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

I B.Tech Supplimentary Examinations, February 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) Distinguish between
   i. Active and Passive elements,
   ii. Unilateral and Bilateral elements
   iii. Linear and Non Linear elements.

   Give examples for each type of element.

   (b) Using Loop method of Analysis, determine the current in 2 ohms resistors. (Figure 1b)

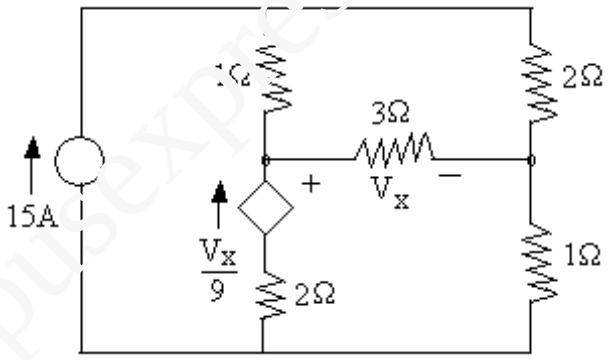

Figure 1b

   (c) Explain the procedure for drawing the dual of a Planar work and draw the dual of network shown in Figure 1. [6+6+4]

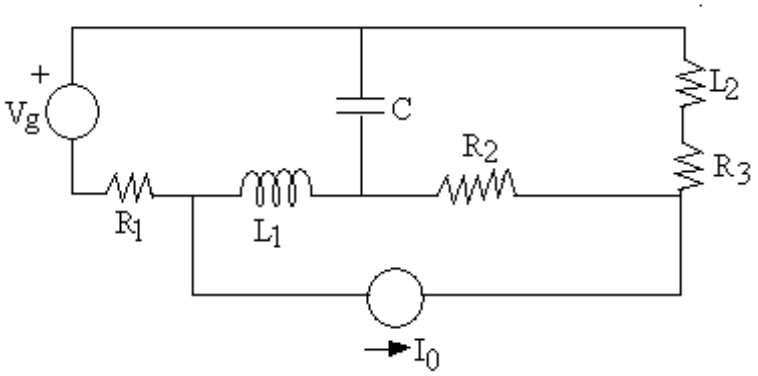

Figure 1

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.

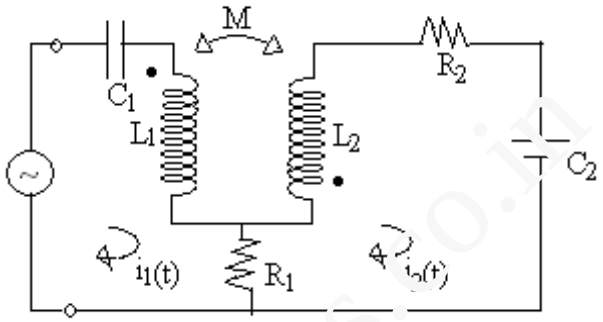

Figure 2b

(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) Show that in a series R-L-C circuit, the resonant frequency is the geometric mean of half power frequencies

(b) The voltage applied to a circuit and the current drawn are V= (200 – j100)V and I= (60 + j40) A respectively. Determine the circuit parameters and power dissipated.

(c) Derive the expression for i(t) when the switch S is suddenly Closed at t=0 in the circuit shown in Figure 3c. Sketch the variation of i(t) with Respect to time. [6+6+4]

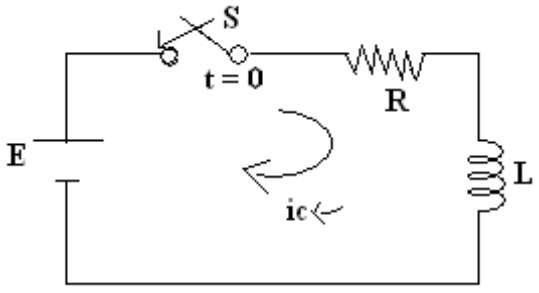

Figure 3c

4. (a) Obtain the response of R-L-C series circuit for impulse excitation. Use Laplace Transform method.

(b) Obtain the S domain equivalent for the following network (Figure 4b) elements.

