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

I B. Tech II Semester Regular/Supplementary Examinations May - 2016

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**

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PART-A

1. (a) For the circuit shown in Figure 1, find the power delivered by each branch.

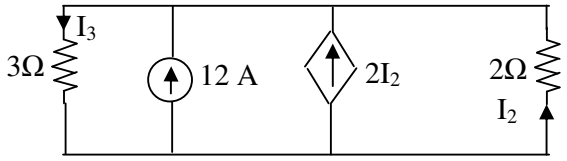

Figure 1

(b) A coil of resistance R and inductance L is connected across 100 V, 50 Hz supply. The current through the coil is found to be 2A and power dissipated is 100 W. Find R and L.
(c) Give a comparison between series and parallel resonance.
(d) State Thevenin's theorem and maximum power transfer theorem.
(e) Prove the conditions for symmetry and reciprocity of hybrid parameters.
(f) A resistor is connected across the terminals of a 20 μF capacitor which has been previously charged to a potential difference of 500 V. If the potential difference falls to 300 V in 0.5 minutes, calculate the resistance in the circuit.

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

PART -B

2. (a) Explain the source transformation with an example.
(b) Determine the voltages at each node of the circuit shown in Figure 2.

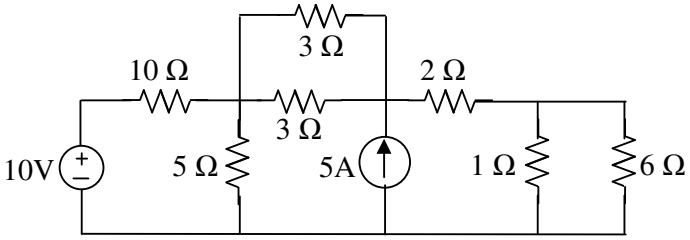

Figure 2

[7+9]

3. (a) A series RLC circuit consists of a resistance of 25 Ω, inductance 0.4 H, capacitance of 250 μF is connected a supply of 230V, 50 Hz. Find the total impedance, current, power, power factor, voltage across coil and capacitance.
(b) Show that the real power consumed by a pure inductor and capacitor is zero.

[8+8]

4. (a) Show that the resonant **frequency i**s the geometric mean of two half power frequencies.
   (b) Calculate the effective inductance across terminals A-B for the circuit shown in Figure 3.

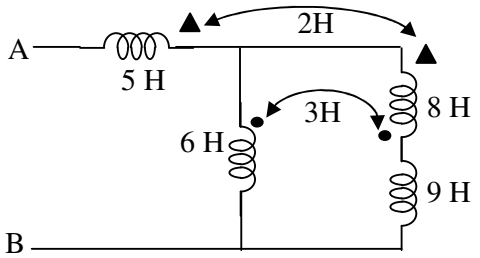

Figure 3

[8+8]

5. (a) In the network shown in Figure 4, find the resistance R_L to be connected between the terminals A and B so that maximum power is developed across R_L. What is the maximum power delivered?

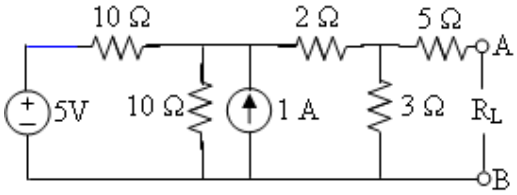

Figure 4

   (b) Determine the current through load resistance R_L in the Figure 5 using Thevenin's theorem. Also find maximum power transfer to resistance R_L.

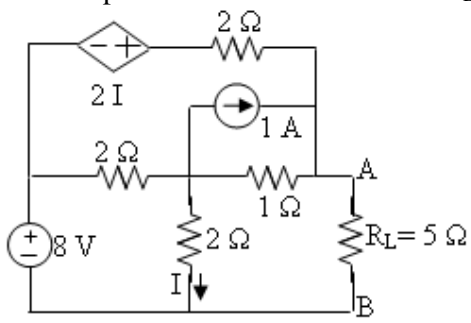

Figure 5

[8+8]

6. (a) Derive Z – parameters as a function of h-parameters.
   (b) Find ABCD and h-parameters of the circuit shown in Figure 6.

