TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

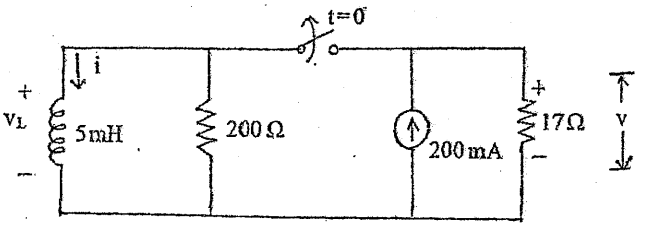
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE 501)*

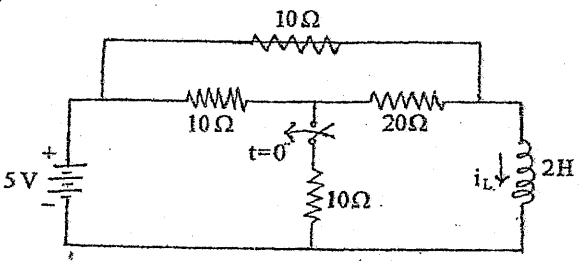
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semi-log graph paper is to be provided.***
- ✓ *Assume suitable data if necessary.*

1. a) Explain the phenomenon of resonance in RLC parallel circuit. Also derive the expression for resonance frequency and draw the wave form of instantaneous voltage and current at resonance. [8]

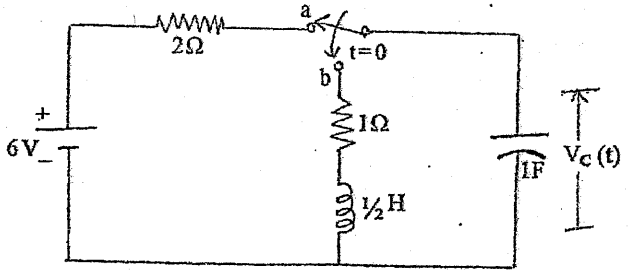
   b) In the circuit shown below, the switch has been closed for a long time and at t = 0 it is opened, determine (i) $i(0^+)$ (ii) $v(0^+)$ (iii) $v_L(0^+)$ and (iv) I and v at t = 20μs. [8]



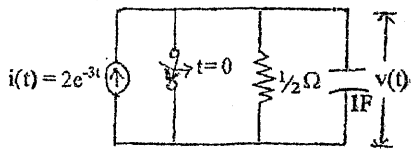
2. a) In the network given below, the switch K is open and the network reaches a steady state. At t = 0, switch K is closed. Find the current in the inductor for t > 0 using classical method. [8]



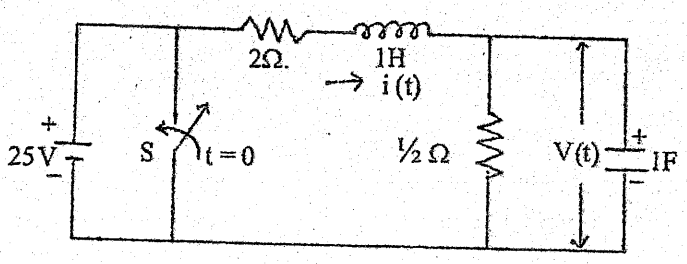
   b) Use Laplace transform approach to find the voltage across the capacitor $V_C(t)$ for t > 0 when the switch is moved to position 'b' at t = 0 which was in position 'a' for a long time prior to switching. [8]



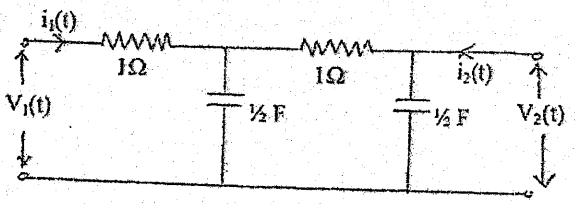
3. a) An exponential current $i(t) = 2e^{-3t}$ is applied at time t = 0 to a parallel R-C circuit shown below. Comprising resistor R = ½ Ω and capacitor C = 1F. Obtain complete solution for v(t). Assume V_C = 0 before the application of current. Use Laplace transform method. [8]



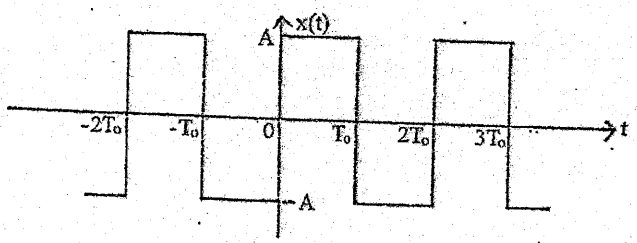
b) In the circuit shown in figure below, steady state is reached with switch S open. Switch S is closed at t = 0. Determine current through inductor i(t) and voltage across the capacitor v(t) for t > 0 using Laplace transform method. [8]



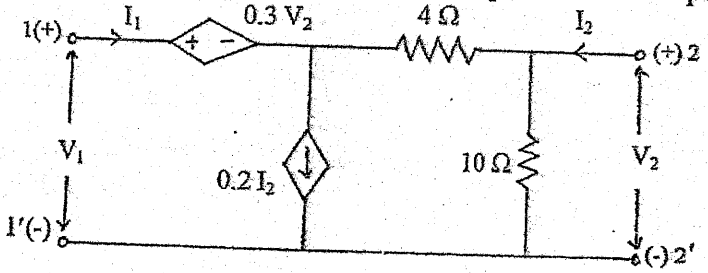
4. a) For the following network determine the voltage ratio transfer function. If this network is terminated at port 2 with a 2Ω resistor, find for this terminated network α_{21} (S) and V_{21}(S) [8]



b) Obtain the trigonometric Fourier-series of the waveform shown in figure below and sketch the line spectra. [8]



5. a) For the two port network shown in figure below, find Z-parameter and T-parameter. [8]



b) Draw the asymptotic Bode plot for the transfer function given below. [8]

$$G(S)=\frac{2(S+5)}{S(S^2+21S+20)(S+10)}$$

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Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE 501)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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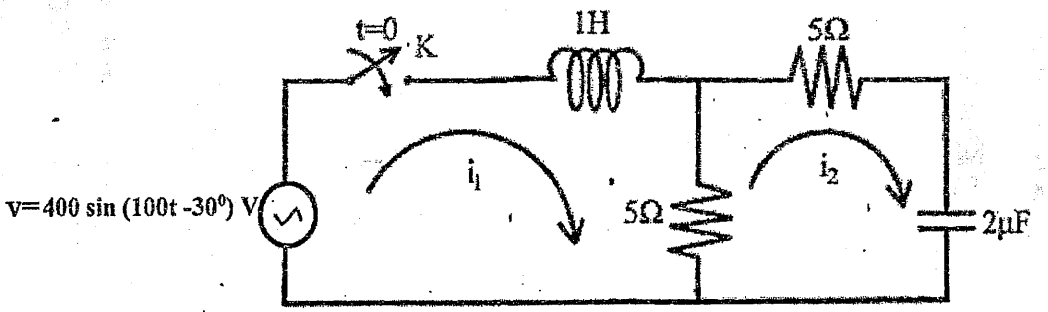
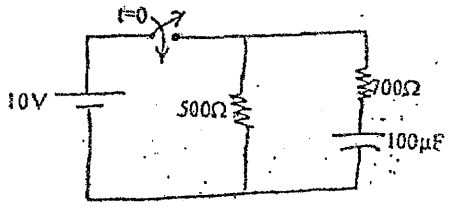
- ✓ ***Semi log graph will be provided.***
- ✓ *Assume suitable data if necessary.*