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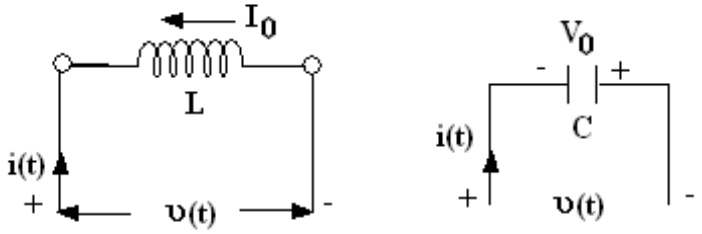

Figure 4b

(c) Define RMS value, Average value form factor of a periodic quantity. [8+5+3]

5. (a) State and explain reciprocity theorem.

(b) Calculate the current i_y in the network of Figure 5b using superposition theorem. [6+10]

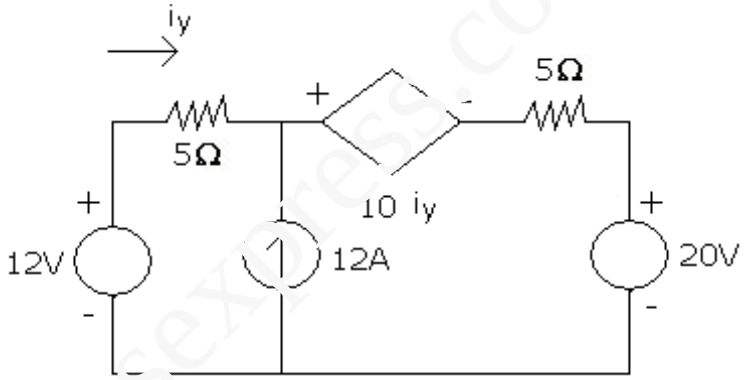

Figure 5b

6. (a) Obtain the short circuit admittance parameters of the network shown in Figure 6a and there by obtain the A, B, C, D parameters?

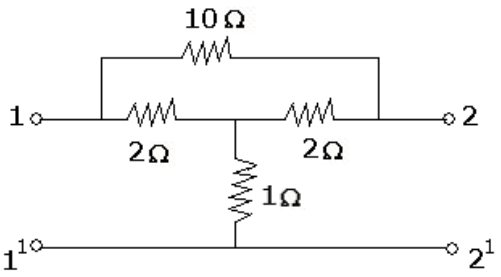

Figure 6a

(b) Express z-parameters in terms of h-parameters? [12+4]

7. Derive the expressions for attenuation constant, phase constant, cut-off frequency and characteristic impedance of a symmetrical Π section. [16]

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**

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   (b) Using Loop method of Analysis, determine the current in 2 ohms resistors. (Figure 1b)

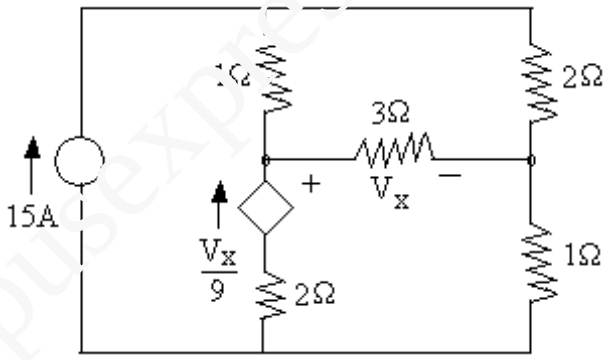

Figure 1b

   (c) Explain the procedure for drawing the dual of a Planar work and draw the dual of network shown in Figure 1. [6+6+4]

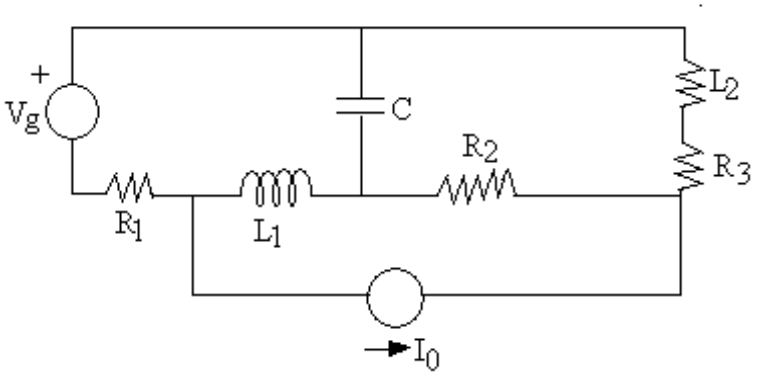

Figure 1

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
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(b) Write down the Loop Equations for the coupled network shown in Figure 2b.

