

**II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2018**

**NETWORK ANALYSIS**

(Com to ECE, EIE and ECC)

Time: 3 hours

Max. Marks: 70

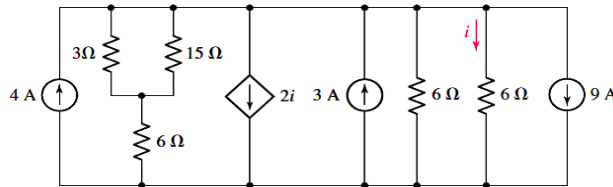
- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answer **ALL** the question in **Part-A**  
 3. Answer any **FOUR** Questions from **Part-B**

**PART -A**

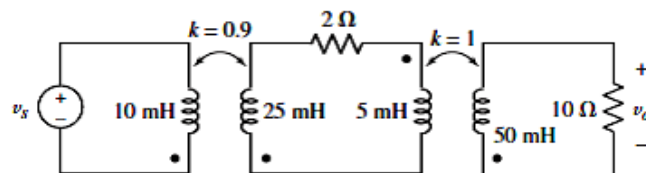
1. a) Distinguish the advantages and disadvantages of tie-set matrix? (2M)
- b) Derive the expression for current and voltage in a pure resistor for sinusoidal excitation. (3M)
- c) Define the terms reluctance and mmf. (2M)
- d) List out the applications and limitations of Millman's theorem. (2M)
- e) Write the expressions for Y-parameters in terms of Z-parameters for a two port network. (2M)
- f) Find the energy stored and time constant in a series R-L circuit applied with a DC voltage of 30V, where  $R=7.5\Omega$  and  $L= 10H$ . (3M)

**PART -B**

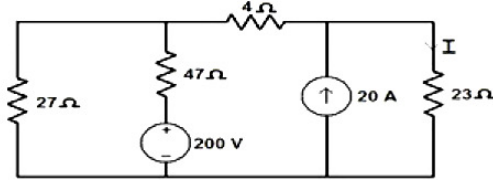
2. a) Give details for source transformation technique with an example. (7M)
- b) Determine the power absorbed by the  $15\Omega$  resistor in the circuit given (7M)



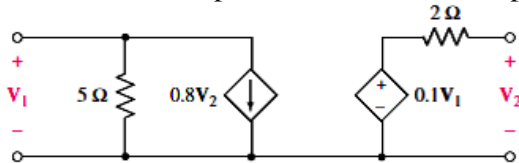
3. a) A series RLC circuit consists of a resistance of  $25\Omega$ , inductance  $0.4H$ , capacitance of  $250\mu F$  is connected a supply of  $230V$ ,  $50Hz$ . Find the total impedance, current, power, power factor, voltage across coil and capacitance. (7M)
- b) Illustrate the dot rules of coupling circuits. (7M)
4. a) Show that the resonant frequency of an RLC series circuit is the geometric mean of the lower and upper half-power frequencies. (7M)
- b) For the given circuit below, if  $v_s = 8 \cos 1000t$  V, calculate  $v_o$ . (7M)



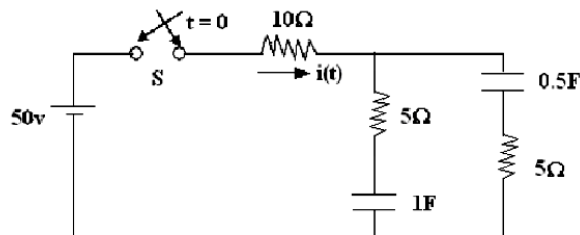
5. a) Compute the current in 23 ohm resistor using super position theorem for the circuit shown (7M)



- b) State and explain Thevenin's theorem with an example. (7M)
6. a) A two port network has the Z-parameters  $Z_{11}=20\Omega$ ,  $Z_{22}=30\Omega$  and  $Z_{12}=Z_{21}=40\Omega$  then find the ABCD and h-parameters for the network. (7M)
- b) Obtain both the impedance and admittance parameters for the two-port network (7M)