1. a) Discuss about resonance in a circuit consisting of a practical coil in parallel with a capacitor. Also derive an expression for impedance and current at resonating frequency. [8]

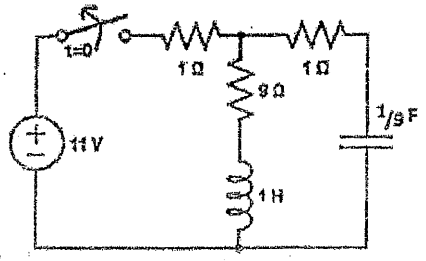
   b) In the given network of figure below, both the energy storing elements are initially relaxed ie. no current is flowing through the inductor and no charge is accumulated across the capacitor before application of voltage. The switch K is closed at t=0. Find the values of i_1, i_2, $\frac{di_1}{dt}$, $\frac{di_2}{dt}$, $\frac{d^2i_1}{dt^2}$, $\frac{d^2i_2}{dt^2}$ at $t=0^+$. [8]



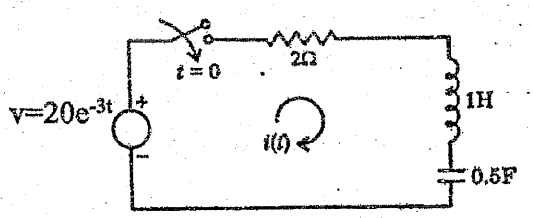
2. a) Using classical method, find the expression for the current supplied by the source in the network shown in figure. Also find the time taken by the source current to reach 25 mA. [8]



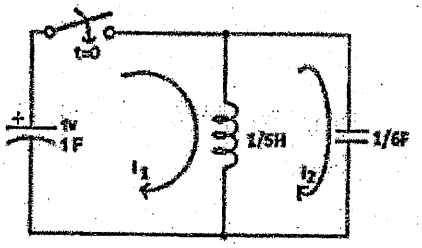
   b) Using classical method, find the expression for the current and voltage of inductor and capacitor respectively for t>0 from the circuit shown in following figure. [8]



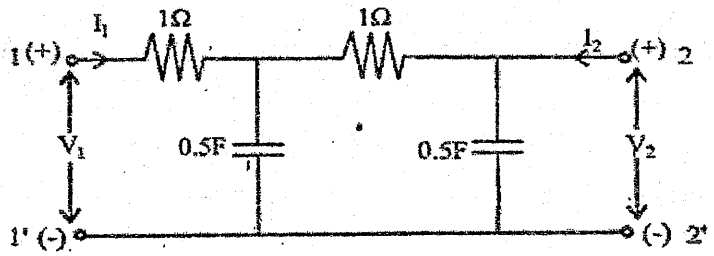
3. a) In the series R-L-C circuit shown in figure, there is no initial charge on the capacitor. If the switch S is closed at t=0, determine expression of current and voltage for all elements for t>0. [8]



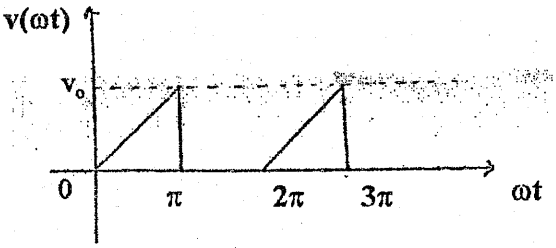
b) Using Laplace transform method, find the loop current i_1 and i_2 for t>0 in the figure shown below. [8]



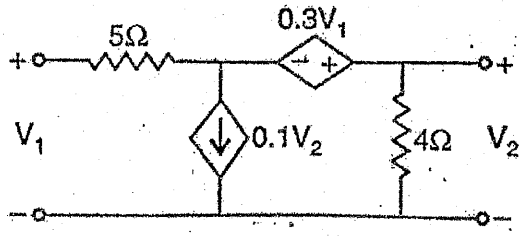
4. a) For the given two port network, determine the driving point impedance. If this network is terminated at port 2 with 1F capacitor, find the following network function for this terminated network, (i) $Z_{21}(s)$ (ii) $Y_{21}(s)$ (iii)$\alpha_{21}(s)$ [8]



b) Find the trigonometric Fourier series for the given waveform shown in figure below. [8]



5. a) For the two port network shown below, find h-parameter and T' parameter. Also Check for reciprocity of network. [8]



b) Draw the asymptotic bode plot for the transfer function given by: [8]

$$G(s) = \frac{64(s+2)}{s(s+0.5)(s^2+3.2s+64)}$$

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Subject: - Electric Circuit Theory *(EE 501)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
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- ✓ *Semi log graph will be provided.*
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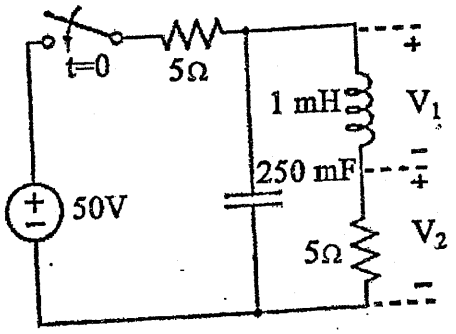
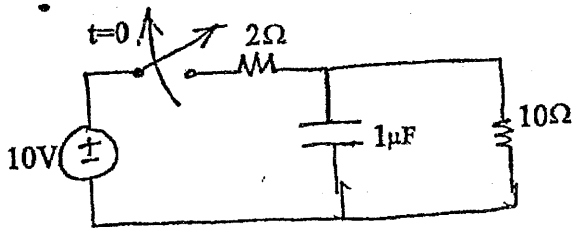
1. a) A 50 μF capacitor, when connected in series with a coil having 40 Ω resistance, resonates at 1000 Hz. Find the inductance of the coil. Also obtain the circuit current if the applied voltage is 100V. Also calculate the voltage across the capacitor and the coil at resonance. [8]

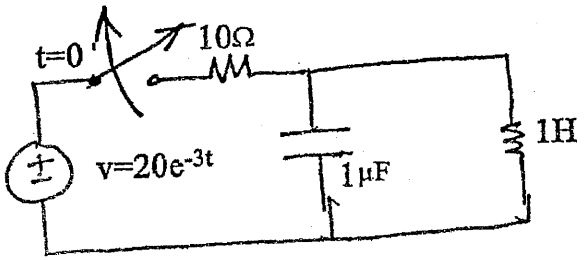
   b) In the circuit shown in figure, switch is closed at t=0 with zero capacitor voltage and zero inductor current, find the following. [8]
   i) v_1 and v_2 at t=0+
   ii) dv_1/dt and dv_2/dt at t=0+
   iii) d^2v_2/dt at t=0+



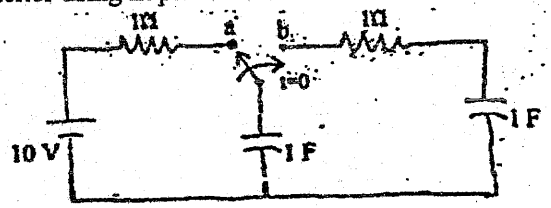
2. a) The circuit shown in figure is in the steady state with the switch S closed. The switch is opened at t=0. Determine current and voltage of all elements for t>0 using classical method. [8]



