

II B.TECH - I SEMESTER EXAMINATIONS – MAY, 2011
ELECTRICAL CIRCUITS
(COMMON TO EEE, ECE, ETM)

Time: 3hours

Max. Marks: 75

Answer any FIVE questions
 All Questions Carry Equal Marks

- 1.a) Write the volt-ampere relationship of R, L and C elements.
 - b) Explain the independent and dependent sources. [8+7]
2. Find the voltage to be applied across 'A-B' in order to drive a current of 10 A into the circuit as shown in below figure 1 using star-delta transformation. [15]

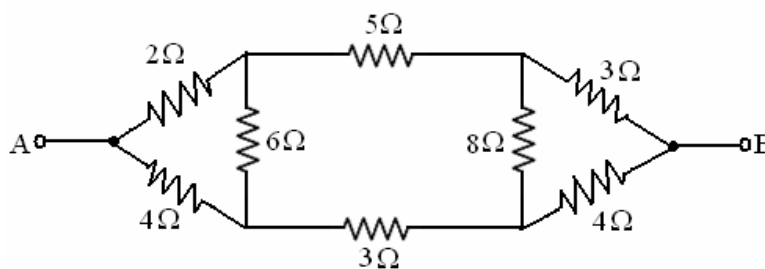


Figure 1

- 3.a) Define the following terms:
 - i) RMS value
 - ii) Average value
 - iii) Form factor
 - iv) Peak factor
- b) Determine the average and effective values of saw-tooth waveform as shown in below figure 2. [7+8]

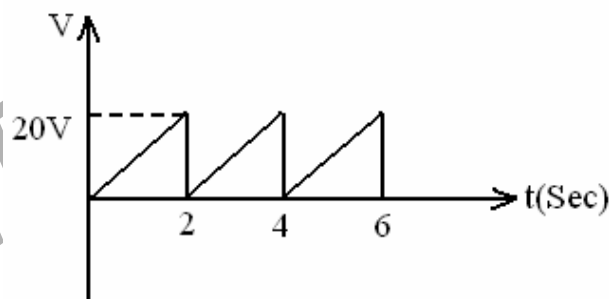


Figure 2

- 4.a) Explain the procedure to draw the locus diagram of R-L series circuit when L is varying.
 - b) A series RLC circuit has to be designed so that it has a band width of 320 Hz and inductance of the coil is 0.2H. It is has to resonate at 350Hz, determine the resistance of coil and capacitance of condenser. If the applied voltage is 150V, determine the voltage across capacitor and coil. [7+8]
- 5.a) Compare and contrast electric and magnetic circuit.
 - b) Two coils having 500 and 1000 turns, respectively, are wound side by side on a closed iron circuit of area of cross-section 100 cm^2 and mean length 800 cm. Calculate the coefficients of self induction of the two coils and the mutual induction between the two. Neglect leakage. Take μ_r as 2000. If a current steadily grows from 0 to 1 A in 0.1 sec, in the first coil, find emf induced in the other coil. [7+8]

- 6.a) Explain the following terms with respect to graph theory
 i) Node ii) tree iii) link iv) sub-graph
 b) Find the branch currents as shown in following figure 3 by using the concept of tie-set matrix. [7+8]

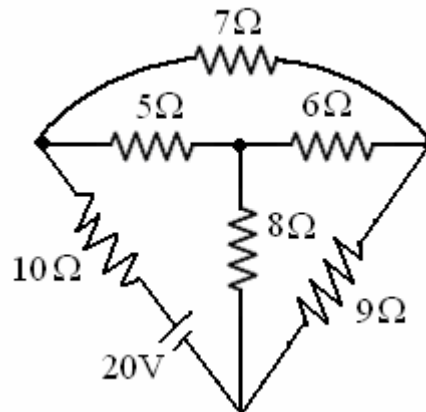


Figure 3

7. Determine the load resistance to receive maximum power from the source, also find the maximum power delivered to the load in the circuit shown in below figure 4.

