Subject Code: R13211/R13 **Set No - 1**

I B. Tech II Semester Supplementary Examinations Feb. - 2015

NETWORK ANALYSIS

(Common to ECE, EIE, E Com.E)

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 is the principle of duality.

(ii) Define form factor and peak factor.

(iii) A series circuit of R=10 ohms and X_C = 15 ohms has applied phasor voltage $V = 50\angle -90^0$ V. Find real power, reactive power, apparent power and power factor in the circuit.

(iv) State dot rule of a coupled circuit.

(v) State superposition theorem.

(vi) Write the condition for symmetry and reciprocity of Transmission line parameters.

(vii) Define natural and forced response.

[3+3+4+3+3+3+3]

PART -B

2.(a) Draw the graph of the network given in figure 1, find tie test schedule and determine loop currents.

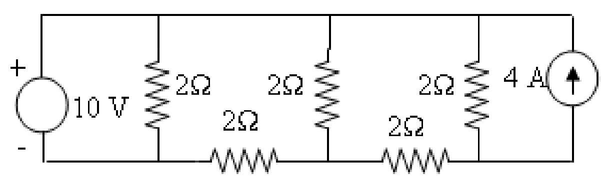

Figure 1

(b) A non-alternating periodic waveform has been shown figure 2. Find its form factor and peak factor.

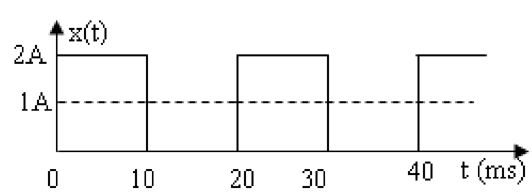

Figure 2

[8+8]

3.(a) When a resistor and choke coil in series are connected to a supply of 240 V, a current of 3 A flows lagging the supply voltage by 40^0. The voltage across the inductor is 180 V. Find the resistance of the resistor and the parameters of the coil.

(b) Three impedances Z_1=(5+j5) Ω, Z_2=(-j8) Ω and Z_3=4 Ω are connected in series to an unknown voltage source V. Find I and V if the voltage drops across Z_3 is $63.2\angle 18.45^0$ V.

[8+8]

4.(a) Show that sum of the energy stored by the inductor and the capacitor in a parallel R-L-C circuit at any instant is constant at resonant frequency and is equal to CV^2, where C is the capacitance and V is r.m.s value of voltage.

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

4.(b) For the circuit shown in figure 3, find the voltage drop across j5Ω reactance.

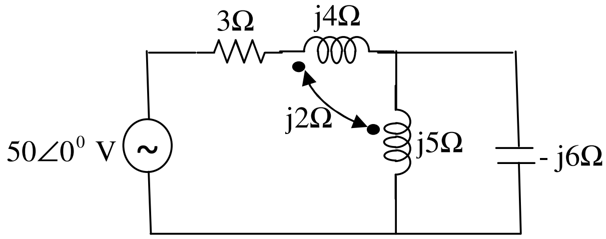

Figure 3

[8+8]

5.(a) State and explain Reciprocity theorem with an example.

(b) Find the Norton and Thevenin's equivalents with respect to the terminals a-b as shown in figure 4.

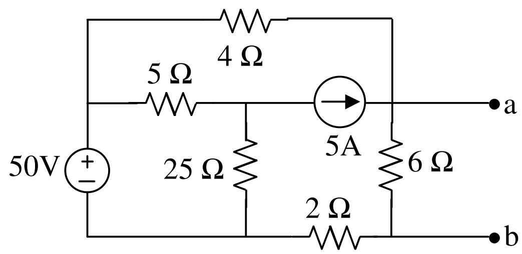

Figure 4

[8+8]

