

I B.Tech Supplementary Examinations, Aug/Sep 2008

ELECTRICAL CIRCUITS ANALYSIS

(Common to Electrical & Electronic Engineering and Instrumentation & Control Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Two resistances when they are in series has an equivalent resistance of 9 ohms and when connected in parallel has an equivalent resistance of 2 ohms. Find the resistances and the ratio of the voltage and current sharing between these elements if supply voltage is 50V.
- (b) Find the equivalent resistance between the terminals AB in the network as shown in figure 1b, if each has a resistance of R ohms and hence find the total current, current through each of the element if the total voltage is 45V. [8+8]

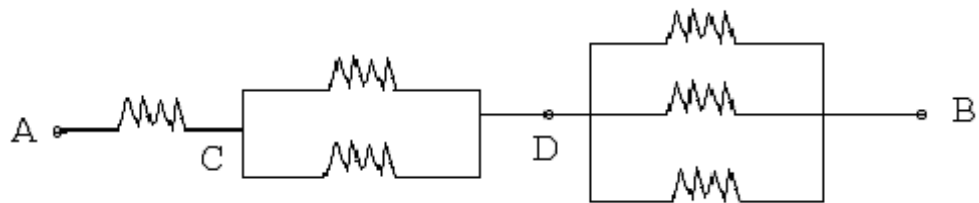


Figure 1b

2. (a) Derive an expression for the energy stored in an inductor and a capacitor.
- (b) Obtain an expression for Co-efficient of coupling. [10+6]
3. (a) Compare series and parallel resonant circuits.
- (b) A series RLC circuit consists of resistor of $100\ \Omega$, an inductor of 0.318H and a capacitor of unknown value. When this circuit is energised by a 230V , 50Hz ac supply, the current was found to be 23A . Find the value of capacitor and the total power consumed. [4+12]
4. A symmetrical 3-phase, 3-wire, 440V supply is connected to a star connected load. The impedances in each branch are : $Z_1=(2+j3)\Omega$, $Z_2=(1-j2)\Omega$, $Z_3=(3+j4)\Omega$. Find its equivalent delta connected load. Hence find the phase and line currents and the total power consumed in the circuits. [16]
5. In the network as shown in figure 5, the numerical values of resistances are given with numbers. Write the oriented graph of the network. Select a tree with branches 1, 2, 3 as the tree branches, write tie-set and cut-set schedule.. The numbers in the brackets are related to element numbering. [16]

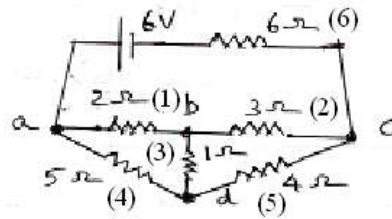


Figure 5

6. (a) State and explain reciprocity theorem.
 (b) Verify reciprocity theorem for the voltage V and Current I in the network shown in figure 6b. [6+10]

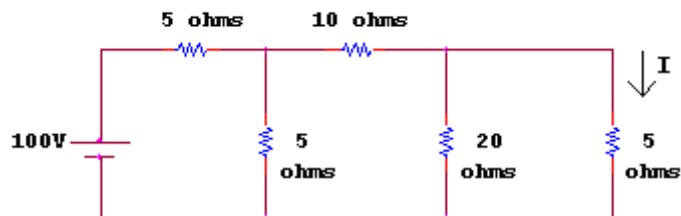


Figure 6b

7. Derive the expression for transient response of RLC series circuit with unit step input. [16]
 8. Two identical sections of the network shown in figure 8 are connected in parallel. Obtain the Y parameters of the resulting n/w and verify the result by direct calculation. [6+10]

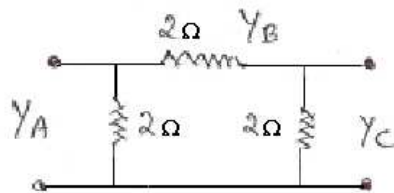


Figure 8

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1. (a) Find the power drawn by each element in the network as shown in figure 1a.