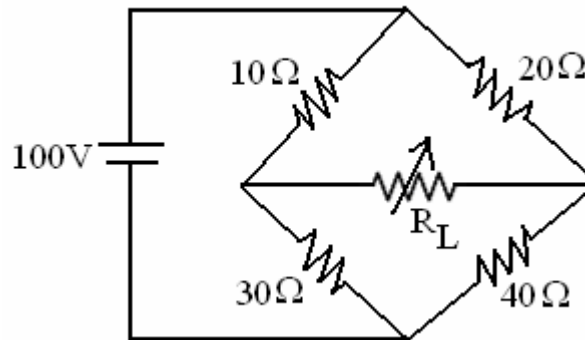


Figure 4

8. Find the current through the capacitor and voltage across 4-Ω resistance of the AC network shown in figure 5 by using superposition theorem. [15]

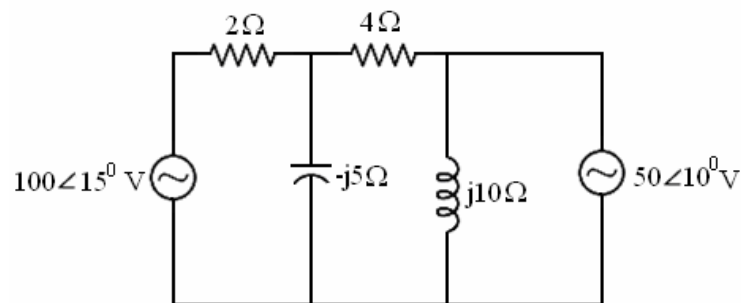


Figure 5

- 5.a) State and explain Faraday's laws of electromagnetic induction.
 b) Self-inductance of two coupled coils are $L_1 = 10 \times 10^{-3} \text{ H}$ and $L_2 = 20 \times 10^{-3} \text{ H}$. The coefficient of coupling (K) being 0.75 in the air, find voltage in the second coil, and the flux of first coil, provided the second coil has 500 turns and the circuit current is $I_1 = 2 \sin 314t \text{ A}$. [7+8]
- 6.a) Illustrate the super mode analysis with an example.
 b) For the network shown in figure 3 determine all branch currents and the voltage across the 6- Ω resistor by loop current analysis. [7+8]

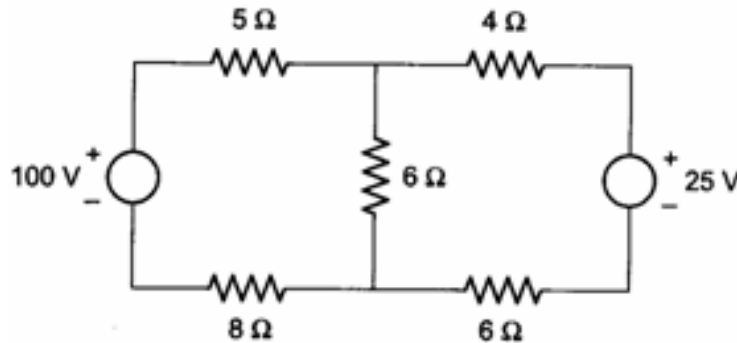


Figure 3

- 7.a) State and explain superposition theorem.
 b) Find thevenin's equivalent circuit for the circuit shown in below Figure 4. [7+8]

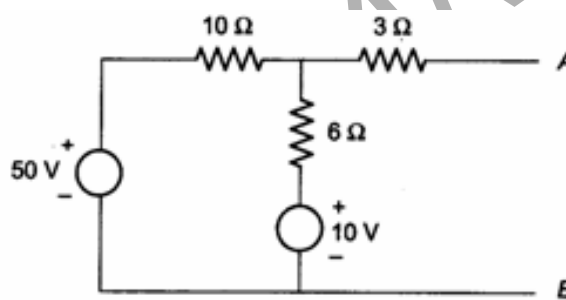


Figure 4

- 8.a) State and explain the maximum power transfer theorem.
 b) Determine the current I in the branch AB of circuit shown in figure 5 by using Norton's theorem. [7+8]