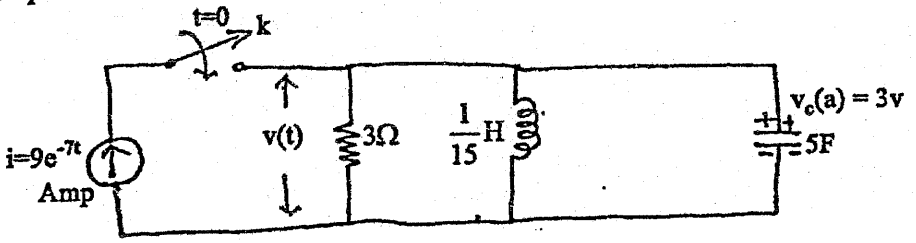
   b) Using Classical method, find the expression for current and voltage of capacitor for t>0 in the circuit shown below. [8]



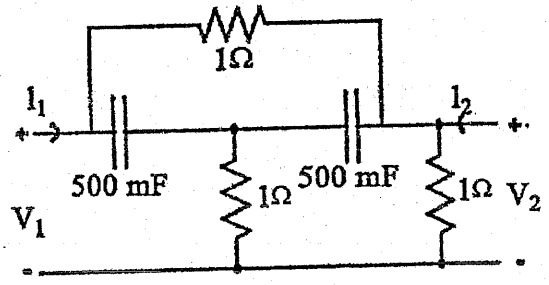
3. a) Keeping the switch at position 'a' for a long time, if the switch is moved to position 'b' at t = 0 in the circuit shown in figure below, find expressions for current through and voltage across capacitor using Laplace transform method. [8]



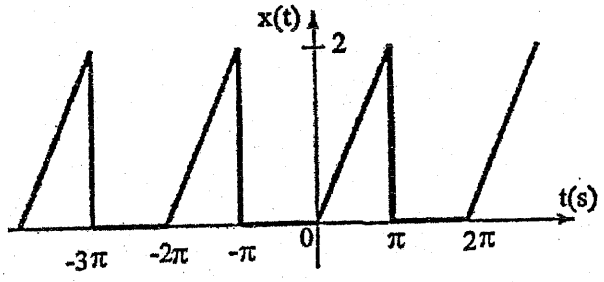
b) In the given network of figure below, both the energy storing elements are initially reached to steady state, before application of current source. The switch K is closed at t=0. Find complete expression for voltage v(t) across the network, for t>0, using Laplace transformation. [8]



4. a) Find the input point driving impedance, transfer impedance, and voltage ratio transfer function for the circuit shown in following figure. [8]



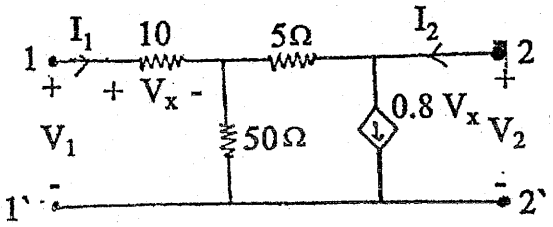
b) Find the trigonometric fourier series for the waveform shown in figure below. [8]



5. a) Draw the asymptotic Bode Plot for the transfer function [8]

$$H(s)=\frac{(s+5)}{s(s^2+21s+20)(s^2+2s+100)}$$

b) For the two port network shown in figure below. Find the Z parameter and T parameter. [8]



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Subject: - Electric Circuit Theory *(EE501)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semi log paper should be provided.***
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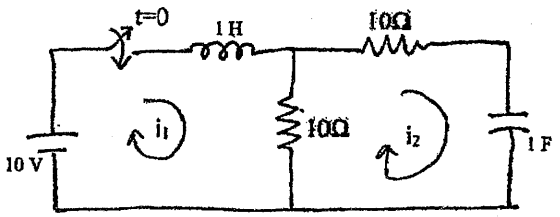
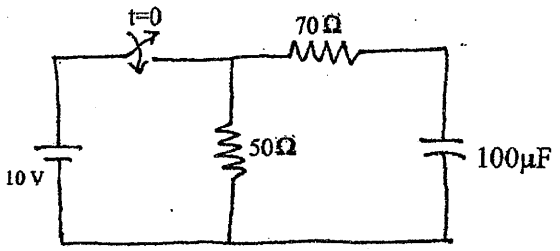
1. a) Explain the phenomenon of resonance in RLC parallel circuit. Also derive the expression for resonance frequency and draw the wave form of instantaneous voltage and current at resonance. [8]

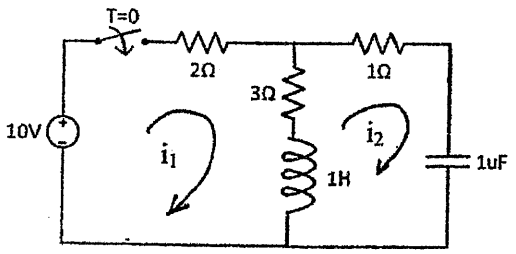
   b) Obtain the value of i_1, i_2, di_1/dt, di_2/dt, d^2i_1/dt and d^2i_2/dt^2 at $t = 0^+$, if the switch is closed at $t = 0$ in the circuit shown in figure below. [8]



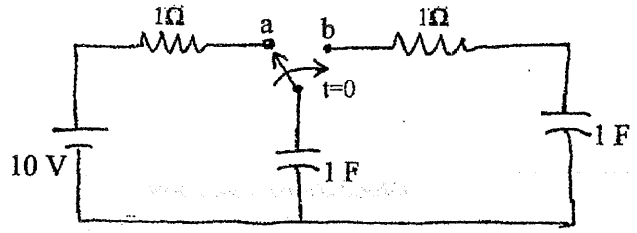
2. a) In the circuit shown in figure below, if the switch is closed at $t = 0$, find the time when the current from the battery reaches to 500mA. Use classical method. [8]



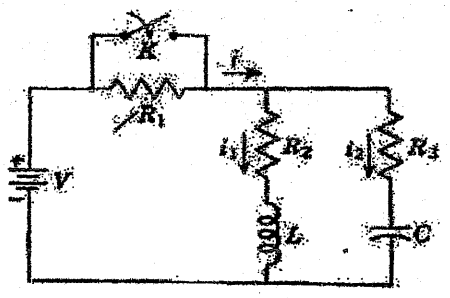
   b) Find the time expression for loop currents for $t > 0$ in the given circuit using classical method. [8]



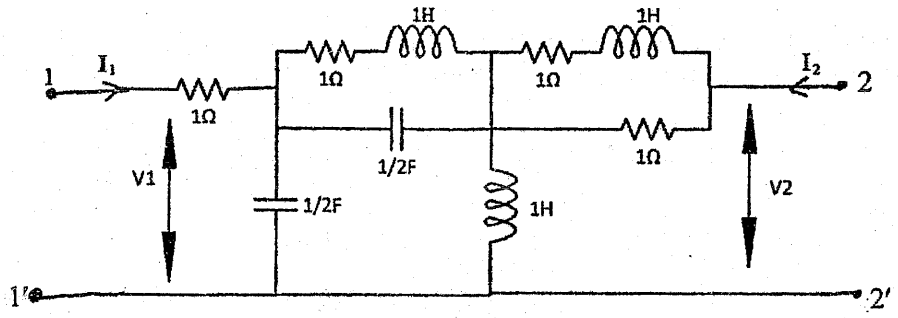
3. a) Keeping the switch at position 'a' for a long time, if the switch is moved to position 'b' at $t = 0$ in the circuit shown in figure below, find expressions for current through and voltage across capacitor using Laplace Transform method. [8]



b) In the network shown below, a steady state is reached with the switch *K* open with V = 100V, $R_1 = 10\Omega$, $R_2 = 20\Omega$, $R_3 = 20\Omega$, L = 1H, and C = 1 μF. at time t = 0, the switch is closed. Evaluate the currents i_1 and i_2, using Laplace transform, for t > 0. [8]



