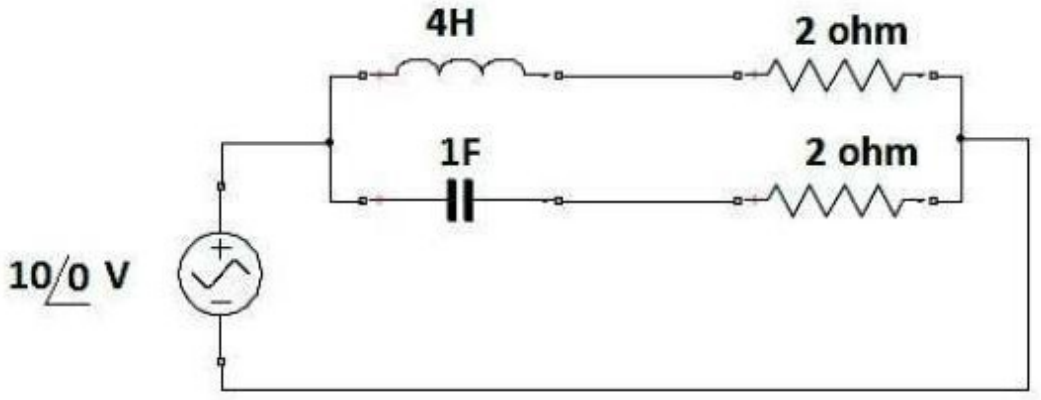
(e) Quality factor

(f) Half power frequencies

6(a) A coil of 20 ohm resistance and 0.2 H inductance is connected in parallel with capacitor of 100 μF capacitance Find the frequency of resonance and the effective impedance at resonance.

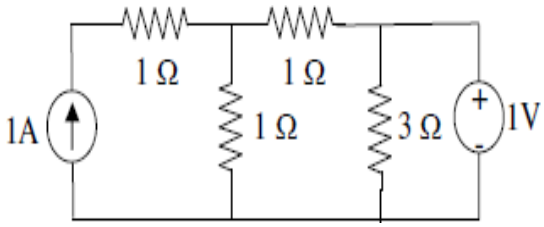
(b) Draw the current locus for a series RL circuit.

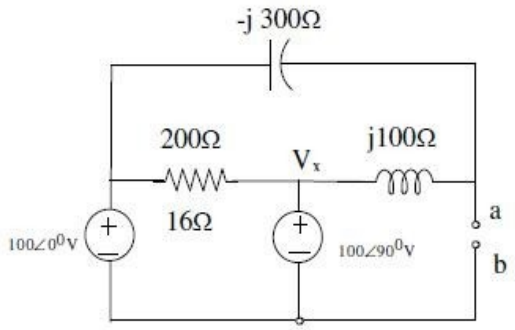
(c) Determine the current supplied by the source at resonance for the circuit shown in Figure



UNIT-6

1(a) Find I in the circuit shown Figure 3, using superposition theorem





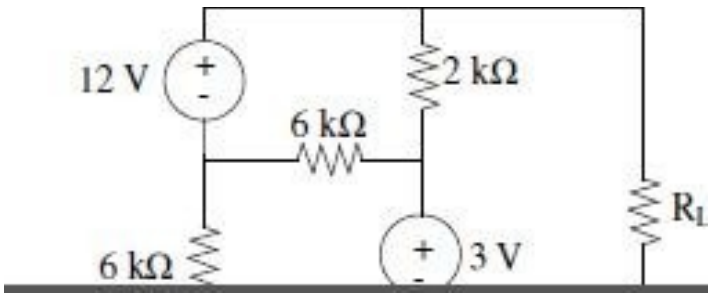
(b) Find the Thevenin equivalent circuit for the circuit shown above Figure

(c) State the maximum power transfer theorem.

2(a) State and explain Norton's theorem

(b) State and explain compensation theorem

(c) For the network shown in figure:3, find the value of R_L for maximum power transfer. Also find the maximum power transferred to R_L.



3(a) State and prove the superposition theorem with the help of an example.

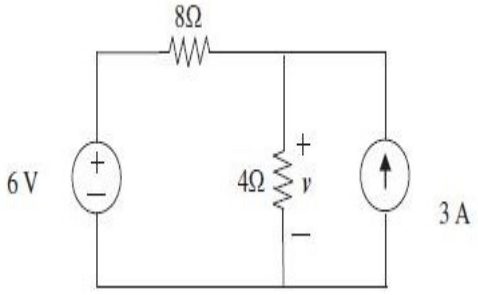
(b) State Millman's theorem.

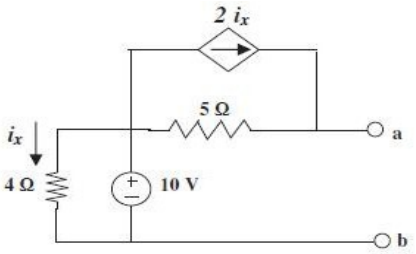
(c) State and explain Thevenin's theorem.

(d) For the network shown in figure:3, find the current through 1.375 ohms resistor and hence

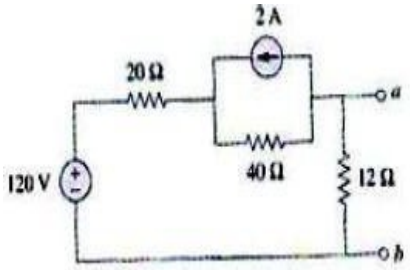
verify reciprocity theoremfigure:3

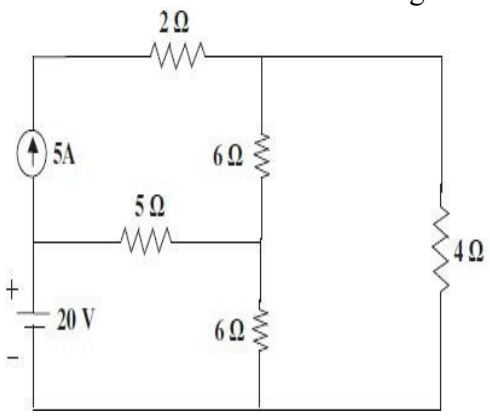
4. (a) Use the superposition theorem to find *v* in the circuit of below Figure 4.





(b) Using Norton's theorem, find R_N and I_N of the circuit in Figure at terminals a-b.
(c) Find the Thevenins equivalent with respect to terminals a-b in the circuit shown in fig





5(a) Find the current through 4ohm resistor in the Figure shown below using superposition theorem.

. (b) Obtain Thevenin's equivalent network for the fi shown below