Subject Code: R13212/R13 **Set No - 1**

I B. Tech II Semester Regular Examinations August - 2014

ELECTRICAL CIRCUITS ANALYSIS-I

(Electrical And Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(i) What are the differences between dependent and independent sources.
(ii) Write the volt-ampere relations of R, L, C parameters.
(iii) Define the average and root mean square value of an alternating quantity.
(iv) Draw the impedance triangle of series R-L and R-C circuits.
(v) Define the quality factor. What is its significance?
(vi) Define reluctance and magnetic flux.
(vii) List the properties of incidence matrix.
(viii) State the maximum power transfer theorem. [3+2+3+3+3+2+3+3]

PART-B

2.(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 figure:1.

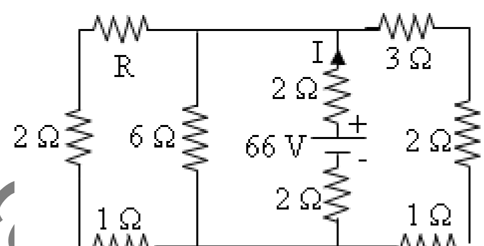

Figure:1

(c) 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.

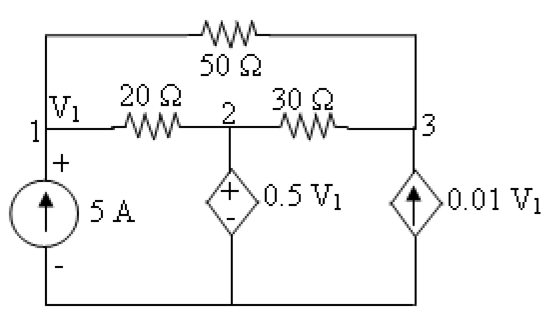

Figure:2

[5+5+6]

3.(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 μF loss-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.

[7+9]

4.(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 ω_r, find in terms of L, R and ω_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.

[7+9]

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

(b) A ring has a mean diameter of 21 cm and cross sectional area of 10 cm^2. 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.

[7+9]

6.(a) Two identical coupled coils have an equivalent inductance of 80 mH when connected series aiding and 35 mH in series opposing. Find L_1, L_2, M and K.

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

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

Also find number of cut-sets and draw them.

[7+9]

7.(a) State and explain Norton's theorem.

(b) For the network shown in figure:3, (i) determine the current through R=10 ohm resistor using Thevenin's theorem (ii) verify the result using Norton's theorem (iii) calculate the maximum power transfer through R and find the value of R.

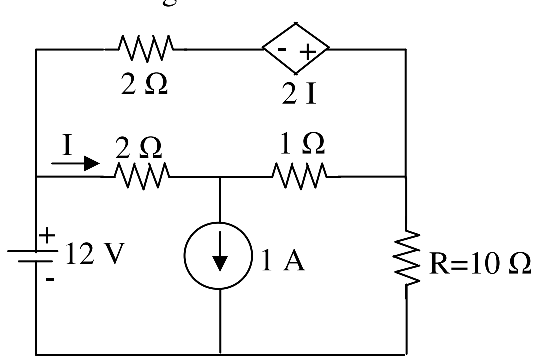

Figure:3

[6+10]

Subject Code: R13212/R13 **Set No - 2**

I B. Tech II Semester Regular Examinations August - 2014

ELECTRICAL CIRCUITS ANALYSIS-I

(Electrical And Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(i) What are the differences between ideal and practical sources.
(ii) Distinguish between passive and active components.
(iii) Define form factor and peak factor of an alternating quantity.
(iv) For a given impedance $Z = R \pm iX$, show that conductance $G = \frac{R}{Z^2}$ and suseptance, $B = \frac{X}{Z^2}$, where R and X are resistance and reactance.
(v) Why the net voltage across L and C in a series R-L-C series circuit under resonance is zero.
(vi) State Faraday's law of electromagnetic induction.
(vii) Define Tie-set and cut-set.
(viii) State compensation theorem.

[3+3+2+2+3+3+3+3]

PART-B

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.

[4+6+6]

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.

[8+8]

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

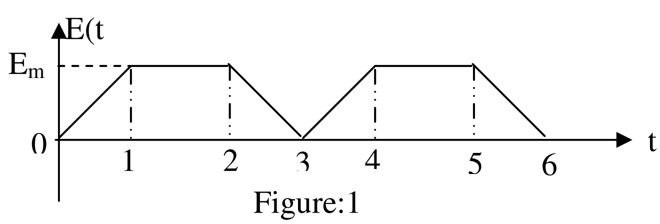

Figure:1

4.(b) A series RLC circuit with $R=100\Omega$, L = 0.5H, C=40μF has an applied voltage of $100\angle 0^0$ with 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.

[8+8]

5.(a) Two coupled coils with respect to self inductances $L_1 = 0.6$ H, $L_2 = 0.4$ H having a K = 0.4. Coil 2 has 100 turns. The current in coil 1 is $I_1 = 10 \sin 200t$ 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.