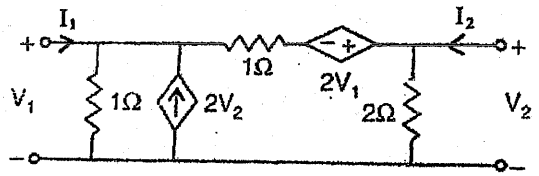
4. a) Find the forward voltage ratio transfer function $G_{21}(s)$ and forward transfer admittance $Y_{21}(s)$ in the following circuit. [8]



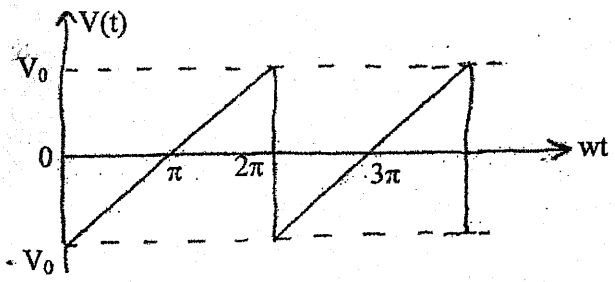
b) Sketch the Bode Plot for the transfer function given by

$H(S) = 64(S+2)/[S(S^2 + 0.5S)(S^2 + 3.2S + 64)]$ [8]

5. a) Find transmission and admittance parameter for the given TPN and check its reciprocity and symmetry. [8]



b) Obtain trigonometric Fourier series of the waveform shown in figure below and sketch the line spectra. [8]



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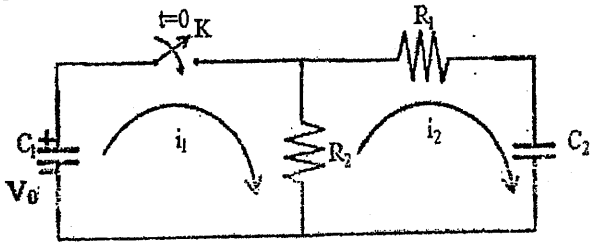
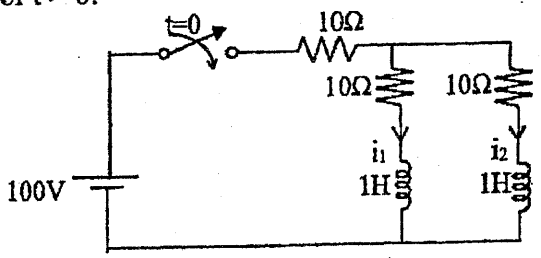
1. a) What do you mean by resonance in RLC series circuit? Define half power frequencies and bandwidth in RLC series circuit and also obtain an expression for them. [8]

   b) In the given network, the capacitor C1 is charged to voltage V_0 and switch K is closed at t = 0. When $R_1 = 2M\Omega$, $V_0 = 1000V$, $R_2 = 1\ M\Omega$, $C_1 = 10\mu F$ and $C_2 = 20\mu F$, solve for $i_1, i_2, \frac{di_2}{dt}, \frac{d^2i_2}{dt^2}$ at $t = 0^+$. [8]

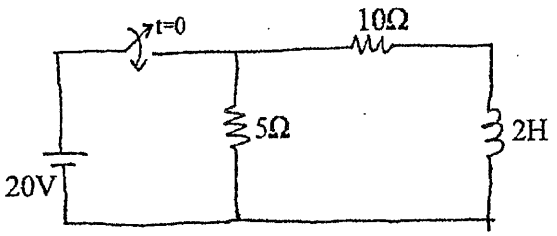


2. a) In the network shown, the switch is closed at t = 0, with the network previously unenergised. For the element values shown on the diagram, find $i_1(t)$ and $i_2(t)$, by classical method for t > 0. [8]



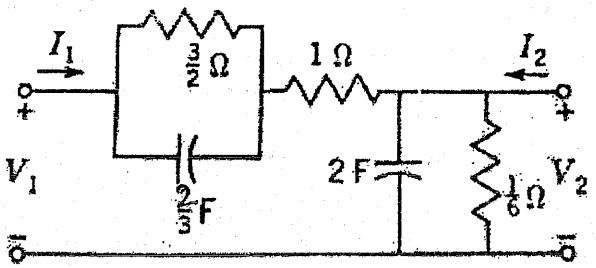
   b) Find the time expression for current for t > 0 in RLC series circuit with R = 10 ohm, L = 1H and $C = \frac{1}{9}F$, if the circuit is supplied by v = 10sint at t = 0. Assume that capacitor and inductor are initially de-energized. Use classical method. [8]

3. a) In the circuit shown in figure below, obtain an expression for voltage across the inductor if the switch is closed at t = 0 using Laplace Transform method. [8]



b) An exponential current $i(t) = 20e^{-4t}$ Amp is suddenly applied at time t = 0 to a parallel RLC circuit comprising of resistor R = 1/10Ω, inductor L = 10mH and capacitor C = 2.5μF. Obtain the complete particular solution for voltage v(t) across the network, by Laplace transform method. Assume zero initial current through inductor and zero initial charge across the capacitor before application of the current. [8]

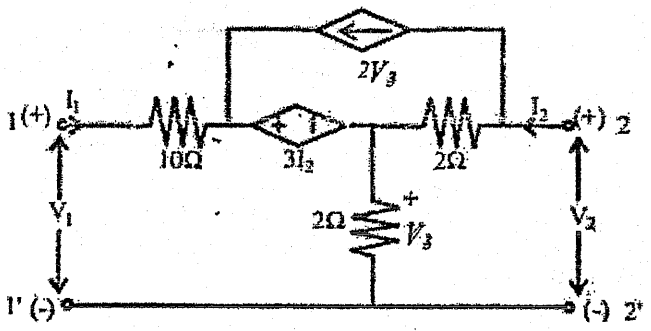
4. a) Find the voltage ratio transfer function of the two port network shown in figure below, if the port 2 is terminated with 2H inductor. [8]



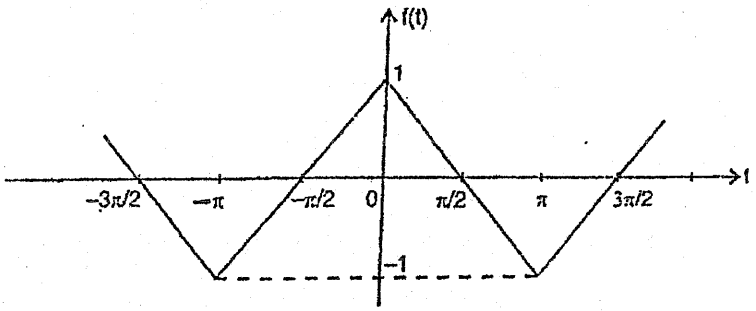
b) Sketch Bode Plot for the following transfer function. [8]

$$H(s) = \frac{40(s+1)}{(2s^2+10s)(s^2+2s+10)}$$

5. a) Find the Z-parameter and hence T' -parameter for the network shown in figure below also check if network is symmetrical. [8]



b) For the given waveform, find the trigonometric form of Fourier series and then plot its line spectrum. [8]



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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

