Code No: R05010401 **Set No. 1**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
NETWORK ANALYSIS
(Common to Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Electronics & Telematics and Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Draw the wave forms of i_R ,i_L and i_C for the circuit shown in Figures 1a & 1a, When it is excited by a Voltage source having a wave form shown below.

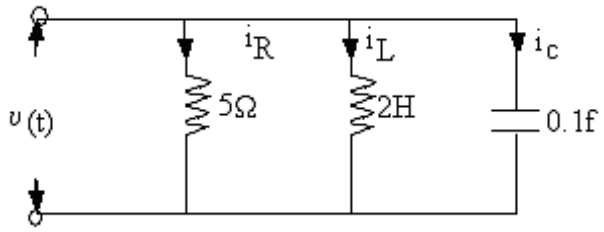

Figure 1a

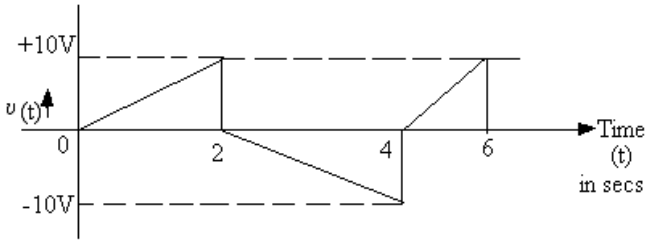

Figure 1a

(b) What is an incidence matrix? What are cutset and Tieset matrix? Illustrate with a suitable example.

(c) Draw the dual of the Network shown in Figure 1c.

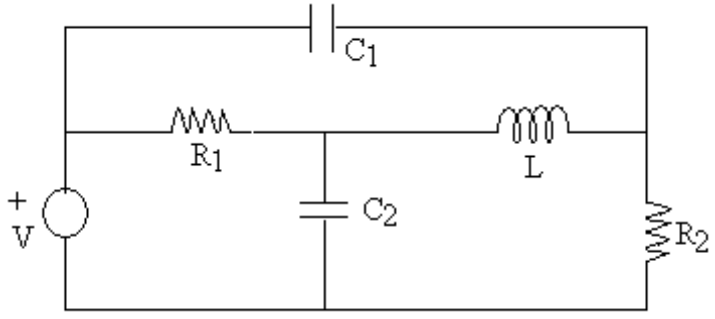

Figure 1c

2. (a) Explain what you understand by coefficient of coupling and derive expression for it.

(b) Two identical coils with L=0.02H have a coefficient of coupling of 0.8. Find

mutual inductance and the two equivalent inductances with the two coils connected in series aiding and series opposing. Derive the equations employed.

(c) An iron ring of 20cm diameter and 5cm2 in cross section is wound with 200 turns. The relative permeability of iron is 500. To establish a flux density of 1wb/m2, Determine the magnetizing current in the coil. [5+7+4]

3. (a) A coil of Resistance 20Ω and inductance of 0.2H is connected in parallel with a capacitor of 100μF. Determine the resonant frequency and input impedance at Resonance.

(b) A series R-L circuit with R=20Ω and L=5H has a constant voltage V=50V applied at t=0 by closing the switch S. Determine the current i(t), V_R(t) and V_L(t) for t>0.(Figure 3b)

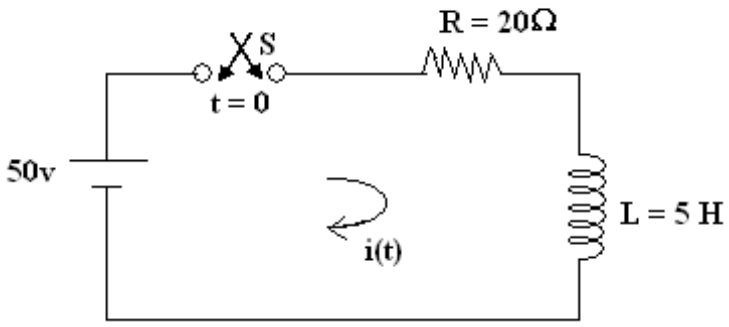

Figure 3b

(c) Determine the value of c such that the power factor of the circuit is unity (Figure 3c). [6+6+4]

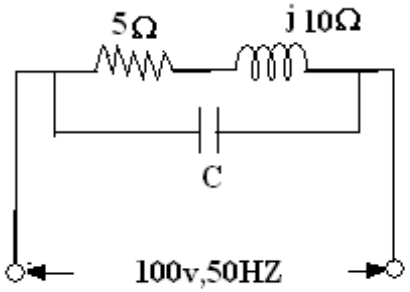

Figure 3c

4. (a) Obtain the S-Domain Equivalent for the following elements (Figure 4a).