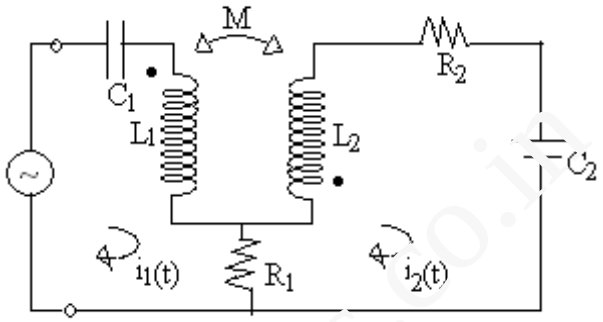

Figure 2b

(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) Derive the expression for the current i(t) in a series R-L circuit When the switch s is suddenly transferred from position 1 to position 2 at t=0, Also determine the expressions for V_R(t) and V_L(t). (Figure 3a)

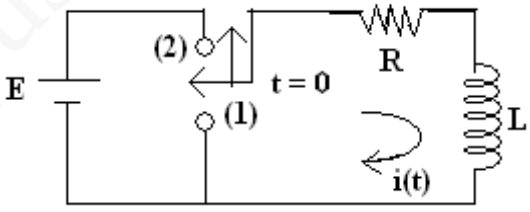

Figure 3a

(b) A two element series circuit is connected across an A.c source given by V=200$\sqrt{2}$ sin(314t+20^0). The current in the circuit is found to be i=10$\sqrt{2}$cos(314t-25^0). Determine the parameters of the circuit . Also Determine the power factor, Real power and Reaction power taken by the circuit.

(c) Derive the expression for "Band Width" in a series R-L-C circuit. [6+6+4]

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

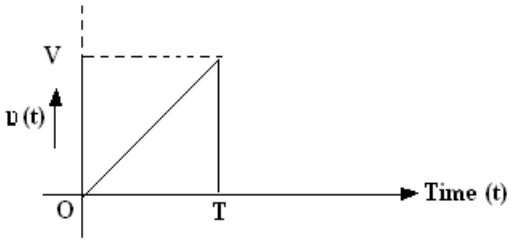

Figure 4a

(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) State and explain max. power transfer theorem when a circuit is excited by d.c. source.

(b) Give the applications of max. power transfer theorem.

(c) Determine the value of R_L in the network shown in Figure 5 for max. power transfer and calculate the value of power. [6+2+8]

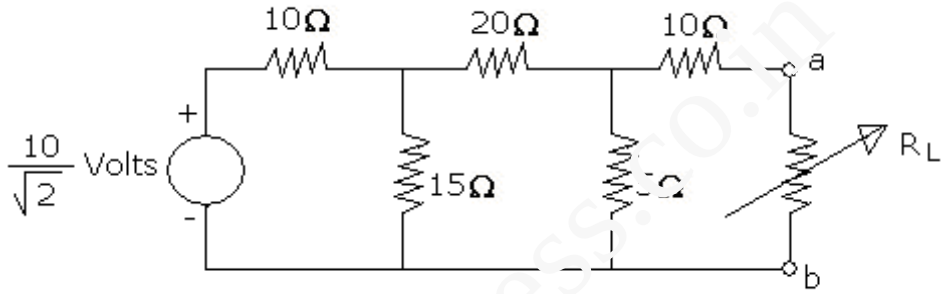

Figure 5

6. (a) Why Z-parameters are known as open circuit parameters?

(b) What is meant by port? Explain two port network?