6. Find ABCD and h-parameters of the circuit in Figure 5.

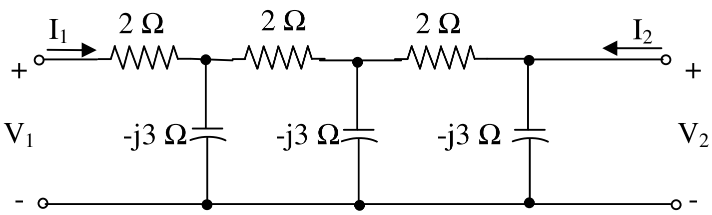

Figure 5

[16]

7.(a) Derive an expression for voltage across capacitor in a series RC circuit excited by a unit step voltage. Assume that initial voltage across capacitor is zero.

(b) A sinusoidal voltage v = 250 sin 50 t is applied suddenly to series R-L circuit with R = 10 Ω and L = 5H. Find the instant at which transient current becomes zero.

[8+8]

Subject Code: R13211/R13 **Set No - 2**

I B. Tech II Semester Supplementary Examinations Feb. - 2015

NETWORK ANALYSIS

(Common to ECE, EIE, E Com.E Branches)

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

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*****

PART-A

1.(i) Define RMS value and average value

(ii) Define planar graph and non-planar graph. What is the difference between these two?

(iii) In a circuit the applied voltage $v = 100\sin(\omega t + 20^0)$ V and a resulting current $i = 5\sin(\omega t - 60^0)$ A. Determine real power, reactive power, apparent power and power factor in the circuit.

(iv) An R-L-C series circuit has R= 10 ohms, L= 0.04 H, and C=1μF. Determine half power frequencies.

(v) State reciprocity theorem.

(vi) Write the condition for symmetry and reciprocity of inverse h-parameters.

(vii) Define time constant and write the expression for time constant for R-L and R-C circuit.

[2+3+4+4+3+3+3]

PART -B

2.(a) A circuit consisting of three resistances 12Ω , 18Ω and 36Ω respectively joined in parallel is connected in series with a fourth resistance. The whole circuit is applied with 60V and it is found that the power dissipated in the 12Ω resistor is 36 W. Determine the value of the fourth resistance and the total power dissipated in the circuit.

(b) Define basic cutset and basic loop incidence matrices and write these for the following graph by taking 1,2,3 as three branches as shown in Figure 1.

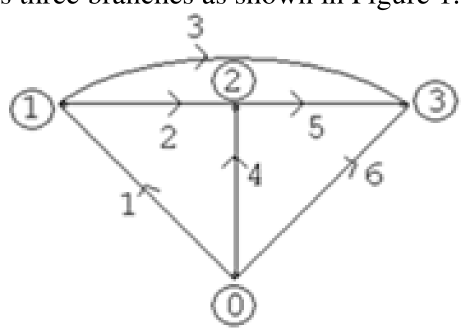

Figure 1

[8+8]

3.(a) In an electrical circuit R, L and C are connected in parallel. R = 15 Ω, L= 0.5 H and C = 10 μF. The circuit is energized with supply at 200 V, 50 Hz. Calculate

(i) the impedance

(ii) current taken from the supply

(iii) power factor of the circuit and power consumed by the circuit.

(b) A series combination of R and C is in parallel with a 25 Ω resistor. A 50 Hz source results in a total current of 6.5 A, a current of 5 A through 25 Ω resistance and a current of 2.3 A in the RC branch. Find apparent, active, reactive power and power factor of the circuit.

[8+8]

Subject Code: R13211/R13 **Set No - 2**

4.(a) In a pair of coupled coils, coil 1 has a continuous current of 2A and the corresponding fluxes Φ_{11} and Φ_{21} are 0.3 mWb and 0.6 mWb respectively. If the number of turns are N_1=500, N_2=1500, find L_1, L_2, and M.

(b) Obtain an expression for frequency at which maximum voltage across the capacitance occurs in a series resonant circuit.

[8+8]

5.(a) State and explain compensation theorem with an example.

(b) Using superposition theorem find v_0 in Figure 2.