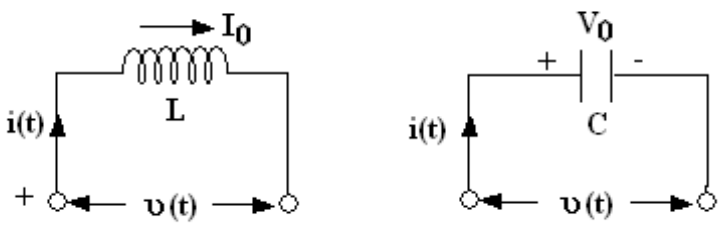

Figure 4a

(b) Define the RMS value Average value and form factor of the periodic quantity.

(c) A sinusoidal Voltage of 50 Sin25 t is applied to a series circuit of R=10Ω and L=2H at t=0. By Laplace Transform method, Determine the current I(t) for all t≥0, Assume Zero initial conditions. (Figure 4) [4+4+8]

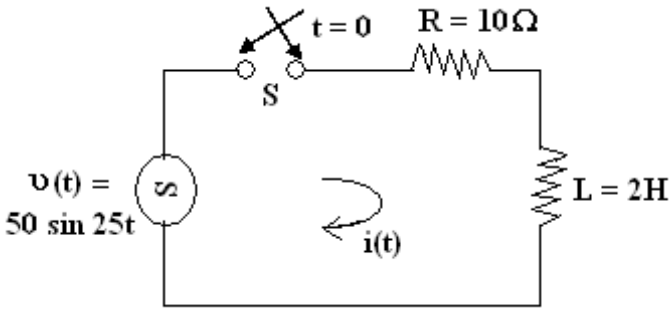

Figure 4

5. (a) State and explain Max. Power transfer theorem which a circuit is excited by a.c. source.

(b) Find the load impedance for max. power transfer in the network of Figure 5? If the load is purely resistive, what will be its value for max. power transfer? Also, find the max. power taken by the load in both cases. [6+10]

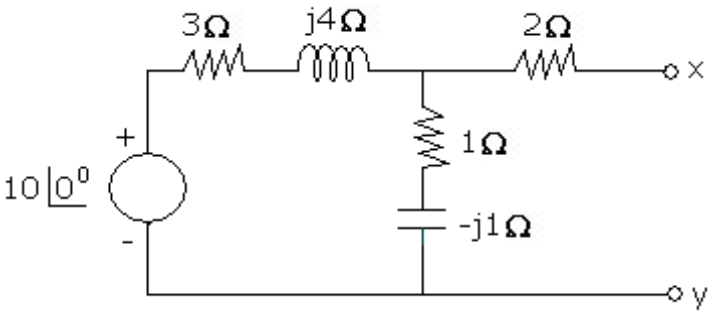

Figure 5

6. (a) Determine the transfer voltage ratio function of the given network shown in Figure 6a.

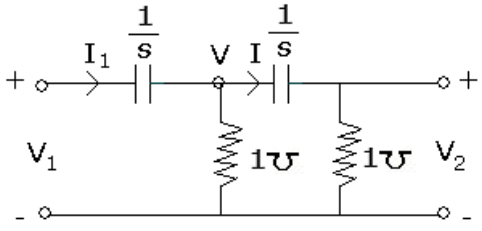

Figure 6a

(b) Determine the driving point admittance of the given T-bridged network shown in Figure 6. [6+10]

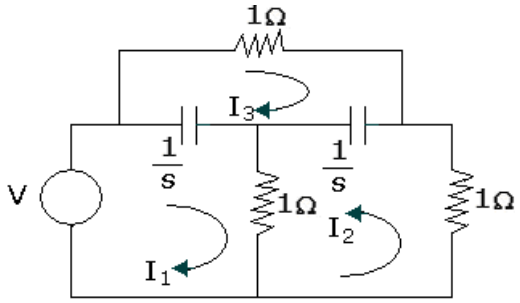

Figure 6

7. (a) Figure 7a shows a resistive T network and a resistive Π network connected in parallel. Find the overall y parameters of the combination.