7. a) A 200  $\Omega$  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. (7M)
- b) In the network shown in the figure, the switch is closed at  $t=0$  and there is no initial charge on either of the Capacitors. Find the current  $i(t)$  by Laplace Transform method. (7M)



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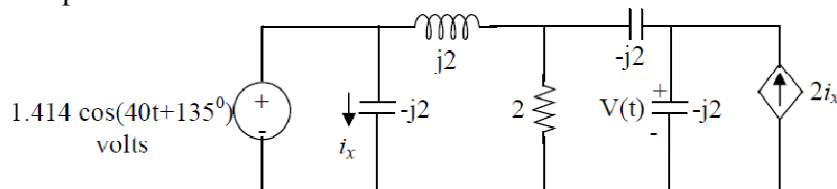
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**PART -A**

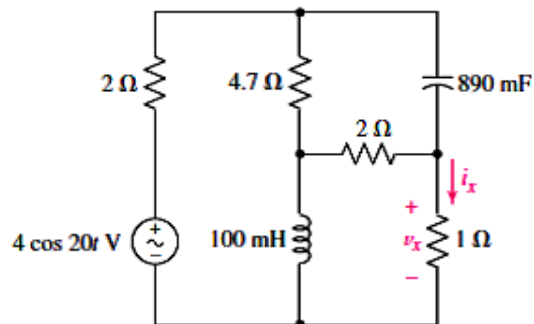
1. a) Write the merits and demerits of Parallel and Series circuits? (2M)
- b) Define the terms Active power, and Reactive power (2M)
- c) Write about the effects of leakage factor in a magnetic circuit. (2M)
- d) State the Maximum power transfer theorem. List its limitations. (3M)
- e) Write h-parameters and mention the reasons to use them. (2M)
- f) Find the expression for time constant of the series R-C circuit. (3M)

**PART -B**

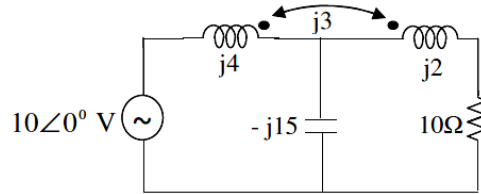
2. a) State and explain the Kirchoff's voltage and current laws with an example. (7M)
- b) Find the voltage  $V(t)$  in the network shown in the figure using nodal technique. (7M)  
All impedances are in ohms.



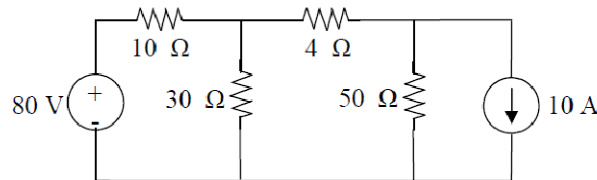
3. a) Derive an expression for coefficients of coupling for magnetic circuits. (7M)
- b) Determine the current  $i_x$  in the circuit (7M)



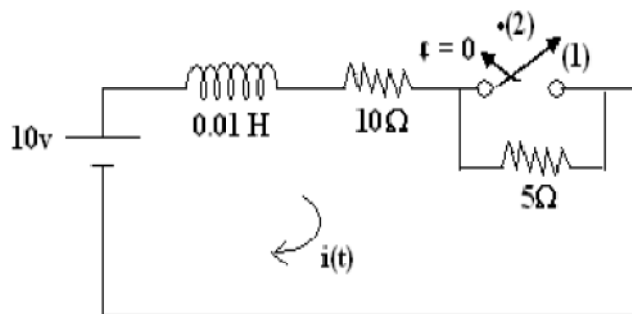
4. a) Derive the expression for bandwidth in a series R-L-C circuit in terms of Q-factor and resonance frequency. (7M)  
 b) Find voltage across  $10\ \Omega$  resistor in the circuit shown in figure. All values are in ohms (7M)