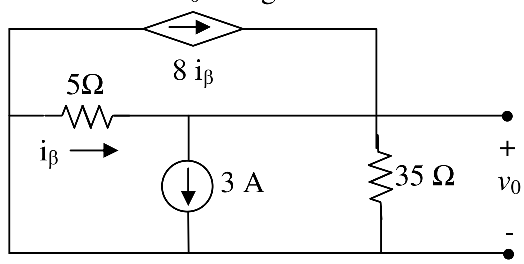

Figure 2

[8+8]

6.(a) Two two-port networks are connected in series. Prove that the overall Z-parameters are the sum of corresponding individual Z-parameters.

(b) Find the ABCD-parameters of the network shown in Figure 3. Verify the whether the circuit is reciprocal.

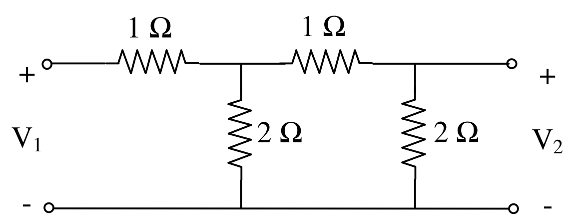

Figure 3

[8+8]

7.(a) For an RC series circuit, a sinusoidal voltage $v(t) = V_m \sin\omega t$ is applied at t = 0. Find the expression for transient current.

(b) Find the current i(t) in the network shown in Figure 4 for t > 0. At t = 0^- the network was unenergized.

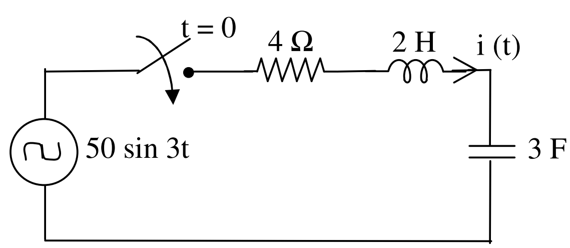

Figure 4

[8+8]

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Subject Code: R13211/R13 **Set No - 3**

I B. Tech II Semester Supplementary Examinations Feb. - 2015

NETWORK ANALYSIS

(Common to ECE, EIE, E Com.E Branches)

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) State Kirchhoff's laws.
(iii) A two element series circuit R=5 ohms and X_L=10 ohms has an effective applied voltage of 100 V. Find real power, reactive power, apparent power and power factor in the circuit. Draw power triangle.
(iv) A series circuit with R=50 ohms, L=0.1 H and C=10 μF has an applied voltage $V = 100\angle 0^0$ V. Find maximum voltage across inductor and the frequency at which it occurs.
(v) State compensation theorem.
(vi) Write the condition for symmetry and reciprocity of h-parameters.
(vii) Voltage across the capacitor cannot change instantaneously. Justify.

[2+3+4+4+3+2+4]

PART -B

2.(a) Construct the incidence matrix for the graph shown in Figure.1.

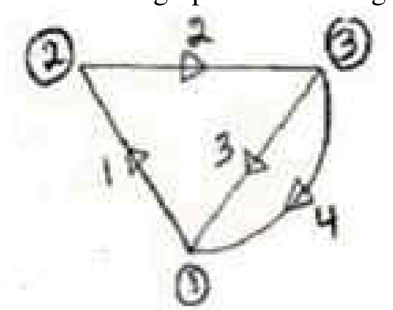

Figure 1

(b) Using nodal analysis, find current in 2 kΩ resistor in the circuit shown in figure 2.