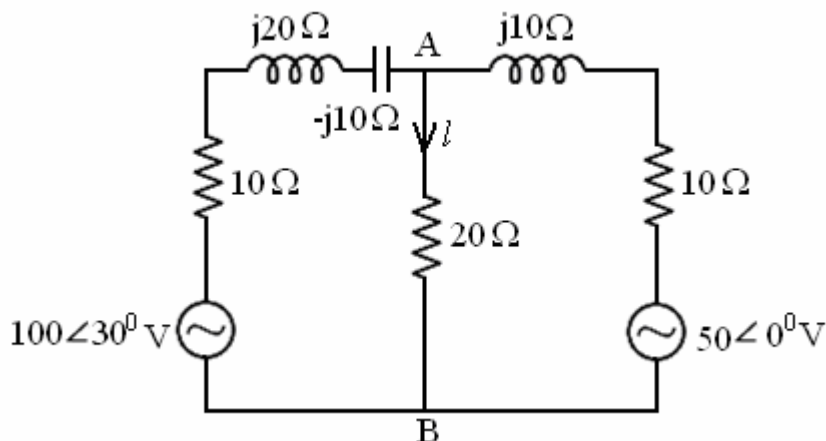


Figure 5

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- 1.a) Distinguish between ideal and practical sources and draw their characteristics.
 b) Calculate the value of 'R' in the circuit shown in below figure 1, if the power supplied by both the sources is equal. [7+8]

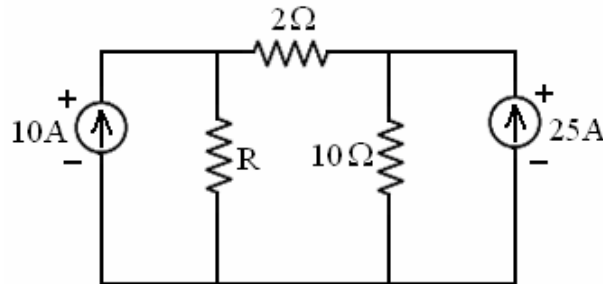


Figure 1

- 2.a) State and explain kirchoff's laws.
 b) Determine the current in the 5Ω resistor for the circuit shown in below figure 2. [7+8]

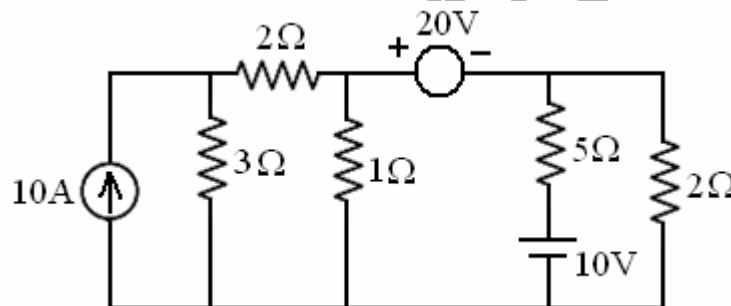


Figure 2

- 3.a) Define the RMS value and obtain an expression for the RMS value of sinusoidal current.
 b) Determine the circuit current and p.f for the following network shown in figure 3. [7+8]

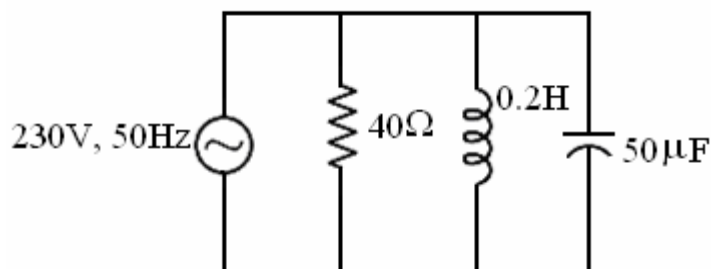


Figure 3

- 4.a) Explain the procedure to draw the locus diagram of R-C series circuit when 'C' is varying.
 b) An impedance coil having $R = 20\Omega$ and a 50Hz inductive reactance of 22Ω is connected to 110V, 60Hz source. A series circuit consisting of resistor, $R = 10\Omega$ and variable capacitor is then connected in parallel with coil
 i) For what value of 'C' will the circuit be in resonance?
 ii) Calculate two line currents at resonance. [7+8]