5. a) State and explain the Norton's theorem for A.C excitation. (7M)  
 b) Verify the Tellegen's theorem for the circuit shown (7M)



6. a) Derive the Z-parameters in terms of Y and ABCD parameters. (7M)  
 b) Why the Y-parameters are known as short circuit parameters? Explain. (7M)
7. a) Derive the expression for voltage across capacitance of a parallel R-C circuit excited with a sinusoidal current source at  $t=0$ . (7M)  
 b) In the circuit shown in Figure, the switch is initially in position 1 for a long time. Derive the expression for  $i(t)$  for  $t>0$  if the switch is transferred to position 2 at  $t=0$ . (7M)



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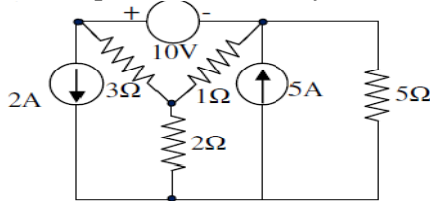
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**PART -A**

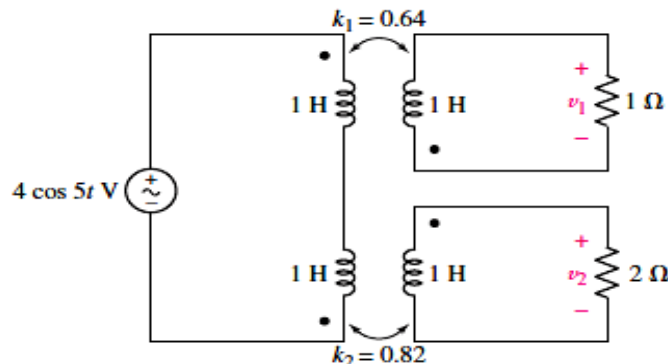
1. a) Write the statements of Kirchoff's voltage and current laws. (2M)
- b) Define the terms Impedance and Phase angle. (2M)
- c) Derive the equation for mutual inductance. (3M)
- d) State and explain the Thevenin's theorem. (3M)
- e) What are the differences between h-parameters and inverse h-parameters? (2M)
- f) Obtain the S-domain equivalent of an inductance with initial current  $I_0$ . (2M)

**PART -B**

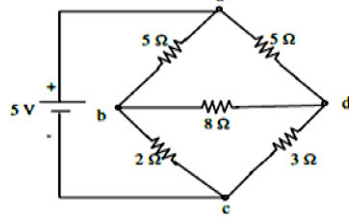
2. a) Derive the expressions for the inductance of series and parallel circuits. (7M)
- b) Find the power delivered by the 5A current source using nodal analysis. (7M)



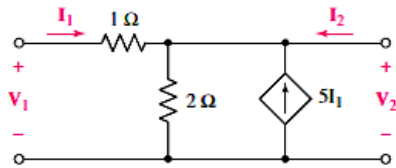
3. a) Derive an expression for resonance frequency in of an R-L-C series circuit. (7M)
- b) A 200 V, 50 Hz AC supply is applied to a coil of 0.08 H inductance and 3.5 Ω (7M)  
resistance connected in series with a 7.2 μF capacitor. Calculate Impedance and  
Current.
4. a) What is Resonance? Derive the expression for resonance frequency in a series (7M)  
RLC circuit.
- b) Compute  $v_1, v_2$  and the average power delivered to each resistor in the circuit (7M)



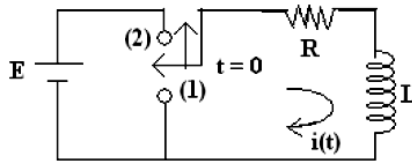
5. a) State and explain the Reciprocity theorem. (7M)  
 b) Find the current through  $8\ \Omega$  resistance for the network shown using Thevenin's theorem (7M)