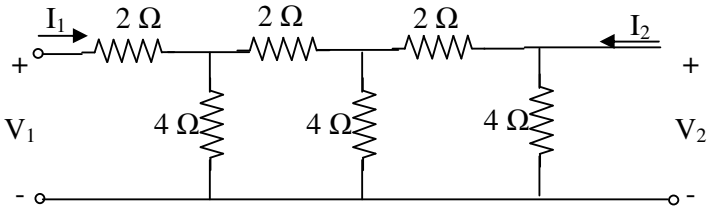

Figure 6

[6+10]

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) A sinusoidal voltage $v(t) = 20 \sin 75t$ is applied suddenly to a series RL circuit with R = 20 Ω and L = 4 H. Find the instant at which transient current becomes zero.

[8+8]

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

I B. Tech II Semester Regular/Supplementary Examinations May - 2016

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**

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PART-A

1. (a) Draw the graph corresponding to the following incidence matrix.

$$A=\begin{bmatrix} -1 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 & -1 & 1 \\ 0 & 0 & -1 & -1 & 0 & -1 & 0 & -1 \\ 0 & 0 & 0 & 0 & -1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 \end{bmatrix}$$

(b) A resistor R is connected in series with a capacitor C and the combination is connected across a 100 V, 50 Hz supply. The voltage drop across the resistor is 60 V and power dissipated in the resistor is 108 W. Find R and C.

(c) Define self inductance, mutual inductance and co-efficient of coupling in a coupled circuit.

(d) State Milliman's theorem and write its limitations.

(e) Prove the conditions for symmetry and reciprocity of transmission line parameters.

(f) Define the free and forced response of a transient circuit.

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

PART-B

2. (a) Explain the RMS value and average value of alternating quantity. Derive necessary expressions.

(b) In the circuit shown in Figure 1, the resistance R is variable from zero to infinity. The current through R can be expressed as $I=a+bV$, where V is the voltage across R as shown in figure and a, b are constants. Determine a and b.

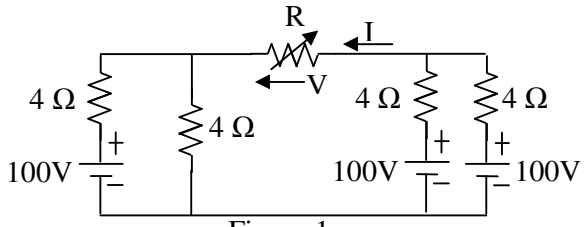

Figure 1

[8+8]

3. (a) The resistor R in series with capacitance C is connected to a 50Hz, 240 V supply. Find the value of C so that R absorbs 300 watts at 100 volts. Find also the Maximum charge and the maximum stored energy in C.

3. (b) In the following network shown in Figure 2, determine (i) Mesh currents (ii) Power supplied by the source (iii) Power dissipated in each resistor.

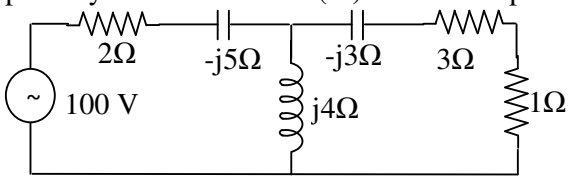

Figure 2

[8+8]

4. (a) Derive the expressions for quality factor and bandwidth in a series RLC resonant circuit.
   (b) Find voltage across 10 Ω resistor in the circuit shown in Figure 3. All values are in ohms.

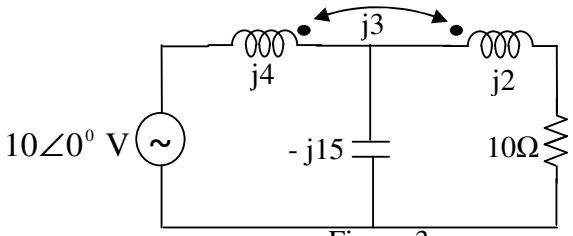

Figure 3

[8+8]

5. (a) For the circuit shown in Figure 4, find Norton's equivalent circuit.