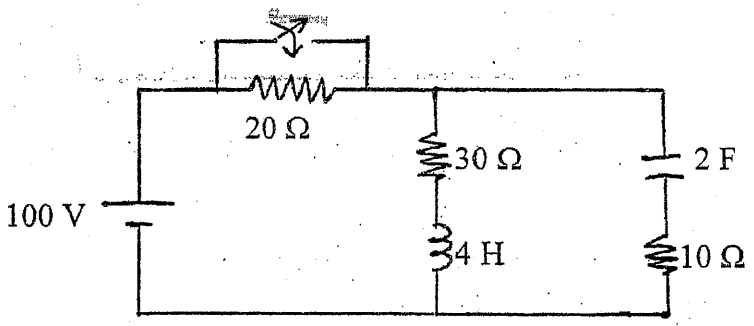
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

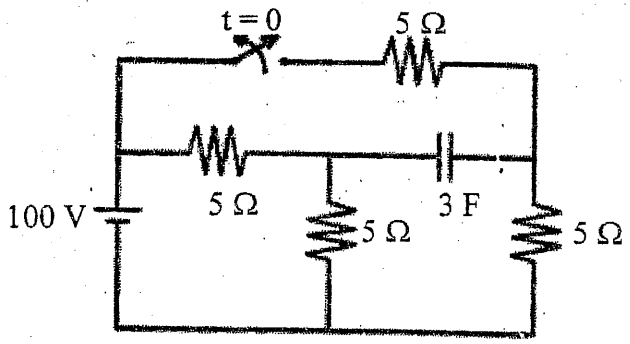
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Semi log paper will be provided.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe the phenomenon of series RLC circuit. What value of capacitor would procedure resonance in 400 V, 50 Hz source if the resistance and inductance are 20mΩ and 6mH respectively? Also calculate the Q-factor and half power frequencies. [8]

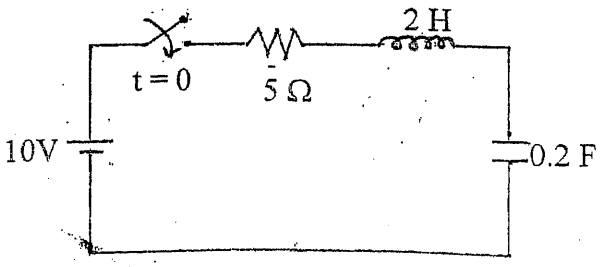
   b) After being open for a long time, if the switch in the circuit shown in figure below is closed at t = 0, find current through inductor, voltage across capacitor, current and voltage across each resistor at $t = 0^+$. [8]



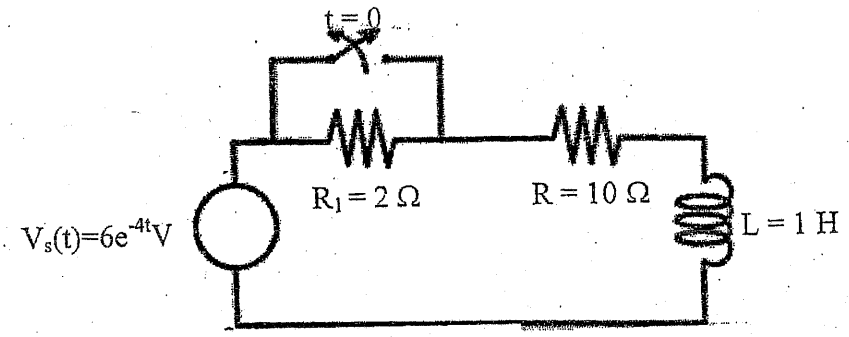
2. a) For the circuit shown in figure below, find the current through and voltage across the capacitor for t > 0. Using Classical approach. [8]



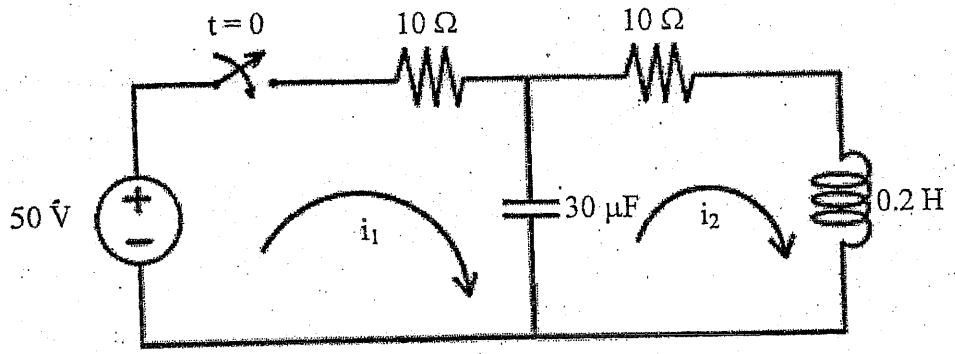
   b) Switch is closed at t = 0, find the expression for circuit i(t), for any time 't', and calculate the value of current at t = 0.1 sec. Also, find the time for current reach maximum value and corresponding maximum value of current. Use Classical method. [8]



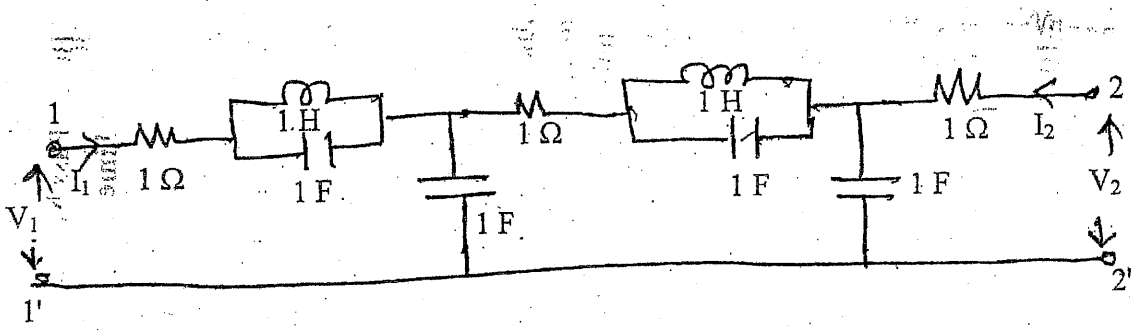
3. a) Find the expression of the current flowing through resistor R of the circuit in following figure and also find the voltage across the inductor for t > 0, when the switch is opened at t = 0. Use Laplace Transform method. [8]



b) In the network shown in figure below, the switch is closed at t = 0, with the network previously unenergised. For the element value given on diagram, find the expression for mesh currents $i_1(t)$ and $i_2(t)$, by Laplace Transformation method. [8]



4. a) For the TPN shown, find voltage ratio transfer function and transform impedance. [4]

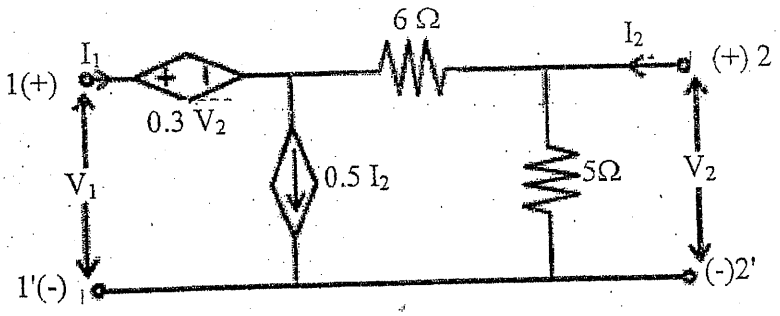


b) Sketch the asymptotic bode plots for the transfer function given by: [8]