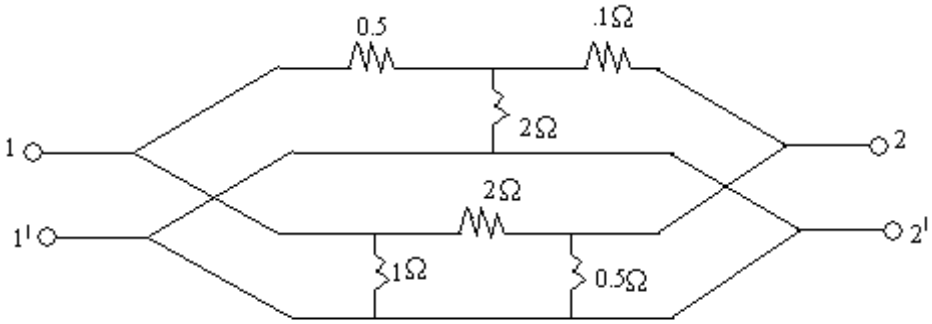

Figure 7a

(b) Find the characteristic impedance of a symmetrical T network. [10+6]

8. (a) Design the T section of an m-derived high pass filter having a design impedance of 300Ω and cut off frequency of 2000 Hz. The frequency of infinite attenuation is 1700Hz.

(b) For the above problem, plot variation of attenuation, phase shift and Z_0 as frequency varies from 0 to 3000 Hz. [10+6]

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Code No: R05010401 **Set No. 2**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
NETWORK ANALYSIS
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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⋆ ⋆ ⋆ ⋆ ⋆

1. (a) The following current wave form i(t) is passed through a series R-L circuit with R =2 Ω and L =2 mH. Find the Voltage across each element and sketch the same. (Figure 1a)

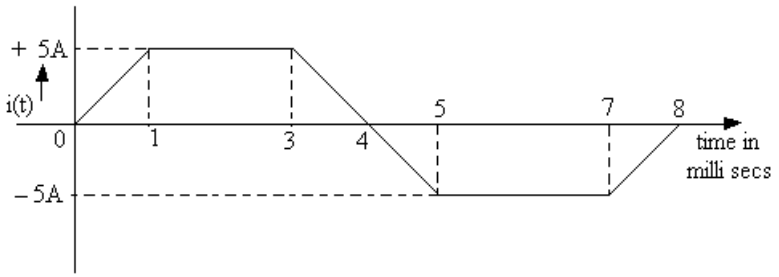

Figure 1a

(b) Using nodal analysis, determine the Power supplied by 8V Voltage source. (Figure 1b)

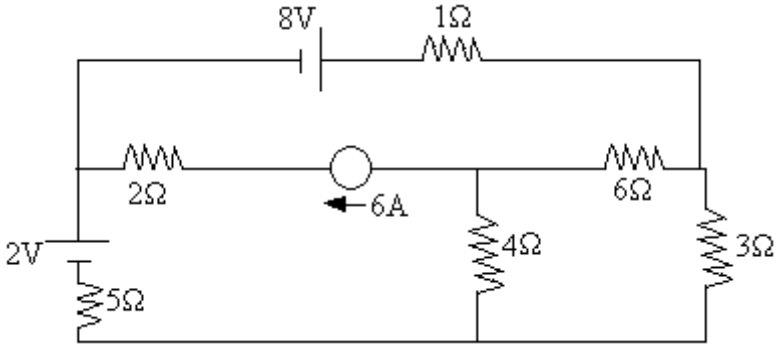

Figure 1b

(c) Write the Tieset matrix for the graph shown in Figure 1c, taking the tree consisting of branches 2,3,4. [6+6+4]

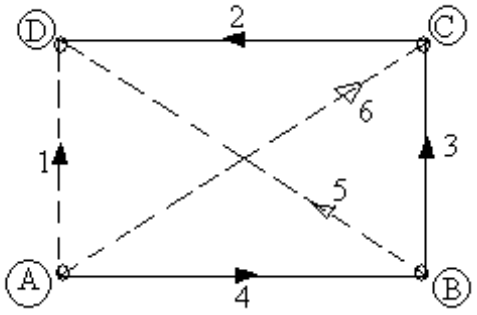

Figure 1c

2. (a) Explain what you understand by coefficient of coupling and derive expression for it.

   (b) Two identical coils with L=0.02H have a coefficient of coupling of 0.8. Find mutual inductance and the two equivalent inductances with the two coils connected in series aiding and series opposing. Derive the equations employed.