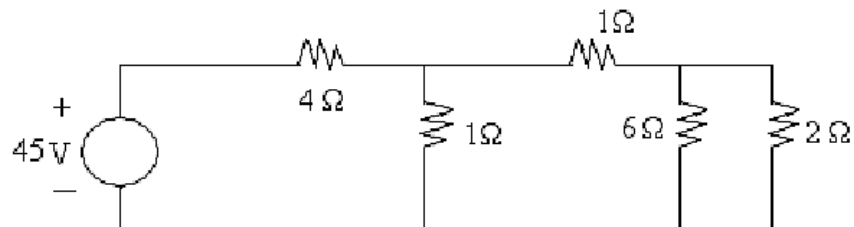


Figure 1a

- (b) Find the current through each element in the network as shown in figure 1b by network reduction technique. [8+8]

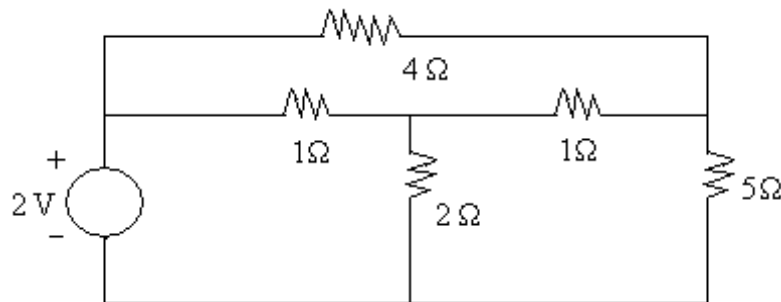


Figure 1b

2. (a) Derive an expression for the energy stored in an inductor and a capacitor.
(b) Obtain an expression for Co-efficient of coupling. [10+6]
3. Calculate the form factor and peak factor of a triangular wave in which the voltage rises uniformly from 0 to V volts in time T seconds and completes the cycle by falling instantly back to zero. [16]
4. A symmetrical 3-phase, 3-wire, 440V supply is connected to a star connected load. The impedances in each branch are : $Z_1=(2+j3)\Omega$, $Z_2=(1-j2)\Omega$, $Z_3=(3+j4)\Omega$. Find its equivalent delta connected load. Hence find the phase and line currents and the total power consumed in the circuits. [16]
5. (a) State properties of trees.

(b) State the properties of complete incidence matrix. [6+10]

6. (a) Solve for current in 5 ohms resistor by principle of super position theorem shown in figure 6a.

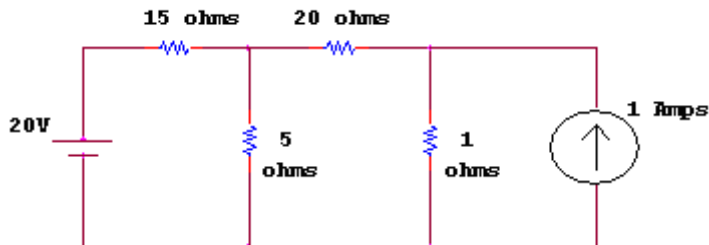


Figure 6a

(b) State and explain Millmann's theorem. [10+6]

7. In the circuit shown in the figure 7, the switch is put in position - 1 for 1 m sec and then thrown to position - 2. Find the transient current in both intervals. [16]

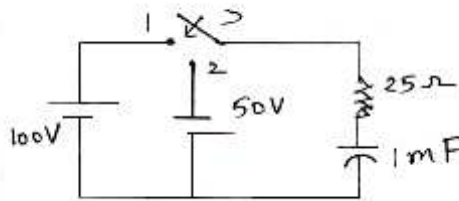


Figure 7

8. (a) Find the h - parameter of the n/w shown in figure 8a:

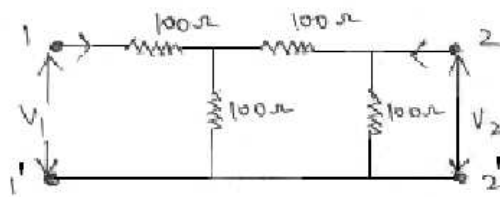


Figure 8a

- (b) Find the transformed ABCD parameters of the n/w as shown in figure 8b. [8+8]

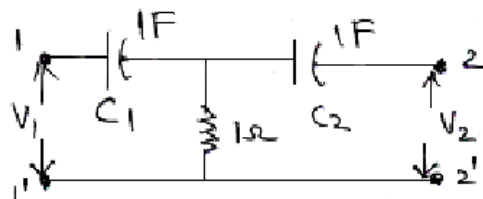


Figure 8b

Code No: 07A1EC02

Set No. 2

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1. (a) A bridge network ABCD is arranged as follows:
Resistance between terminals AB, BC, CD, DA and BD are 10 ohms, 30 ohms, 15 ohms, 20 ohms and 40 ohms respectively. A 4V battery is connected with negligible internal resistance between terminals A and C. Determine the current through each element in the network using network reduction techniques.
(b) Three equal resistances are available. Find
 - i. Two ratios of the equivalent resistances when they are connected in parallel.
 - ii. The ratio of the current through each elements when they are connected in parallel. [10+6]
2. (a) Derive an expression for the energy stored in an inductor and a capacitor.
(b) Obtain an expression for Co-efficient of coupling. [10+6]
3. Calculate the form factor and peak factor of a triangular wave in which the voltage rises uniformly from 0 to V volts in time T seconds and completes the cycle by falling instantly back to zero. [16]
4. (a) Three identical impedances of $(3+j4)\Omega$ are connected in delta. Find an equivalent star network such that the line current is the same when connected to the same supply.
(b) Three impedances of $(7+j4)\Omega$, $(3+j2)\Omega$ and $(9+j2)\Omega$ are connected between neutral and the R, Y and B phases. The line voltage is 440V, Calculate.
 - i. The line currents and
 - ii. The current in the neutral wire.
 - iii. Find the power consumed in each phase and the total power drawn by the circuit. [4+12]
5. (a) State properties of trees.
(b) State the properties of complete incidence matrix. [6+10]
6. (a) Find the current through the branch A-B of the network shown in the figure 6a using Thevenins theorem.

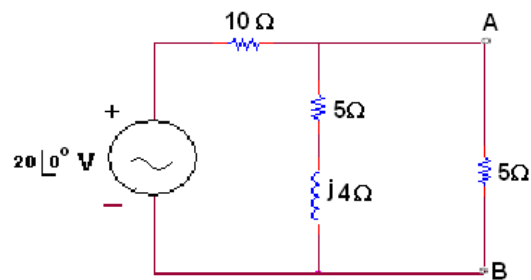


Figure 6a

- (b) State and explain compensation theorem. [6+10]
7. Derive an expression for the current response in R-L series circuit with a sinusoidal source. [16]
8. Compute the transformed Z and Y parameters for the circuit shown in figure 8. [8+8]