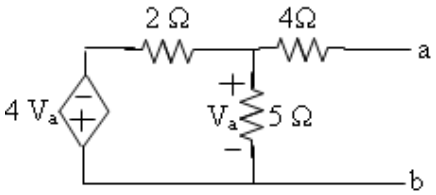

Figure 4

   (b) Determine the current I in the circuit shown in Figure 5 using Superposition theorem.

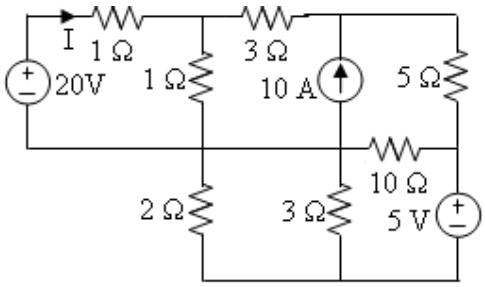

Figure 5

[8+8]

6. (a) Derive h-parameters as a function of ABCD parameters.
   (b) Determine the Z-parameters of the network shown in Figure 6.

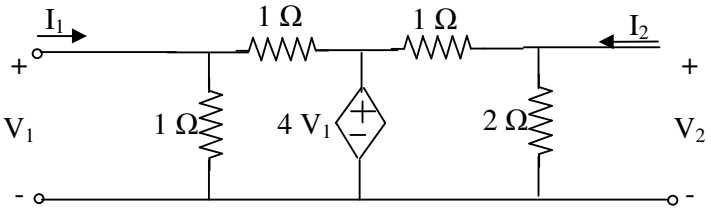

Figure 6

[8+8]

7. (a) A series RLC circuit with R=10 ohms, L=0.1 henries and C=20 microfarads has a constant voltage of 100 Volts applied at time t=0. Determine the transient current i(t) using Laplace transform techniques. Assume zero initial conditions.
   (b) What are initial conditions? Explain how these are evaluated.

[9+7]

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

I B. Tech II Semester Regular/Supplementary Examinations May - 2016

NETWORK ANALYSIS

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

Question Paper Consists of **Part-A** and **Part-B**
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Three Questions should be answered from **Part-B**

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PART-A

1. (a) Write the fundamental cut-set matrix for the network graph shown in Figure 1.

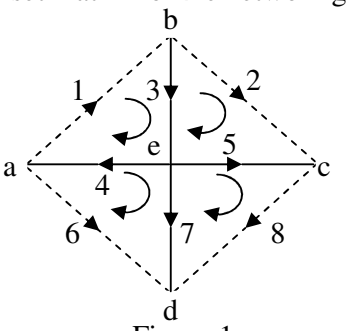

Figure 1

(b) A series circuit has two pure elements. The voltage and current in circuit are $v = 100\cos(314t + 30^0)$ V, and $i = 10\sin(314t + 70^0)$ A. Find elements in the circuit.

(c) Define quality factor and bandwidth. What is the importance of these parameters in series resonant circuits?

(d) State Maximum power transfer theorem and write its limitations.

(e) Why Z-parameters are known as open circuit parameters and Y-parameters are known as short circuit parameters?

(f) Explain the initial conditions for inductor and resistor.

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

PART-B

2. (a) Determine Form factor and Peak factor of the given waveform shown in Figure 2.

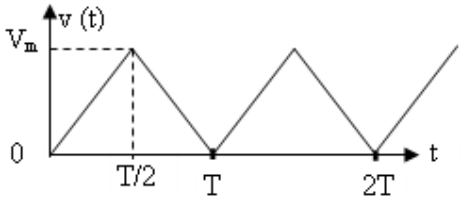

Figure 2

2. (b) Find the total power delivered in the circuit shown in Figure 3 using mesh current method.

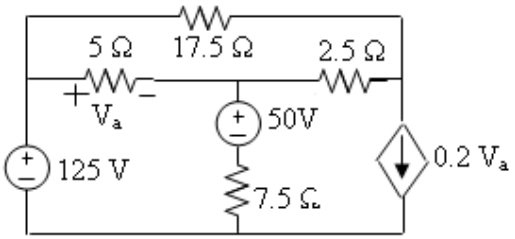

Figure 3

[8+8]

3. (a) A series R-L-C circuit consists of 100 Ω resistor and an inductor of 0.318 H and a capacitor of unknown value. This circuit is supplied by 230V, 50Hz supply and draws a current of 2.3 A and the current is in phase with the supply voltage. Find:
(i) the value of the capacitor (ii) the power supplied by the source.