   (c) An iron ring of 20cm diameter and 5cm2 in cross section is wound with 200 turns. The relative permeability of iron is 500. To establish a flux density of 1wb/m2, Determine the magnetizing current in the coil. [5+7+4]

3. (a) Determine the branch currents and total current in the circuit shown in Figure 3a. Also determine total active and Reactive power taken by the circuit.

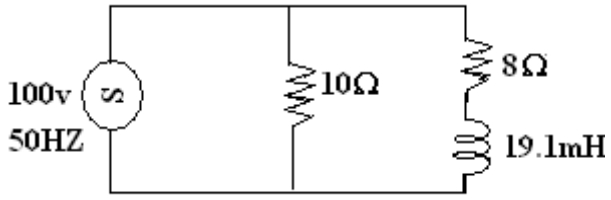

Figure 3a

   (b) Define Q-factor of a resonant circuit and obtain the relation with Band Width.

   (c) In the circuit shown in Figure 3,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. [6+4+6]

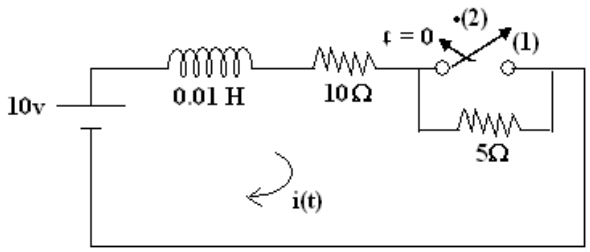

Figure 3

4. (a) In the circuit (Figure 4a) shown steady state conditions are reached with the switch K in position 1. At t=0, the switch is changed over to position 2. Using Laplace Transform method, determine the current thought the inductor i (t) for all t≥0.

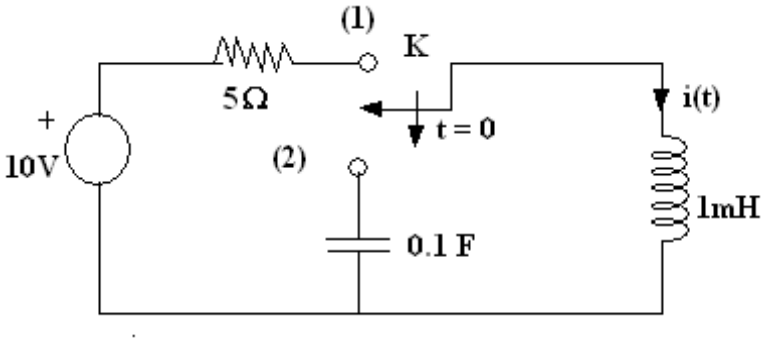

Figure 4a

(b) Using Laplace Transform solve for the current i(t) in the RLC circuit. The capacitor is initially charged to a voltage of 2V. (Figure 4) [8+8]

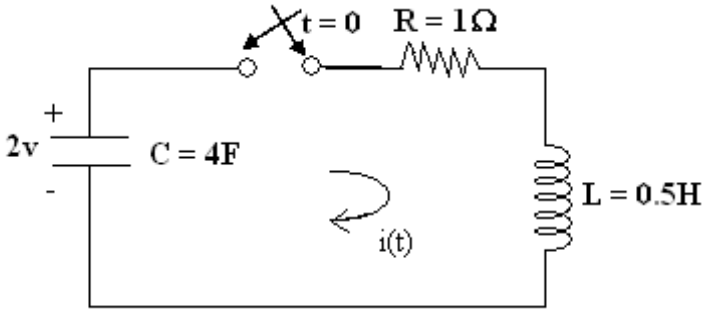

Figure 4

5. (a) State and explain Max. Power transfer theorem which a circuit is excited by a.c. source.

(b) Find the load impedance for max. power transfer in the network of Figure 5? If the load is purely resistive, what will be its value for max. power transfer? Also, find the max. power taken by the load in both cases. [6+10]

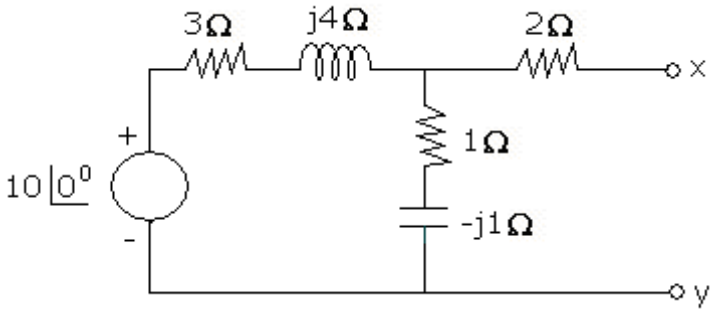

Figure 5

6. (a) Write the standard g-parameters equations?