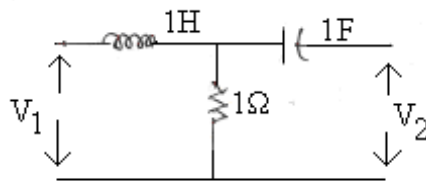


Figure 8

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 Resistance between terminals AB, BC, CD, DA and BD are 10 ohms, 30 ohms, 15 ohms, 20 ohms and 40 ohms respectively. A 4V battery is connected with negligible internal resistance between terminals A and C. Determine the current through each element in the network using network reduction techniques.
- (b) Three equal resistances are available. Find
 - i. Two ratios of the equivalent resistances when they are connected in parallel.
 - ii. The ratio of the current through each elements when they are connected in parallel. [10+6]
2. (a) Derive an expression for the energy stored in an inductor and a capacitor.
- (b) Obtain an expression for Co-efficient of coupling. [10+6]
3. (a) Derive an expression for the current, impedance, average power for a series RC circuit excited by a sinusoidally alternating voltage and also find the power factor of the circuit. Draw the phasor diagram.
- (b) A series R-L series circuit having a resistance of 4Ω and 3 ohms inductive reactance is fed by 100V, 50Hz, $1-\phi$ supply. Find current, power drawn by the circuit and power factor. [8+8]
4. A balanced 3-phase system supplied from 400V, 50Hz supply has R, L and C elements connected parallel in each phase. The values of R, L and C are 10Ω , 1H and $100\mu\text{F}$ respectively. Calculate the line current, the power and power factor. [16]
5. (a) Write the tie - set schedule for the network shown in figure 5a.

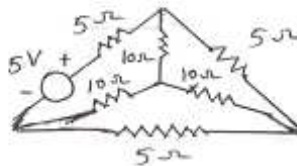


Figure 5a

- (b) Using mesh analysis, determine the voltage V which gives a voltage of 50V across $10\ \Omega$ resistor shown in figure 5b. [6+10]

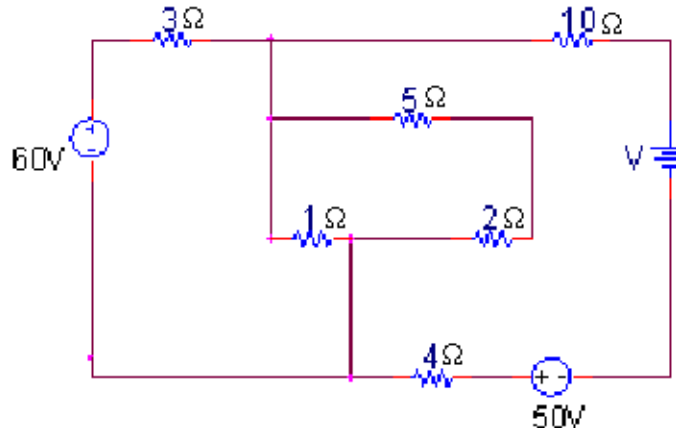


Figure 5b

6. (a) A load impedance of $(20 - jX_c)$ ohms is supplied from a source of emf 10V rms and internal impedance $(20 + j20)$ ohms. Find the value of X_c to give maximum power dissipation in the load and calculate the value of this power.
- (b) For the circuit of the figure 6b, find the value of current through PQ using Superposition theorem. [6+10]

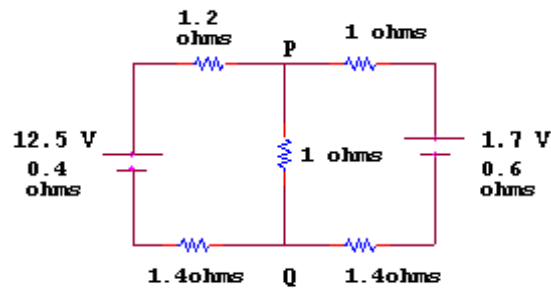


Figure 6b

7. Derive an expression for the current response in R-L series circuit with a sinusoidal source. [16]
8. For the two port n/w shown in the figure 8, the currents I_1 and I_2 entering at port 1 and 2 respectively are given by the equations.
- $$I_1 = 0.5 V_1 - 0.2 V_2$$
- $$I_2 = -0.2 V_1 + V_2$$

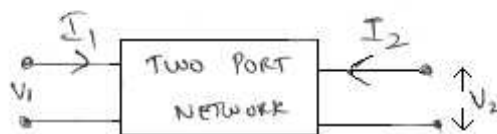


Figure 8

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Set No. 4

Where V_1 and V_2 are the port voltages at port 1 and 2 respectively. Find the Y, Z, ABCD parameters for the n/w. Also find its equivalent π network. [16]