(b) An electrical circuit with R = 10 Ω, L= 0.1 H and C = 100 μF are all connected in parallel. The circuit is energized with supply at 230 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.

[8+8]

4. (a) Two coupled coils have self-inductances L_1=2 H and L_2=6 H. The coefficient of coupling between them is 0.5. If a current $i_1 = 4\sin(40t - 30^0)$ A flows through coil 1 and $i_2 = 2\sin(40t - 30^0)$ A flows through coil 2, find the voltages across coil 1 and 2, if the mutually induced e.m.f opposes the self induced e.m.f.

(b) A series RLC circuit has the following parameters: R = 10 ohms, L = 3H, C = 120 μF. Calculate the resonant frequency. Under resonant condition, calculate current, power, and voltage drops across various elements, if the applied voltage is 100V.

[8+8]

5. (a) Verify the Tellegen's theorem for the circuit shown in Figure 4.

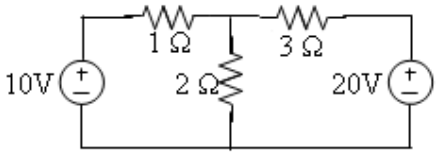

Figure 4

(b) Find current in 9 Ω resistor in the circuit shown in Figure 5 when 5 Ω resistor is changed to 6 Ω using compensation theorem.

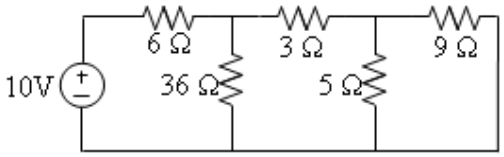

Figure 5

[8+8]

6. (a) The Z-parameters of a two-port network are: Z_{11} = 25 Ω, Z_{22} = 40 Ω, Z_{12} = Z_{21} = 20Ω. Calculate Y- and ABCD parameters of the network. Also find equivalent T-network.
   (b) Derive Z-parameters in terms of Y- parameters and ABCD parameters.

[8+8]

7. (a) A sinusoidal voltage V = 50 sin 400t is applied suddenly to a series RC circuit with R = 25Ω and C = 50μF. Assuming zero initial charge on capacitor, find the expression for current in the circuit.
   (b) A 200 Ω resistor is in series with an inductor L. The initial value of the inductor current is 5 mA and its value after 5 ms is 3mA. Find the time constant and the inductance.

[8+8]

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

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NETWORK ANALYSIS

(Common to ECE, EIE, E Com E)

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

Question Paper Consists of **Part-A** and **Part-B**
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PART-A

1. (a) Determine the loop currents in the circuit shown in Figure 1.

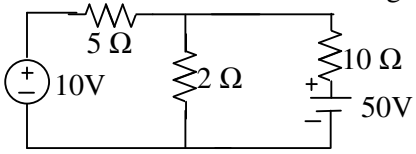

Figure 1

(b) An R-L series circuit has R=2.5 ohms and L=0.2 H. Find the power factor of the circuit if an alternating voltage of $230\angle 30^0$ V is applied across the circuit.
(c) What are the characteristics of parallel resonant circuits?
(d) State Reciprocity and Compensation theorems.
(e) Prove the conditions for symmetry and reciprocity of inverse transmission parameters.
(f) Derive the equation for decay of current in R-L circuit. What is the role of time constant in this circuit?

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

PART-B

2. (a) Define the following: (i) Time period (ii) Average value
(iii) RMS value (iv) Form Factor.

(b) Use node-voltage method to find the power developed by the 20 V source in the circuit shown in Figure 2.