(c) Find the y-parameters for the network shown in Figure 6. [3+3+10]

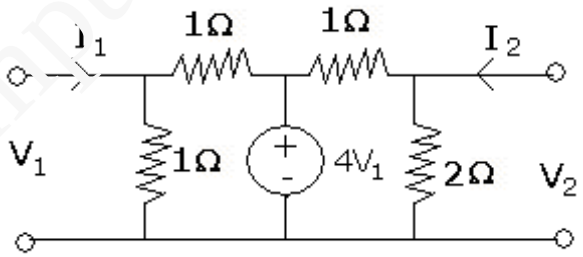

Figure 6

7. (a) For a symmetrical Π section, show that $Z_0(\pi) = \sqrt{\frac{Z_1 Z_2}{\left(1+\frac{Z_1}{4Z_2}\right)}}$

(b) Obtain the image impedance of the network shown in Figure 7. [6+10]

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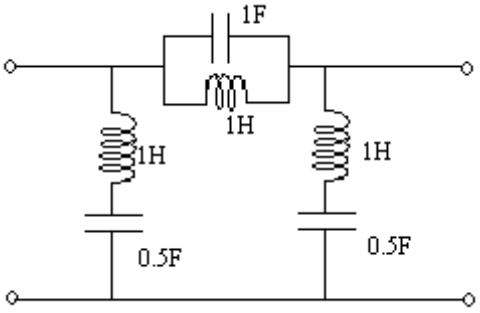

Figure 7

8. (a) Explain m derived low pass T-section and Π section and in detail.
   (b) What is filter? Explain various types of filters? [10+6]

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

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1. (a) State and Explain Kirchoff's Laws.
   (b) For the given network graph shown in Figure 1b, obtain the Basic tieset matrix, taking the tree consisting of edges 2,4,5.Write down the network Equations from the above matrix.

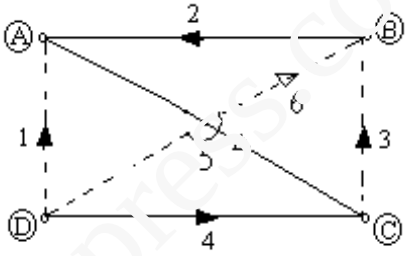

Figure 1b

   (c) Find the Voltage between A & B for the given Circuit (Figure 1) using Loop current method of analysis. [4+6+6]

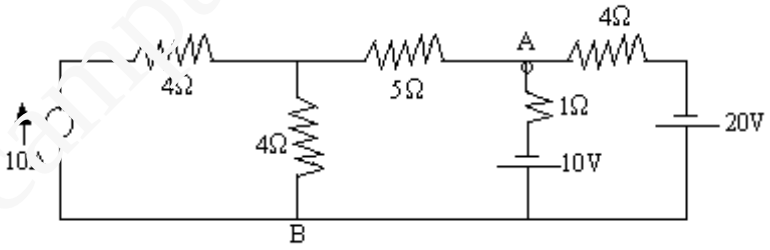

Figure 1

2. (a) Explain the concept of impedance transformation with an ideal transformer.
   (b) Write down the loop equation for the coupled network shown in Figure 2b.

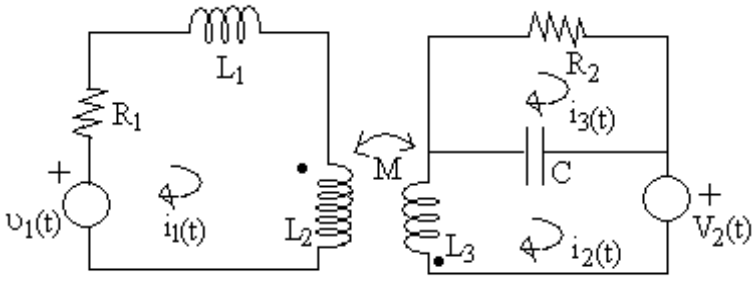

Figure 2b

(c) Two coils are wound side by side on a nonmagnetic former. An emf of 0.25V is induced in coil 1 when the flux linking with it changes at the rate of 10^{-3}wb/sec. A current of 2A in coil 2 causes flux of 10^{-4}wb to link coil 1. What is the mutual inductance between the coils. [5+6+5]

3. (a) What are initial conditions? Why do you need them?