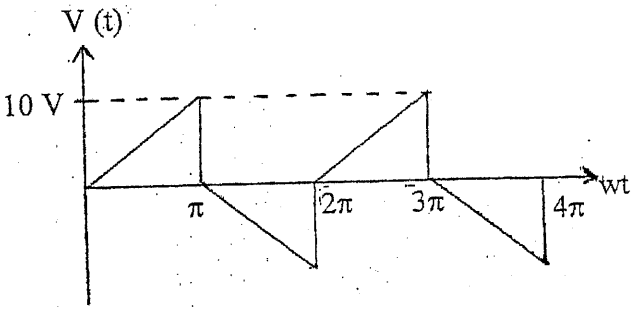
$$G(S)=\frac{5S^2(S+100)}{(S+20)(S^2+20S+100)}$$

c) Find the expression for Equivalent Z-parameter equation if three two-port networks are connected in series. [4]

5. a) For the two port network shown in figure below, find Z-parameter and T-parameter. [8]



b) Find the trigonometric Fourier Series for the wave shown in figure and sketch line spectrum. [8]



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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

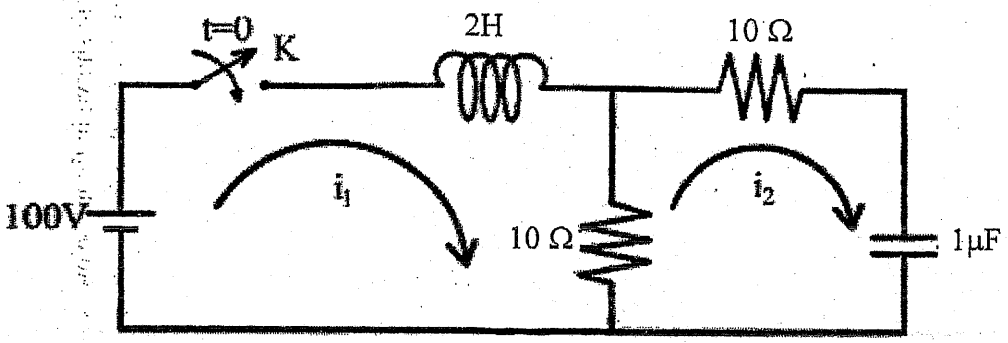
Exam.	Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

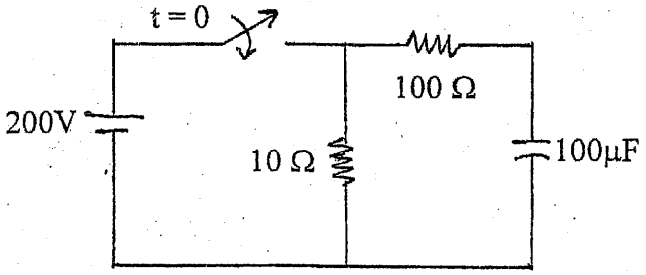
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Semi log paper will be provided.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe the resonance phenomenon in RLC series circuit. Define half power points and band width for a series RLC circuit and derive expression for them. [8]

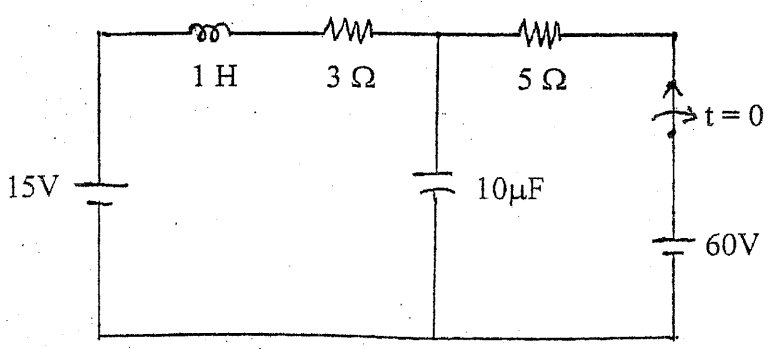
   b) In the given network of figure below, both the energy storing elements are initially relaxed i.e. no current is flowing through the inductor and no charge is accumulated across the capacitor before application of voltage. The switch K is closed at t = 0. Find the values of $i_1, i_2, \frac{di_1}{dt}, \frac{di_2}{dt}, \frac{d^2i_1}{dt^2}, \frac{d^2i_2}{dt^2}$ at $t = 0^+$. [8]



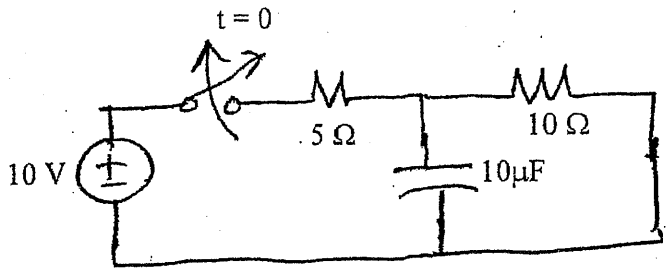
2. a) In the circuit shown in figure below, if the switch is closed at t = 0, find the expression for voltage across capacitor using classical method. [8]



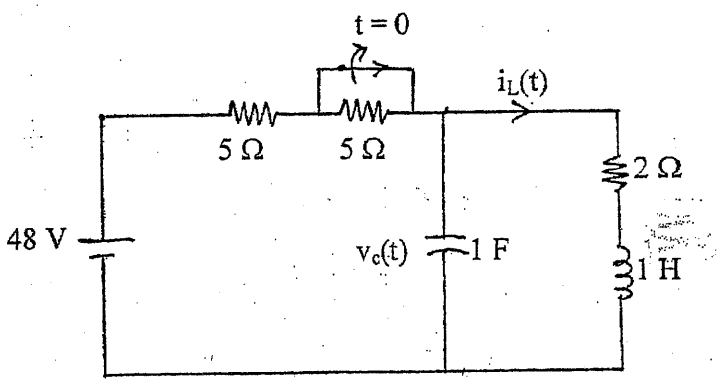
   b) Keeping the switch closed for a long time, if the switch is opened at t = 0 in the circuit shown in figure below, find expression for voltage across capacitor using classical method of solution. [8]



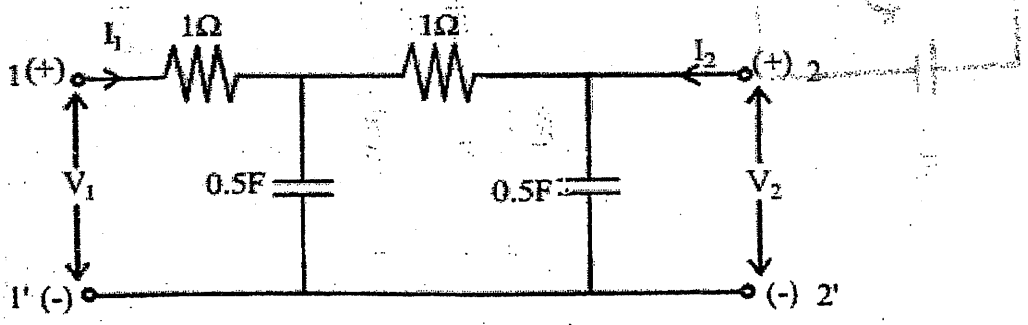
3. a) For the circuit shown in figure below, Find the current and voltage of capacitor for $t > 0$ using Laplace Transform method. [8]



b) After being closed for a long time, if the switch in the circuit shown in figure below is opened at t = 0. Obtain the expressions for $i_L(t)$ and $v_c(t)$ for $t > 0$, using Laplace Transform Method. [8]



4. a) For the given two port network, determine the driving point impedance and voltage ratio transfer function. [4]