- 5.a) Explain the importance of dot convention in coupled circuits.
 b) A mild steel ring has a mean circumference of 1000 mm and a uniform area of cross-section of 600 mm^2 . Calculate the MMF required producing a flux of 500 nWb, assuming permeability of mild steel as 1200. An air gap of 2 mm in length is now cut in the ring. Determine the flux produced, if the MMF remains constant. [7+8]
- 6.a) Explain the super mesh Analysis with an example.
 b) For the resistive network as shown in below figure 4, write a cut set schedule and equilibrium equations on voltage basis. Hence obtain value of branch voltage and branch currents.

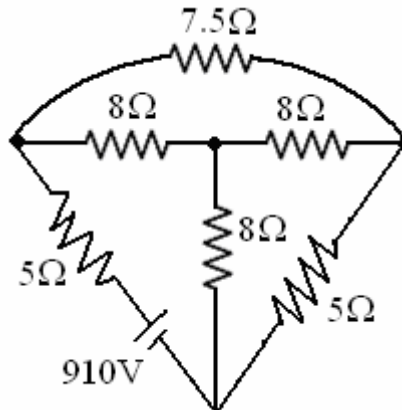


Figure 4

7. Use Thevenin's theorem to find the current through the 5-Ω resistor in figure 5. [15]

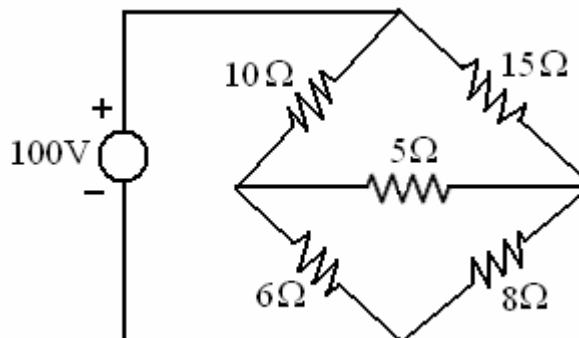


Figure 5

- 8.a) State and explain compensation theorem.
 b) Using Millman's theorem find the current through R_L in the circuit shown in figure 6. [7+8]

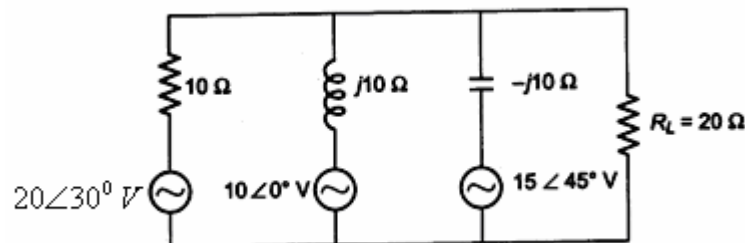


Figure 6

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- 1.a) Compare active and passive elements and give examples for each.
 - b) Explain the source transformation technique. [8+7]
2. Determine the resistance between the terminals 'A-B' in the network shown in below figure 1.

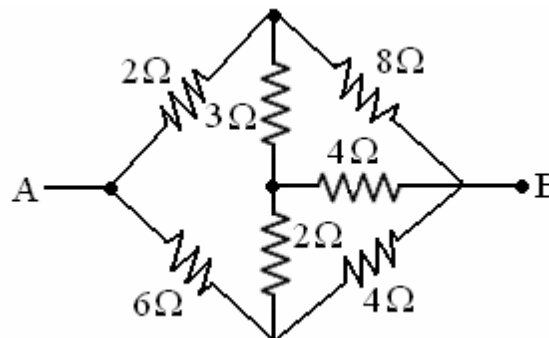


Figure 1

- 3.a) Explain the significance of j-operator. What are the different forms of expressing the sinusoidal quantity in complex form?
- b) Compute the RMS and average values of square wave form shown in below figure 2. [7+8]