6. a) Explain the cascading of two 2-port networks and derive the transmission parameters matrix. (7M)  
 b) Determine the admittance parameters which describe the two-port network shown (7M)



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 using Laplace transform approach. (7M)  
 b) Derive the expression for the current  $i(t)$  in a series R-L circuit When the switch is suddenly transferred from position 1 to position 2 at  $t=0$ . (7M)



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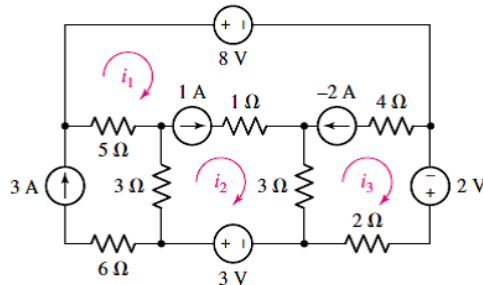
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**PART -A**

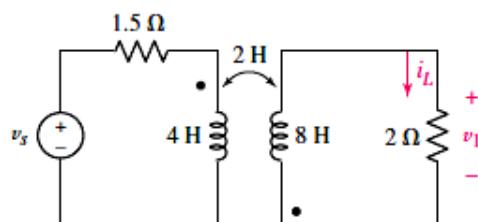
1. a) Define Peak factor and give its relation with r.m.s value. (2M)
- b) What is meant by super node and super mesh. (2M)
- c) Write the differences between series and parallel resonance. (3M)
- d) State the Norton's theorem. (2M)
- e) Obtain the expression for h-parameters in terms of Y-parameters. (3M)
- f) Explain the significance of transient response. (2M)

**PART -B**

2. a) Explain the properties of incidence matrix. (7M)
- b) Obtain numerical values for each of the mesh currents identified in the circuit (7M)

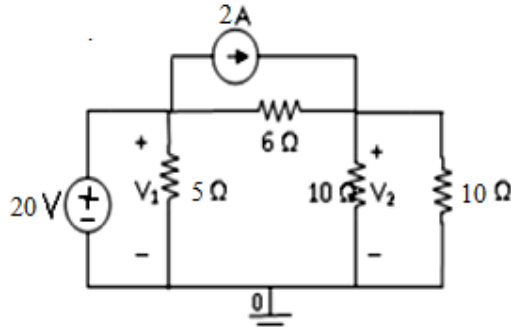


3. a) Derive the relations of impedances in star-to-delta transformation. (7M)
- b) When a 220V, 50Hz supply is applied to a  $15\Omega$  resistance in parallel with an inductor, the total current is 20A. What must be the frequency for the total current to be 30A, if the voltage remains the same? (7M)
4. a) Explain the Faraday's law of electromagnetic induction and list its applications. (7M)
- b) For the circuit in the figure, determine expressions for (i)  $I_L/V_s$ ; (ii)  $V_1/V_s$ . (7M)



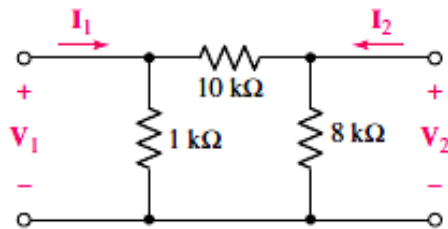
5. a) State the maximum power transfer theorem and derive the expression for maximum power transferred to the load. (7M)

b) Find the voltage across  $10\ \Omega$  resistance using superposition theorem. (7M)



6. a) Explain about the parameters used for series connected 2-port network. (7M)

b) Find the complete set of Y-parameters which describe the two-port network shown



7. a) Derive the expression for  $i(t)$  and voltage across capacitor  $V_c(t)$  for series R-C circuit with D.C voltage applied to it at  $t=0$ . (7M)

b) Using Laplace Transform, solve for the current  $i(t)$  in the RLC circuit. The capacitor is initially charged to a voltage of 2V. (7M)