[6+5+5]

6.(a) State and explain compensation theorem.

(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.

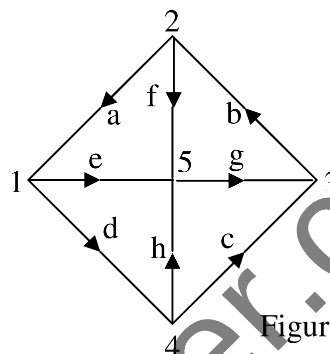

Figure:2

[7+9]

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

(b) 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.

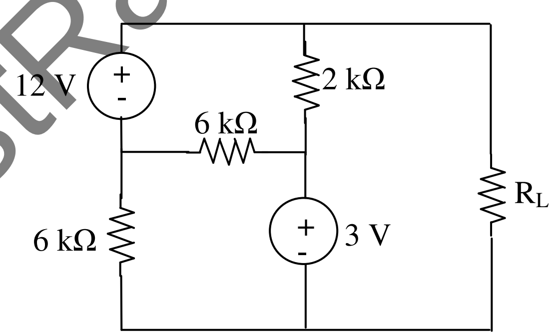

Figure:3

[7+9]

Subject Code: R13212/R13

Set No - 3

I B. Tech II Semester Regular Examinations August - 2014

ELECTRICAL CIRCUITS ANALYSIS-I

(Electrical And Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(i) What are the uses of source transformation.
(ii) Distinguish between series and parallel circuits.
(iii) Explain why current leads the voltage by 90^0 in case of ideal capacitor.
(iv) Define active and reactive power of alternating quantity and write their expressions.
(v) Why the current in AC series R-L-C circuit at resonance is maximum.
(vi) Why the coefficient of coupling in a magnetic circuit is not more than unity.
(vii) What is duality? What are dual quantities?
(viii) State reciprocity theorem.

[3+2+3+3+3+2+3+3]

PART-B

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

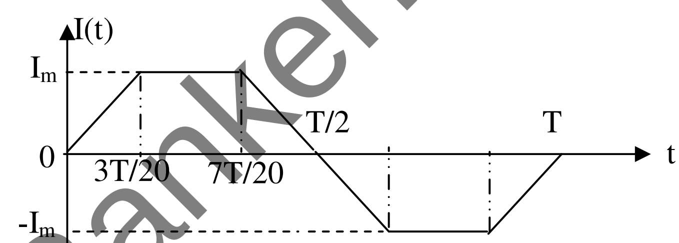

Figure 1

(b) Solve the network given in figure:2 for the following: (i) unknown resistances R_1 and R_2 (ii) unknown currents in various branches of the network.

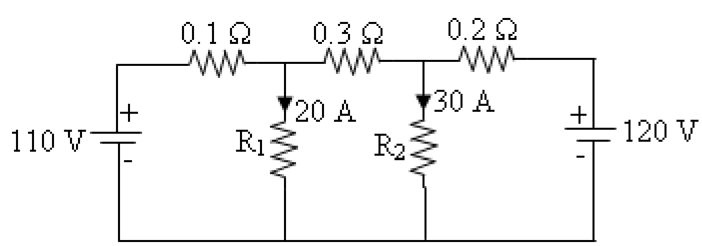

Figure:2

[8+8]

3.(a) With the help of nodal analysis on the circuit of figure:3, find (i) V_A (ii) the power dissipated in 2.5 ohms resistor.

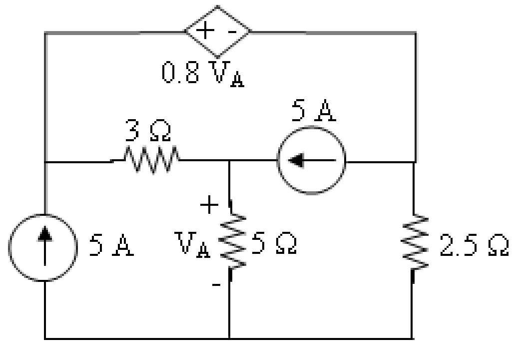

Figure: 3

(b) A coil having a resistance of 20 ohms and an inductance of 0.2 H is connected in series with a 50 μF 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.

[8+8]

4.(a) A mild steel ring has a mean circumference of 600 mm and a uniform cross-sectional area of 350 mm^2. Calculate the m.m.f required producing a flux of 600μWb 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.

(b) A series circuit consisting of R = 500 Ω, L = 0.5 H and C = 15 μF is connected to a variable frequency supply of 120V. If the frequency is varied through 40 to 80 Hz, draw the locus diagram of current. Determine the current and power factor at 40 and 80 Hz frequency.

[7+9]

5.(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+5+7]

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

(b) A resistive network is shown in figure.4. If the resistance of 5 ohms branch increases to 6 ohms in the network, determine the compensation source and verify the result.