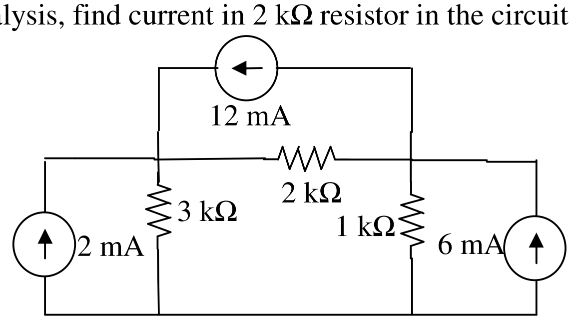

Figure 2

[8+8]

3.(a) Obtain the expressions for star-delta equivalence of impedance network.
(b) A two element series circuit is connected across AC source $e(t) = 200\sqrt{2}\, sin(\omega t + 20^0)V$. The current in the circuit then found to be $i(t) = 10\sqrt{2}\, cos(\omega t - 25^0)A$. Determine the parameters of the circuit.

[8+8]

Subject Code: R13211/R13 **Set No - 3**

4.(a) Two coils have a coupled coefficient K=0.85 and coil 1 has 250 turns. The current in coil 1 is 2 A and total flux is 0.3 mWb. When the current i_1 is reduced linearly to zero in 2 milli-seconds the voltage induced in coil 2 is 63.75 V. Find L_1, L_2, N_2 and M.

(b) Show that sum of the energy stored by the inductor and the capacitor connected in series R-L-C circuit at resonant at any instant is constant and is equal to LI^2, where L is the inductance and I is r.m.s value of current.

[8+8]

5.(a) State and explain Norton's theorem with an example.

(b) Find the voltage V in the figure 3 shown using superposition principle.

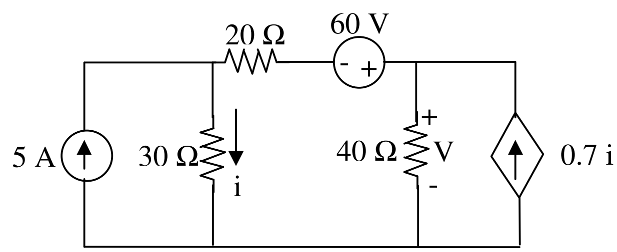

Figure 3

[8+8]

6.(a) Determine the inter relation between Z-parameters and h-parameters.

(b) Derive conditions for reciprocity and symmetry for transmission parameters and y-parameters.

(c) Find the ABCD parameters of the network shown in Figure 4.

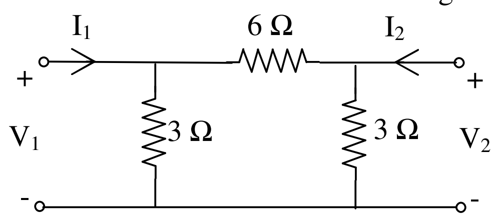

Figure 4

[5+5+6]

7.(a) Explain the use of Laplace transform technique to perform transient analysis with suitable example.

(b) A series RC circuit has R = 50 Ω and C = 90 μF to which a voltage $v = 230 \sin 314\, t$ is applied at t = 2.1 msec. Obtain an expression for i(t).

[8+8]

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Subject Code: R13211/R13 **Set No - 4**

I B. Tech II Semester Supplementary Examinations Feb. - 2015

NETWORK ANALYSIS

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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) Transform a voltage source of 150 V with an internal resistance of 3 ohms into an equivalent current source and its resistance.

(ii) Define (i) tree (ii) cutset (iii) tieset

(iii) The impedance of a circuit is Z=(6+j8) ohms and an applied voltage $V = 50\angle 45^0$ V. Determine real power, reactive power, apparent power and draw power triangle.

(iv) Define coefficient of coupling and give its expression in terms of self and mutual inductances.

(v) State Norton's theorem.

(vi) Write the condition for symmetry and reciprocity of Z- and Y-parameters.

(vii) Current through the inductor cannot change instantaneously. Justify.

[3+3+4+3+3+3+3]

PART -B

2.(a) A 50 Ω resistor is in parallel with a 100 Ω resistor. The current in 50 Ω resistor is 7.2A. What is the value of third resistance to be added in parallel to make the line current as 12.1A?