(b) What is the relation between [z] and [y]?

(c) For the two-port network as shown in Figure 6, determine the admittance matrix. [3+3+10]

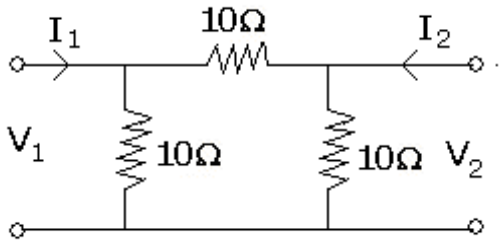

Figure 6

7. (a) For a standard T section, show that $Z_{o(T)}$ is given by $\sqrt{z_1 z_2\left(1+\frac{z_1}{4z_2}\right)}$

   (b) For a T-network, the total series inductance in 40 mH and the total shunt capacitance is 0.2 μF. Calculate

   i. cut off frequency

   ii. the image impedance

   iii. Attenuation constant and phase constant at 3500 Hz and 4500 Hz. [6+10]

8. (a) Explain the variation of Attenuation, phase shift and characteristic impedance of m derived high pass filter?

   (b) Draw the circuit diagram for T and Π sections of m-derived high pass filter. [10+6]

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Code No: R05010401 **Set No. 3**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
NETWORK ANALYSIS
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) "The Current through an inductor can not change instantaneously". Explain and justify the statement.
   (b) Determine the branch Currents in the network (Figure 1b) show using Kirchoff's Laws.

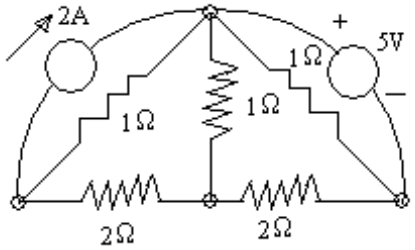

Figure 1b

   (c) The current source of the wave form show in Figure 1 is connected to a series R-L circuit at t=0.If r=1 ohm and L= 2H,determine the Voltage across Resistance $V_R(t)$ and voltage across the inductance $V_L(t)$ for the period $0 \leq t \leq 2$ and sketch the variations of $V_R(t)$ and $V_L(t)$. [4+6+6]

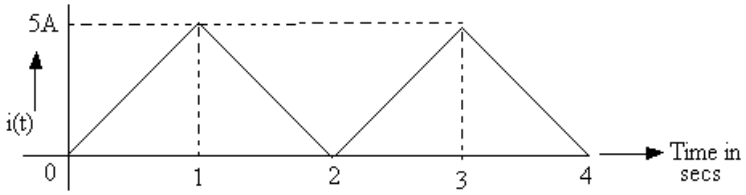

Figure 1

2. (a) Explain the dot convention for magnetically coupled coils and mark the dotted ends for the coils shown on the magnetic core (Figure 2a). Using different symbols.

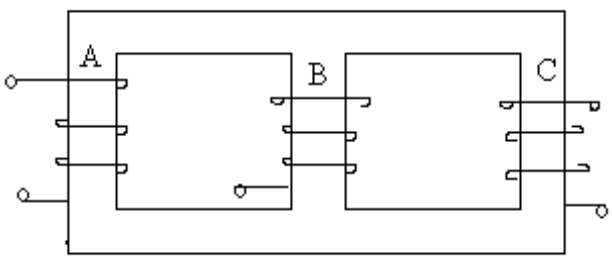

Figure 2a

(b) The numbers of turns in two coupled coils are 600 and 1700 turns respectively. When a current of 6A flow in coil 2 the total flux in the coil is 0.8mwb and the flux linking with the first coil is 0.5mwb.Calculate L_1, L2,M and coefficient of coupling.

(c) A1500 turns coil surrounds a magnetic circuit which has a reluctance of $6*10^6$ AT/wb. Calculate the inductance of the coil. [5+7+4]

3. (a) A coil of Resistance 20Ω and inductance of 0.2H is connected in parallel with a capacitor of 100μF. Determine the resonant frequency and input impedance at Resonance.