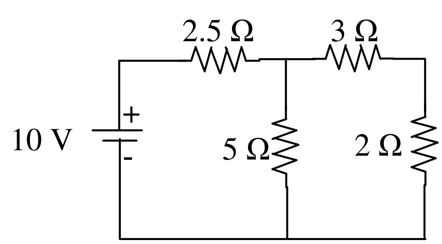

Figure.4

[7+9]

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

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

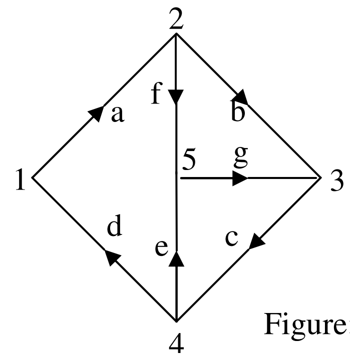

Figure:5

[7+9]

Subject Code: R13212/R13 **Set No - 4**

I B. Tech II Semester Regular Examinations August - 2014

ELECTRICAL CIRCUITS ANALYSIS-I

(Electrical And Electronics Engineering)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(i) Write the statements of KVL and KCL.

(ii) The current in a 15 mH inductor is $i_L = (2 - e^{-1000t})mA$. What is the voltage across inductor?

(iii) Explain why current lags the voltage by 90^0 in case of ideal inductor.

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

(v) Define resonance and bandwidth.

(vi) In a magnetic circuit, if mmf F_1 causes flux ϕ_1, and mmf F_2 causes flux ϕ_2, then the mmf (F_1+ F_2) causes flux $\phi_1 + \phi_2$. Is the statement is true or false. If true, give the reasons.

(vii) Define graph, node and degree of a node.

(viii) State Millman's theorem.

[3+2+3+3+2+3+3+3]

PART-B

2.(a) Prove that pure capacitance when connected across an alternating source draws the current leading over voltage by 90^0. Show that power consumed by pure capacitance is zero.

(b) Find the values of the voltages V_1 and V_2 in the circuit shown in figure:1.

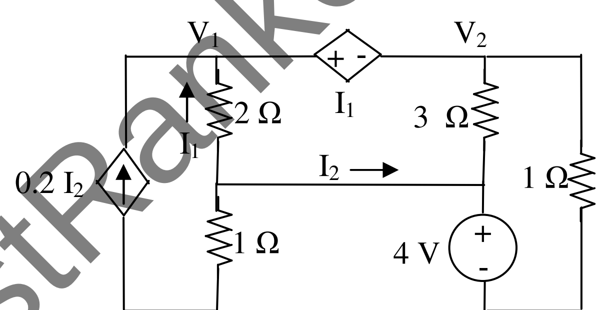

Figure:1

[6+10]

3.(a) Give the detailed comparison of series and parallel circuits.

(b) A resistor *R*, a choke coil having resistance *r* & inductance *L*, a capacitor C=25.5 μF are connected in series. When supplied from the AC source it takes 0.4 A. If voltage across the resistor is 20 V, voltage across the resistor and choke is 45 V, voltage across the choke is 35 V and voltage across the capacitor is 55 V, find: (i) the values of *r, L,* (ii) the applied voltage and its frequency, (iii) power factor of total circuit and power consumed (iv) power loss in choke coil. Also draw the phasor diagram.

[6+10]

||''|''||''||''''|

4.(a) Show that the locus of the current in an R-L circuit with X_L variable is a semicircle. Find the radius and the center of the circle.

(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.

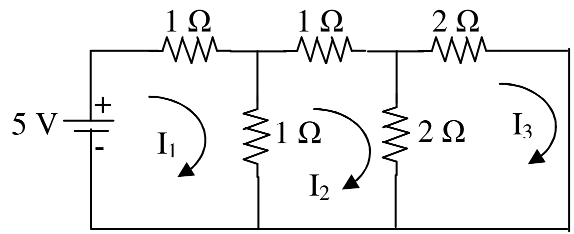

Figure:2

[8+8]

5.(a) State and explain Thevenin's theorem.

(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 cm^2. If the coil has resistance of 10 Ω 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.

[6+10]

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

(b) Impedances Z_2 and Z_3 in parallel are in series with an impedance Z_1 across a 100V, 50 Hz AC supply. Z_1=(0.25+j1.25) ohms, Z_2=(5+j0) ohms, and Z_3=(5-jX_C) ohms. Determine the value of the capacitance of X_C such that the total current of the circuit will be in phase with the supply voltage. What is then the circuit current and power?

[8+8]

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

(b) For the network shown in figure:3, find the current through 1.375 ohms resistor and hence verify reciprocity theorem.

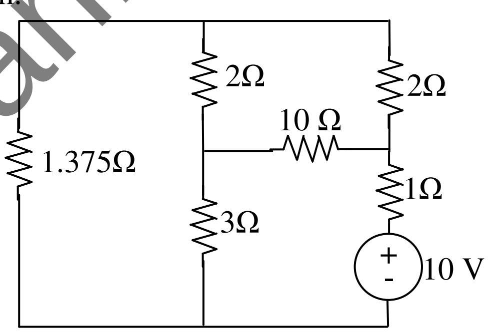

Figure:3

[6+10]