(b) Explain about ideal and non-ideal voltage and current sources.

(c) Find mesh currents and determine voltage across each element in the circuit shown in Fig.1.

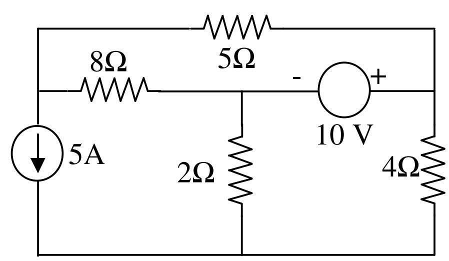

Figure 1

[6+4+6]

3.(a) An R-C series circuit of R = 4.7 kΩ and C = 1μF is connected across a voltage source of 150 V, 50 Hz. Determine impedance, power factor, current flowing in the circuit? What is the power dissipated in the circuit.

(b) Find the impedance and voltage across resistor and inductor, if a resistor of 1kΩ and an inductor of 110 mH are connected in series to a source 11 V, 10 kHz? Also find the power factor and power dissipated in the circuit.

[8+8]

4.(a) Two coupled coils with self inductance L_1=0.2 H and L_2=0.2 H have a coupling coefficient K=0.6. The Number of turns in coil 2 is 1000. If the current in coil 1 is i_1=10 sin400t amperes, determine the voltage in coil 2 and the maximum flux set up by coil 1.

(b) Show that the resonant frequency ω_0 of an RLC series circuit is the geometric mean of ω_1 and ω_2, the lower and upper half-power frequencies respectively. [8+8]

Subject Code: R13211/R13 **Set No - 4**

5.(a) State and explain maximum power transfer theorem.

(b) Using superposition theorem find v_0 in Figure 2.

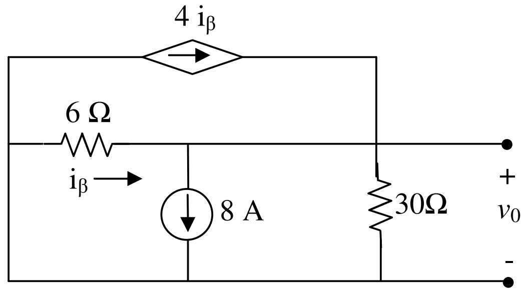

Figure 2

[8+8]

6.(a) Determine the inter relation between ABCD parameters and Z-parameters.

(b) Determine the Y-parameters of the overall network, considering two identical sections of the network shown below Figure 3, are connected in parallel.

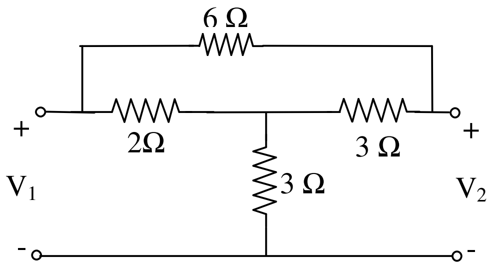

Figure 3

[8+8]

7.(a) A series RL circuit with R=100 ohms and L= 1H has a sinusoidal voltage source 200 sin(500t + φ) applied at time when φ = 0.

(i) Find the expression for current

(ii) At what value of φ must the switch be closed so that the current directly enter steady state.

(b) Find the current through the inductor for t > 0 in Figure 4.

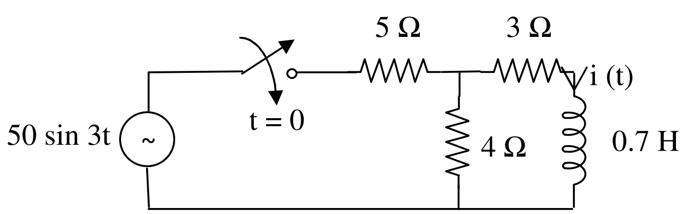

Figure 4

[8+8]