(b) A series R-L circuit with R=20Ω and L=5H has a constant voltage V=50V applied at t=0 by closing the switch S. Determine the current i(t), V_R(t) and V_L(t) for t>0.(Figure 3b)

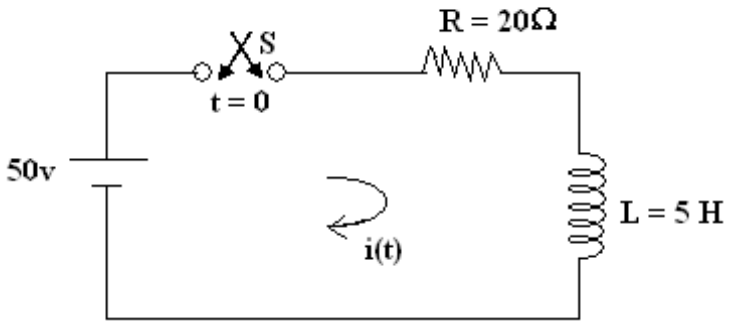

Figure 3b

(c) Determine the value of c such that the power factor of the circuit is unity (Figure 3c). [6+6+4]

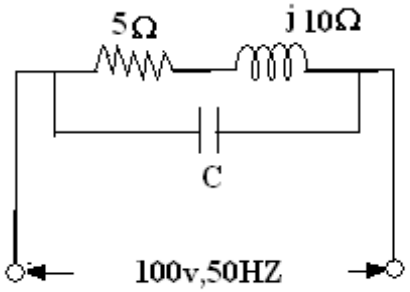

Figure 3c

4. (a) The switch in the circuit (Figure 4a) shown is closed at t=0.The excitation V(t)=0.1 e^{-3t}u(t). Assuming relaxed conditions, for the circuit, determine i(t) for t >0 Use LaplaceTransform method.

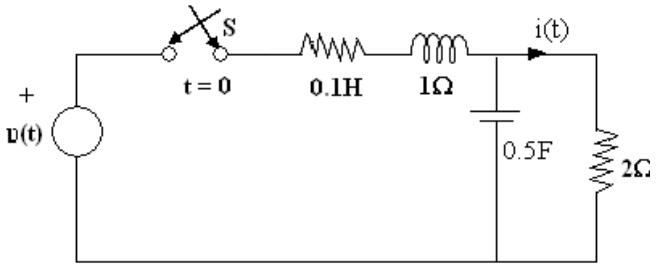

Figure 4a

(b) Find the RMS and Average values of the wave form it V_m =100Volts.(Figure 4) [8+8]

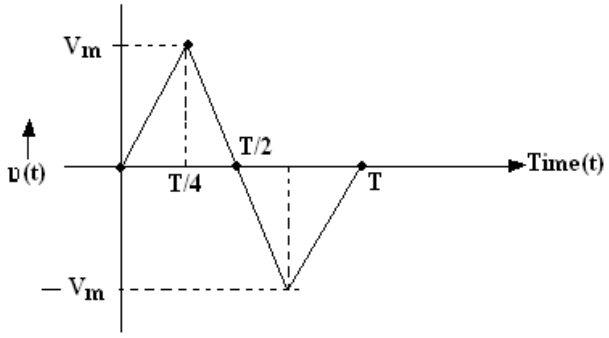

Figure 4

5. (a) State and explain Norton's theorem?

(b) Using Thevenin's theorem, find the current through 1 Ω resistor in the circuit shown in Figure 5b. [6+10]

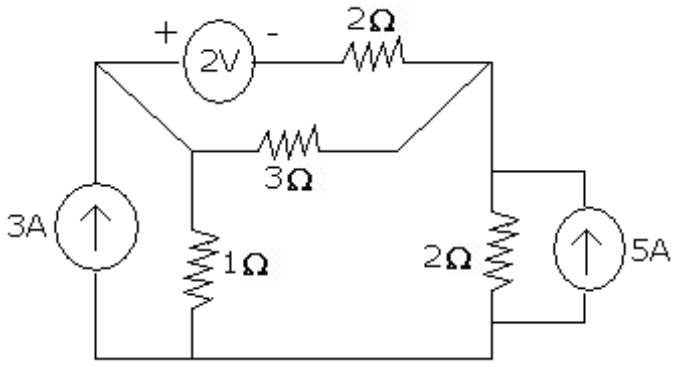

Figure 5b

6. (a) Find the driving point impedance of the network shown in Figure 6a at the terminals $1,1^1$.