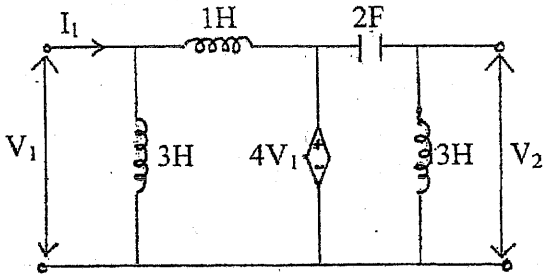


b) Sketch the Bode Plot for the transfer function given by [8]

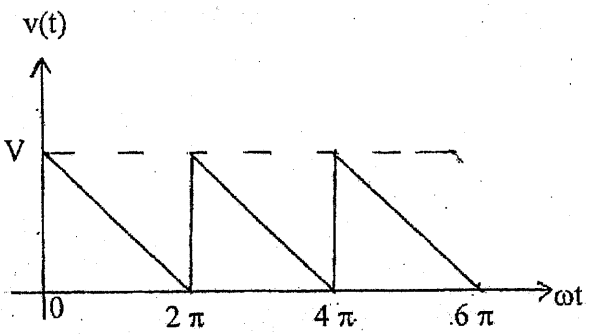
$$H(S) = 200(S+1)/[S(S+5)(S^2+2S+100)]$$

c) Show that all overall transmission parameter matrix for cascaded two 2-port networks is simply the matrix product of transmission parameters for each individual 2-port network in cascade. [4]

5. a) Find the y and g-parameters of the circuit in figure below and also find whether the network is reciprocal or not. [8]



b) Obtain trigonometric Fourier series of the waveform shown in figure below and sketch the line spectra. [8]



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27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

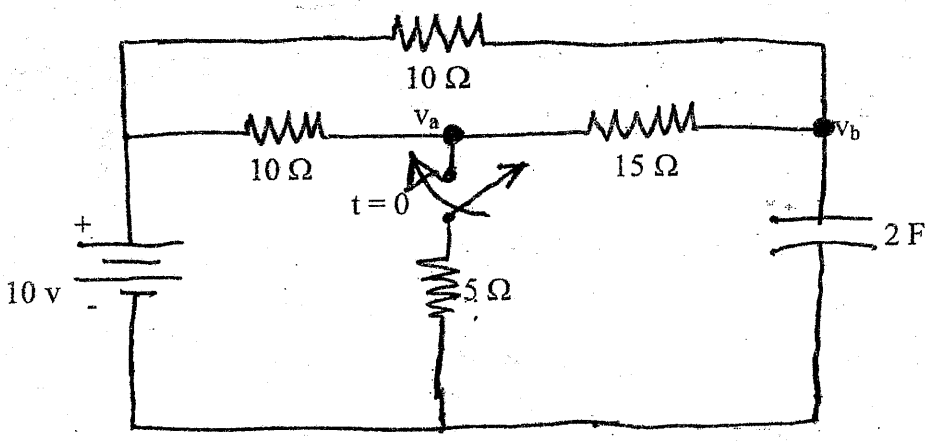
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

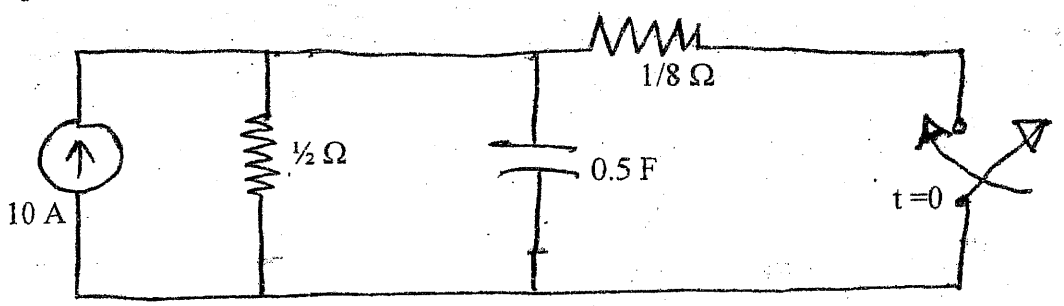
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ ***All** questions carry equal marks.*
- ✓ ***Necessary Semi-log graph paper is Provided.***
- ✓ *Assume suitable data if necessary.*

1. a) A voltage u(t) = 100Sinωt is applied to a series RLC circuit. At the resonant frequency of the circuit, the maximum Voltage across the capacitor is found to be 400 V. The Bandwidth is known to be 600 rad/sec and impedance at resonance is 100 Ω. Find the resonant frequency and compute the upper and lower limits of the bandwidth. Also determine the value of L and C of the circuit.

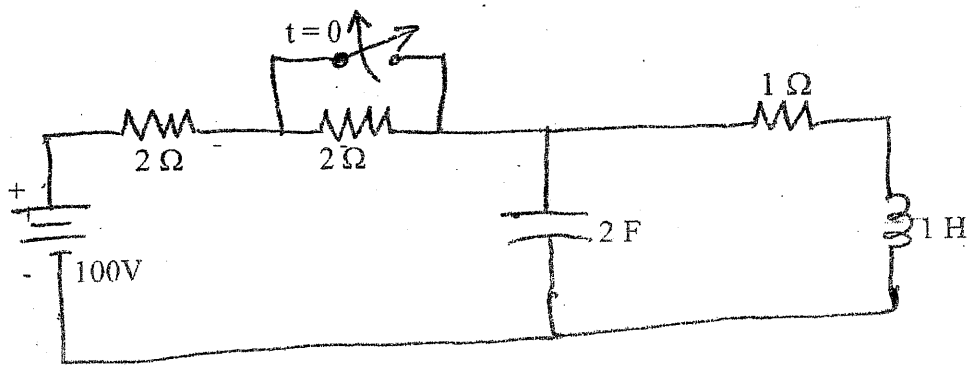
   b) In the network shown in figure below a steady state is reached with the switch open. At t = 0, the switch is closed. Determine the value of $u_a(0^-)$ and $u_a(0^+)$.



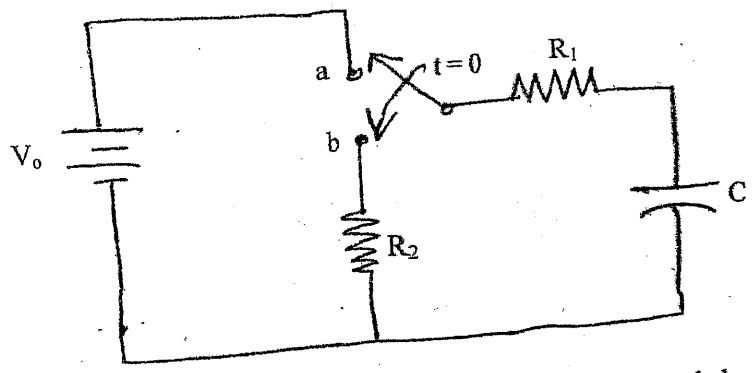
2. a) Using classical method in the circuit shown in figure below. Find the voltage across capacitor for t > 0.