(b) The switch is closed at t=0. find the initial conditions at t=0^+ for i_1 , i_2, V_C,di_1/dt , d i_2/dt. (Figure 3b)

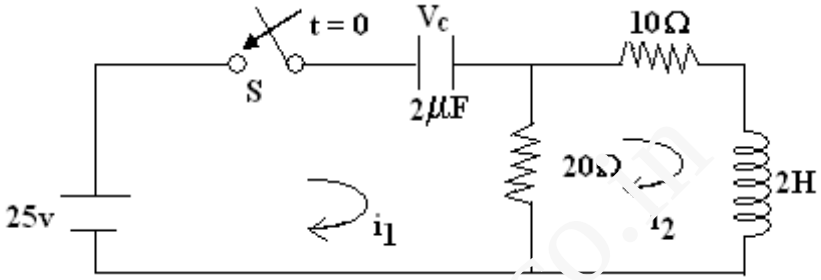

Figure 3b

(c) A current of 5A flows through a non inductive resistance in series with a chocking coil when supplied at 250v, 50Hz. If the voltage across the non inductive resistance is 125V and that across the coil 200V, calculate the Impedance, Reactance and Resistance of the coil, power absorbed by the coil and the total power draw the phasor diagram [3+5+8]

4. (a) A Voltage V Sin(wt+ϕ) is applied to an initially relaxed RL series circuit. Find the value of ϕ for which there will be no transient current in the circuit. Use Laplace Transform method.

(b) Find RMS and average value of Voltage wave form shown in Figure 4. [8+8]

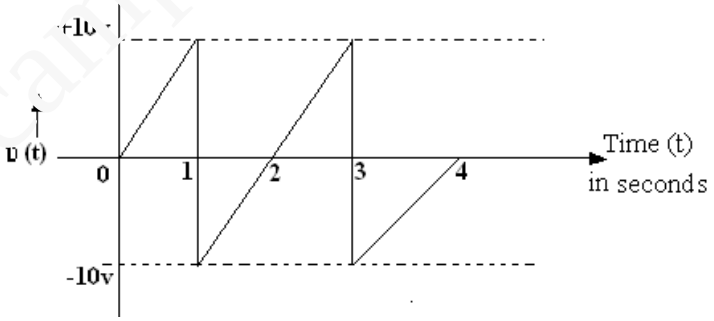

Figure 4

5. (a) Explain reciprocity theorem. What is its importance with reference to a two-port network.

(b) Verify reciprocity theorem as applied to the network shown in Figure 5. [6+10]

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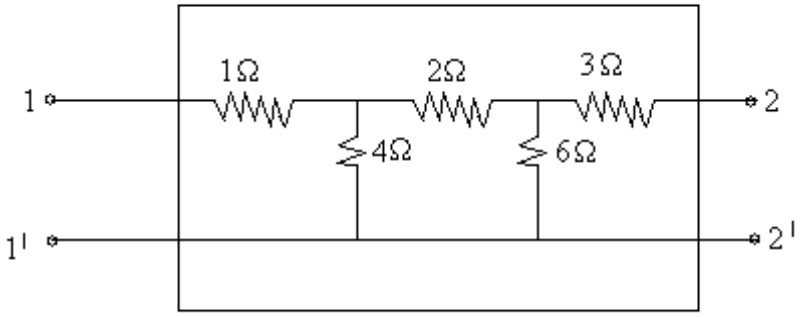

Figure 5

6. (a) An impedance function is given as

$$Z(s) = \frac{15\,(s^3 + 2s^2 + 3s + 2)}{(s^4 + 6s^3 + 8s^2)}.$$

Determine the poles and zeros.

(b) Explain

i. driving point function and

ii. Transfer function.

(c) Find the driving point impedance for the network shown in Figure 6. [6+4+6]

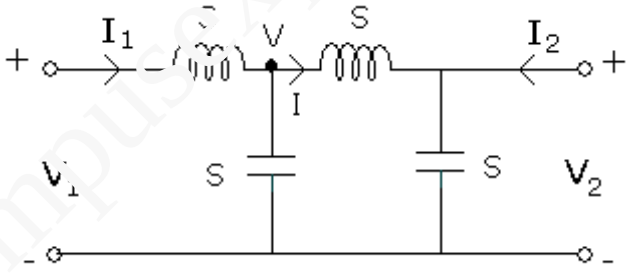

Figure 6

7. (a) Draw the circuit of an asymmetrical L-attenuator working between two equal impedances with a given loss. Derive the design equations for the circuit elements in terms of

i. the iterative resistance R_i, and

ii. the current ratio N.