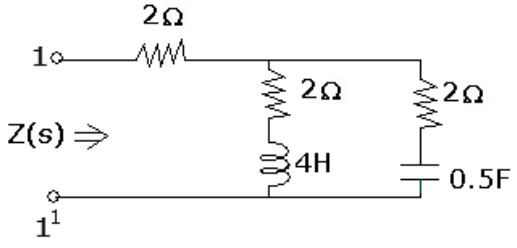

Figure 6a

(b) Define transfer function of a network? Obtain the voltage ratio transfer function $V_0(s)/V_i(s)$ of the network shown in Figure 6. [8+8]

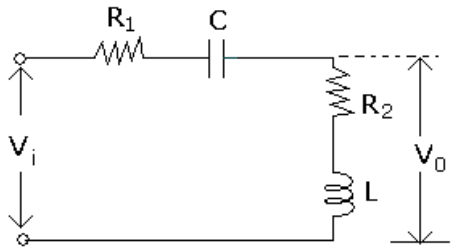

Figure 6

7. (a) Explain
   i. propagation constant
   ii. Attenuation.

   (b) A symmetrical T section has an inductance of 0.47H in each series arm and a 300μ F capacitor in the shunt arm.
   i. Find the characteristic impedance at frequencies fo 50 Hz and 100 Hz,
   ii. If the T section is terminated in the characteristic impedances, find the ratio of load current to input current at both the frequencies. [6+10]

8. (a) What is constant k-filter? What is the difference between constant k-filter and m-derived filter? What are the limitations of constant K-filter?

   (b) Find the circuit parameters of a constant k-band pass filter having a pass band from 500 Hz and a characteristic resistance of 100Ω. [8+8]

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Code No: R05010401 **Set No. 4**

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Time: 3 hours **Max Marks: 80**

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1. (a) Describe the Volt-ampere relations for R , L and C Parameters.
   (b) Derive the expression for the energy stored in an ideal inductor.
   (c) Find the Currents I_1 and I_2 using Nodal Analysis. (Figure 1) [4+4+8]

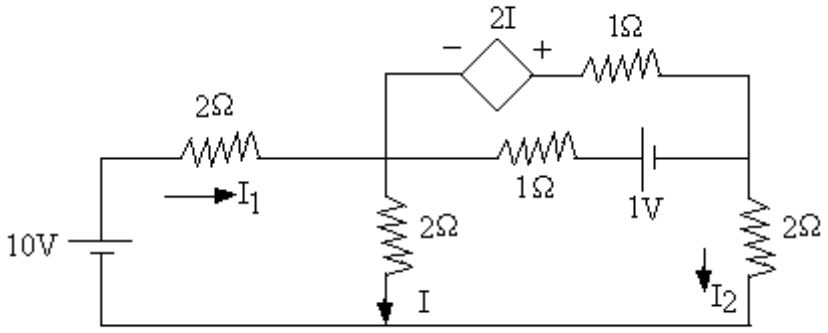

Figure 1

2. (a) A Transformer has 100 turns on the primary and 200 turns on the secondary .A current in the primary causes a flux which links all turns of both the primary and secondary .The flux decreases according to the law $\phi = e^{-t}$ Webers for all t $\geq$0.Find
      i. the flux linkages of the primary and secondary
      ii. the voltage induced in the secondary
      iii. If the coefficient of the coupling is 0.95 , What happens to the voltage induced in the secondary.
   (b) Write down the Loop Equations for the coupled network shown in Figure 2b.

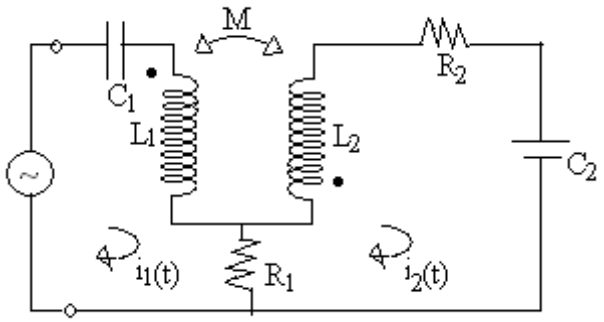

Figure 2b

(c) Calculate the MMF required to produce a flux of 0.01 wbs across an air gap of 2mm length having an effective area of 200cm^2 in a magnetic circuit.[6+6+4]

3. (a) A parallel circuit comprises of two branches having impedances Z_1 =(10+j30)Ω and Z_2 =(6-j8)Ω. The total current taken is 15A. What is the power taken by each branch and the total power consumed by the circuit.