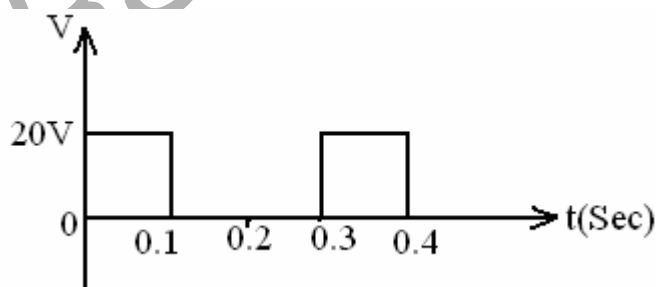


Figure 2

- 4.a) Explain the procedure to draw the lows diagram of R-L-C series circuit when varying X_L and X_C .
 - b) A series resonant circuit has the following parameters:
 Resonance frequency = 3×10^6 Hz,
 Band width = 10^5 Hz and $R = 4 \Omega$.
 Calculate L and C of the network, half power frequency and power quality. [7+8]
- 5.a) Derive the relation between self inductance, mutual inductance and coefficient of coupling.
 - b) A mild steel ring has a mean circumference of 600mm and a uniform cross-sectional area of 350 mm^2 . Calculate the MMF required producing a flux of $600 \mu\text{Wb}$ when an air gap of 1mm length is now cut in ring. Also determine the flux produced if MMF remains constant. Given relative permeability of mild steel is 1200. [7+8]

- 6.a) Describe the procedure to construct the dual of a network with an example.
 b) Find the current and voltages across the registers of the network shown in below figure 3. [7+8]

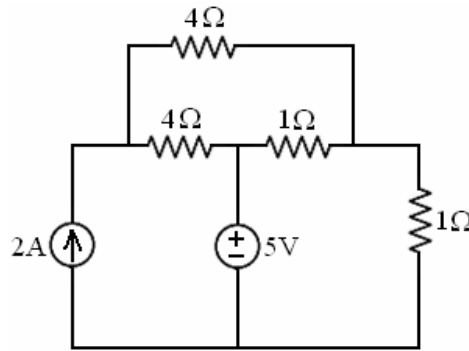


Figure 3

7. Find the current in the 7- Ω resistor across AB of the network shown in figure 4 using superposition theorem. [15]

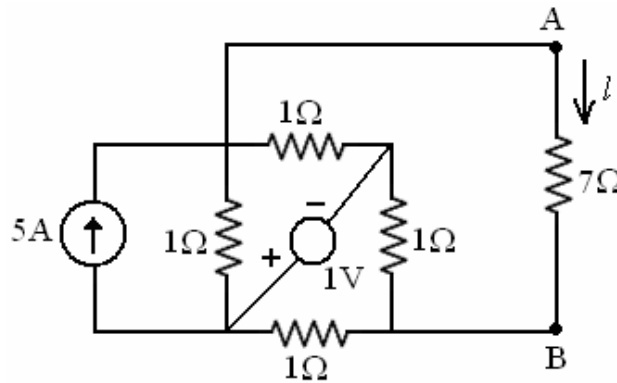


Figure 4

8. For the network shown in figure 5, replace the circuit to the left of terminals 'AB' with a Thevenin equivalent. The determine current in the $(2 - j2) \Omega$ impedance connected to the equivalent circuit.

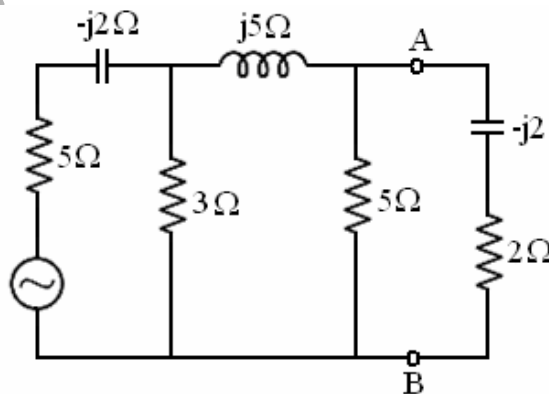


Figure 5