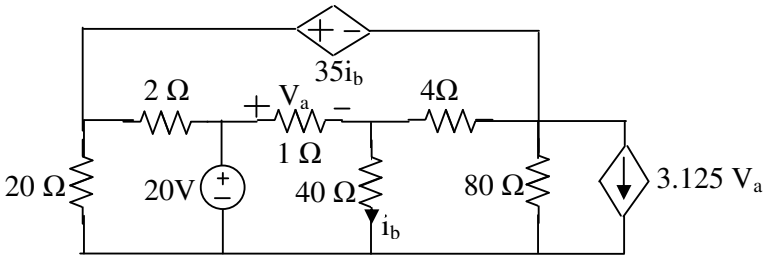

Figure 2

[8+8]

3. (a) A coil with a resistance of 7Ω and an inductance of 31.8 mH is connected to 230V, 50Hz supply. Calculate (i) the circuit current (ii) phase angle
(iii) power factor (iv) power consumed.

3. (b) Find value of voltage V which results in $V_0 = 5\angle 0^0$ volts in the circuit shown in Figure 3

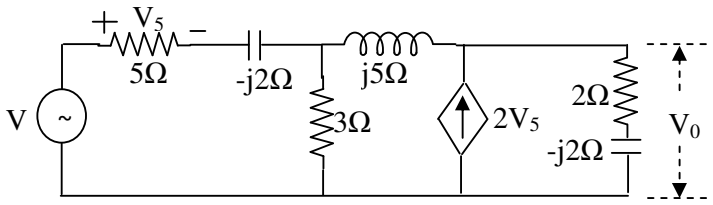

Figure 3

[8+8]

4. (a) Two coupled coils with self inductance L_1=0.04 H and L_2=0.16 H and coefficient of coupling K=0.6 has 800 turns in coil 2. The current in coil 1 is $i_1 = 10\sin 500t$ A. Find the voltage induced in coil 2 and maximum flux set up by coil 1.

   (b) For the circuit shown in Figure 4, find the value of X_C in ohms for which the circuit is under resonance condition.

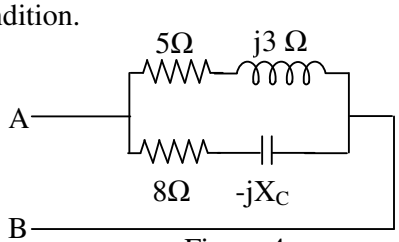

Figure 4

[8+8]

5. (a) Obtain the maximum amount of power transferred to R_L from the sources using Maximum power transfer theorem in the circuit shown in Figure 5.

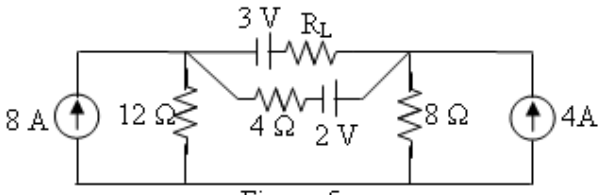

Figure 5

   (b) Determine the current through R_L=10 ohms resistor as shown in Figure 6 using Thevenin's theorem and verify it by Norton's theorem. Find the value of R_L for which maximum power will be transferred to it. Also determine the maximum power transfer.

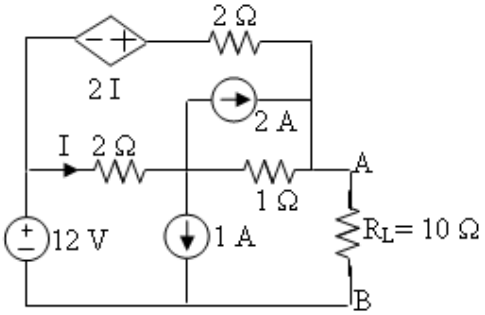

Figure 6

[8+8]

6. (a) Two two-port networks are connected in cascade. Prove that the overall transmission parameter matrix is the product of individual transmission parameters matrices.
   (b) Obtain the admittance parameters of the network shown in Figure 7 and there by obtain the ABCD parameters.

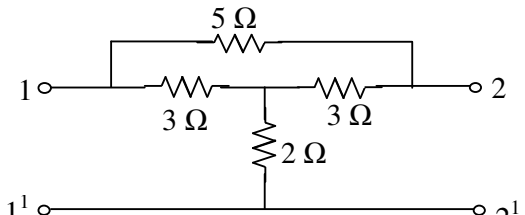

Figure 7

[8+8]

7. Derive the expression for transient response in series R-L-C circuit for AC excitation using Laplace transform method.

[16]

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