(b) A coil of inductance 2H and resistance of 10Ω in series with condenser 'C' is supplied at constant voltage from variable frequency. If a maximum current is 10A at 75Hz, find the value of C and also determine the frequency when the current is 5A.

(c) In the circuit (Figure 3) shown switch K is closed at t=0 find the value of i, di/dt, d^2i/dt^2 t=0^+. [6+6+4]

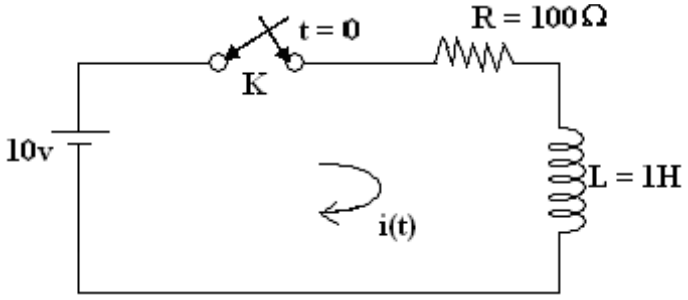

Figure 3

4. (a) Find the Laplace Transform of single pulse shown in Figure 4a.

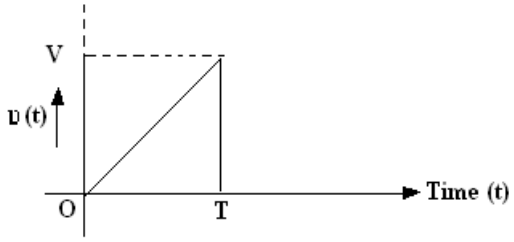

Figure 4a

(b) Define RMS value, Average value, Form factor of an alternating quantity. Also state the relationship between them.

(c) Find the RMS value of the voltage wave whose equation is v(t)=10+200 Sin(wt-30^o)+100Cos3wt-50 Sin(5wt+60^0). [8+4+4]

5. (a) Draw the phasor diagram for R, L, C series circuit when it is excited by sinusoidal voltage?
   (b) What is duality? Explain the procedure for obtaining the dual of the given planar network?
   (c) Draw the dual of the following network shown in Figure 5c. [6+6+4]

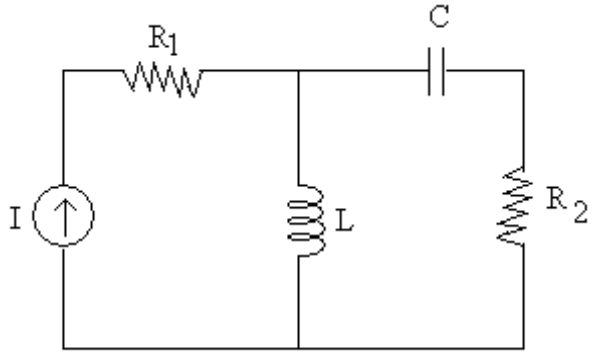

Figure 5c

6. (a) Obtain the expressions of ABCD parameters in terms of z parameters.
   (b) Determine the ABCD parameters of given network as shown in Figure 6. [6+10]

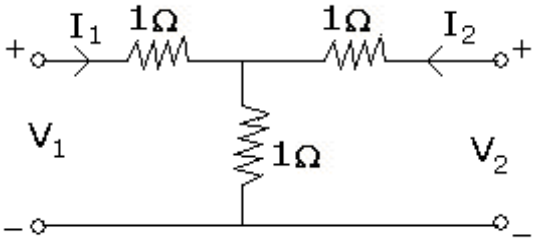

Figure 6

7. (a) An attenuator is composed of symmetrical T-section having series arm each of 175Ω and shunt arm of 350Ω. Derive expression for and calculate the characteristic impedance of this network and attenuation per section.
   (b) Design an unbalanced asymmetrical Π-attenuator with loss of 40 dB to operate between 200Ω line and 800Ω line. [8+8]

8. (a) Draw the circuit diagram of a constant k band pass filter. Draw the diagrams to show the variations of attenuation, phase shift.
   (b) In constant k band pass filter, the ratio of capacitance in the shunt and series arms is 100:1. The resonant frequency of both arms in 1000 Hz. Find the band width? [10+6]

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