(b) Design an asymmetrical L-attenuator to operate into a resistance of 300Ω and to provide attenuation of 30 DB. [10+6]

8. What is composite filter? Draw its circuit diagram? Give a general procedure for its design? [16]

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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)

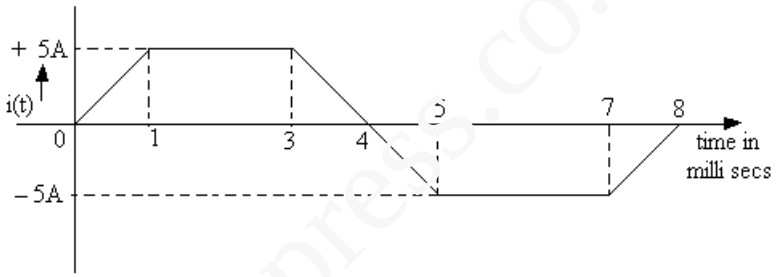

Figure 1a

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

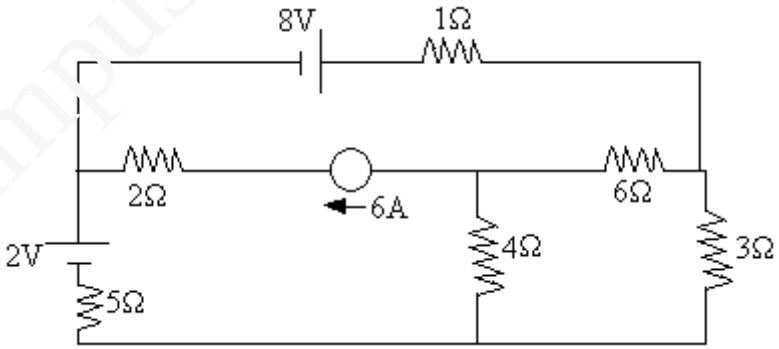

Figure 1b

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

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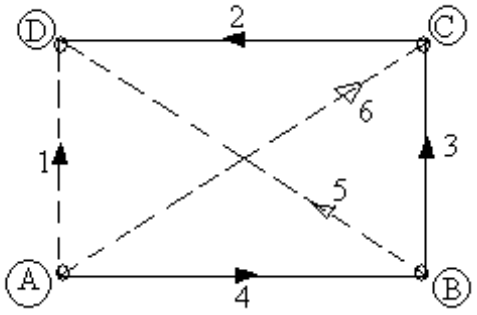

Figure 1c

2. (a) Obtain the Equivalent 'T' for magnetically Coupled circuit shown in Figure 2a.

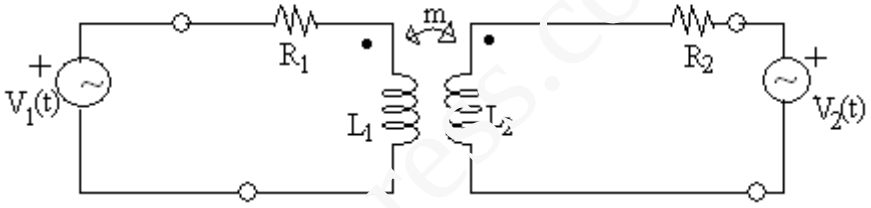

Figure 2a

(b) A coil of 500 turns is wound uniformly over a wooden ring having a mean circumference of 50cms and a cross sectional area of 500mm^2.If the current through the coil is 3Amps, Calculate

i. The magnetic field strength
ii. the flux density and
iii. the total flux.

(c) Write down the Loop Equations for the network shown in Figure 2. [6+6+4]

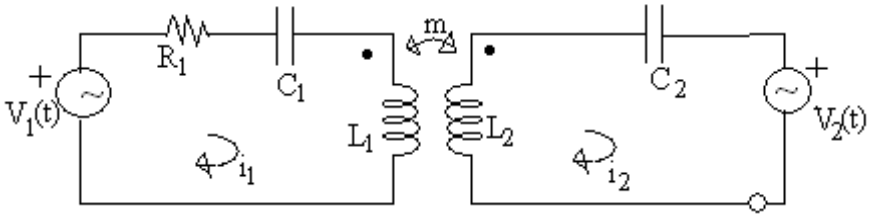

Figure 2

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]

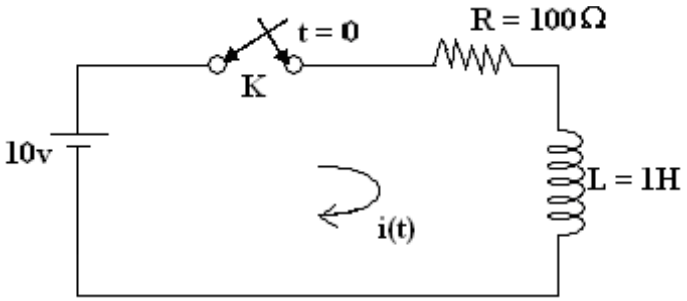

Figure 3

4. (a) In the series R-L-C circuit (Figure 4a) shown, there is no initial charge on the Capacitor. If the switch is closed at t=0,determine the current i(t) for t >0. Use Laplace Transform method and Sketch i(t).

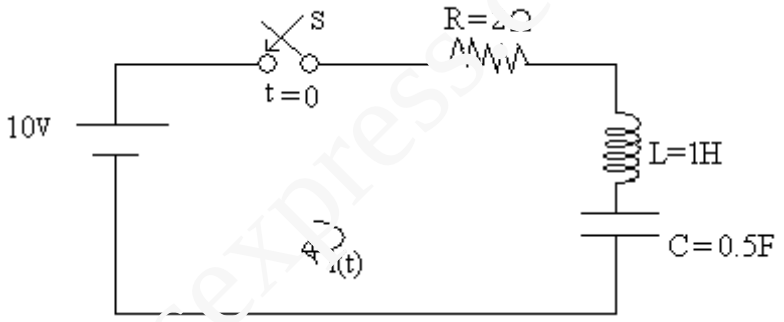

Figure 4a

(b) Determine the Impulse response of series R-L circuit excited by an Impulse formation of magnitude E at t=0.(Figure 4) [10+6]

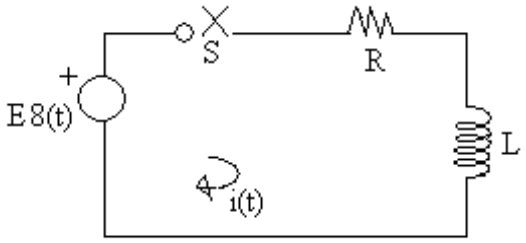

Figure 4

5. (a) Explain the duality exists between Thevenin's equivalent circuit and Norton's equivalent circuit.

(b) Find the current in the arm BD of the bridge network shown in Figure 5b using Nortons Theorem. [6+10]

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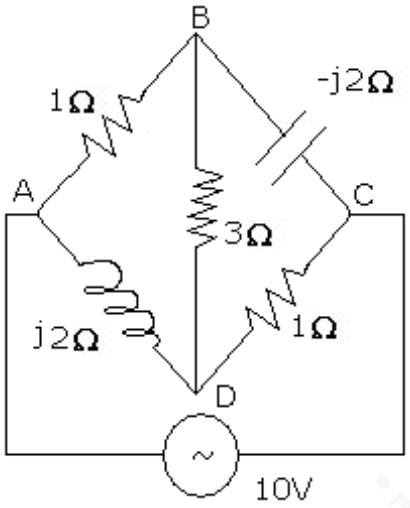

Figure 5b

6. (a) Find the driving point function of the LC network given in Figure 6a.

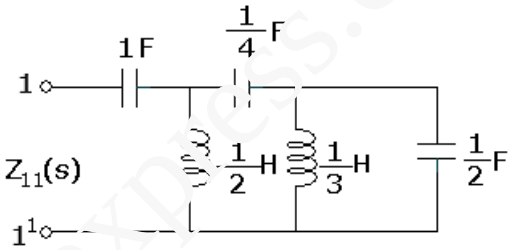

Figure 6a

(b) Find the poles and zeros of the admittance function of Y(s) of the circuit shown in Figure 6. Show the pole-zero pattern. [8+8]

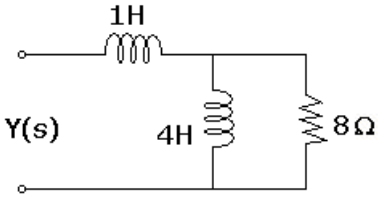

Figure 6

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 phase shift and attenuation of constant k high pass filter.

(b) Design both the T and Π sections of a high pass filter having an infinite frequency characteristics impedance of 300Ω and a cut off frequency of 2000 Hz. [8+8]

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