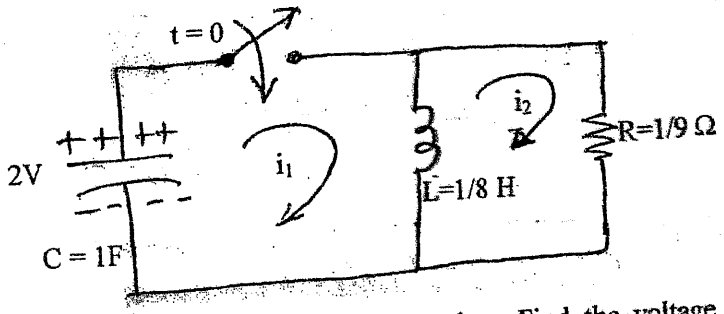
   b) Using classical method, in the circuit shown in figure below. Find the current through inductor and voltage across capacitor for t > 0



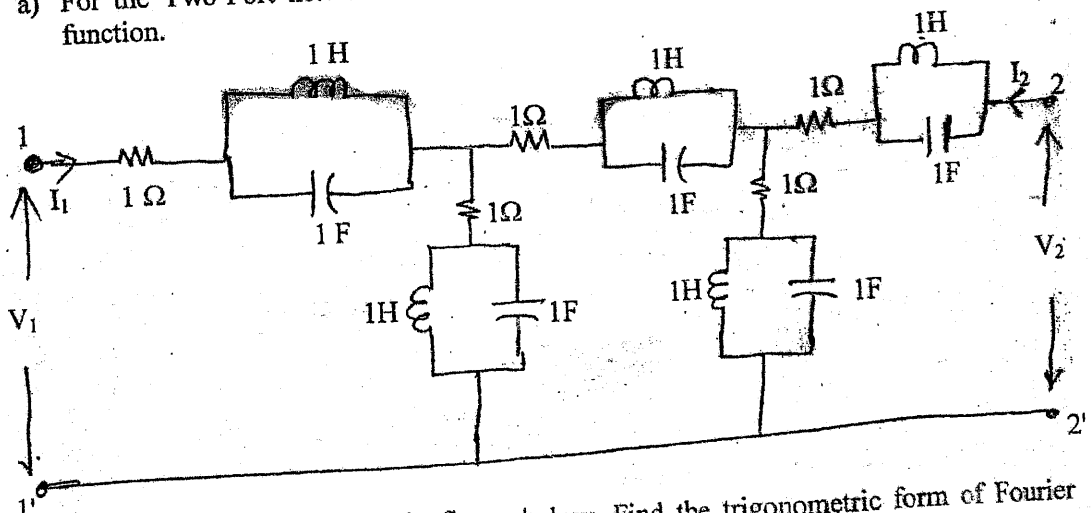
3. a) Using Laplace Transform method in the circuit shown in figure below find the voltage and current of capacitor for $t > 0$



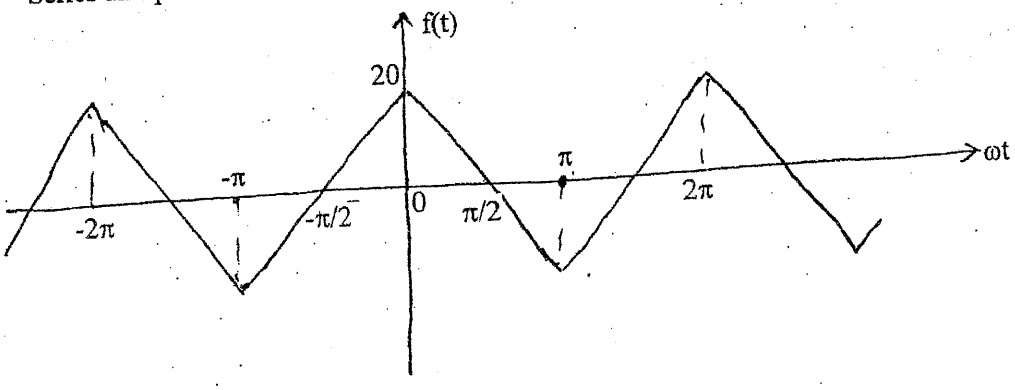
b) Using Laplace Transform method in the circuit shown in figure below. Find the current i_1 and i_2 for $t > 0$.



4. a) For the Two-Port network shown in figure below. Find the voltage ratio transfer function.



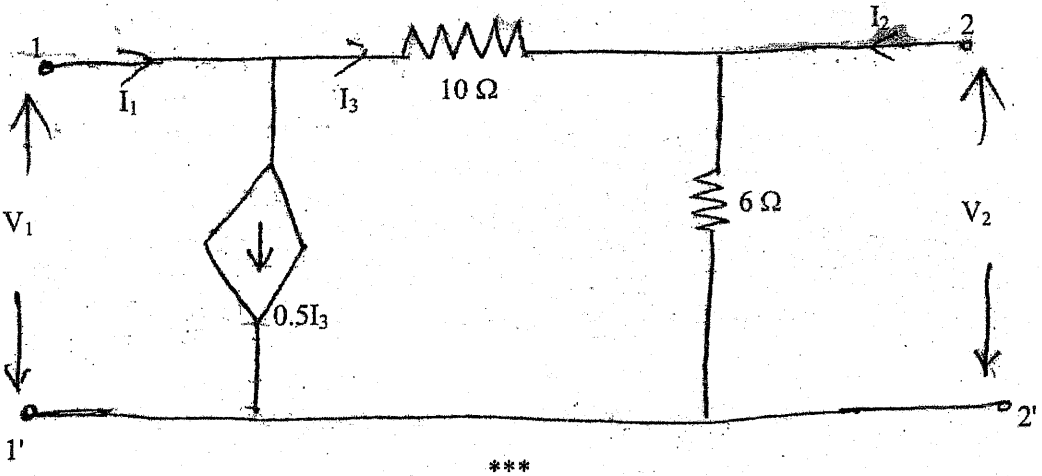
b) For the Waveform shown in figure below. Find the trigonometric form of Fourier Series and plot the line spectrum.



5. a) For the network function given below, plot the asymptotic Bode diagram

$$H(S) = \frac{20(s+1)}{s(s+5)(s^2+2s+10)}$$

b) For the Two Port network shown in figure find Transmission parameter and Y-parameter.



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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

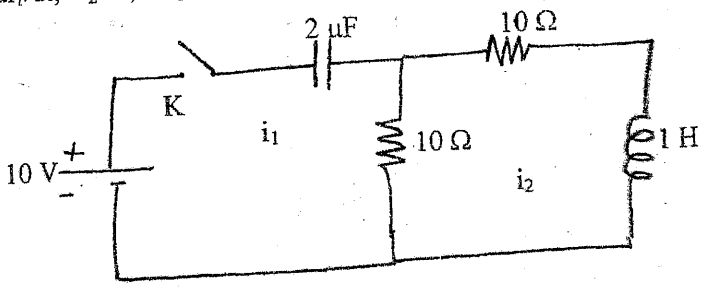
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

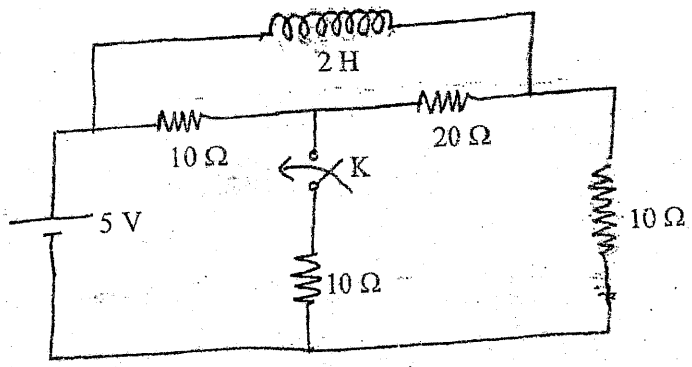
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What do you understand by the bandwidth of a series resonant circuit? Explain with the help of resource curve and also derive its expression both in terms of ω and f. [8]

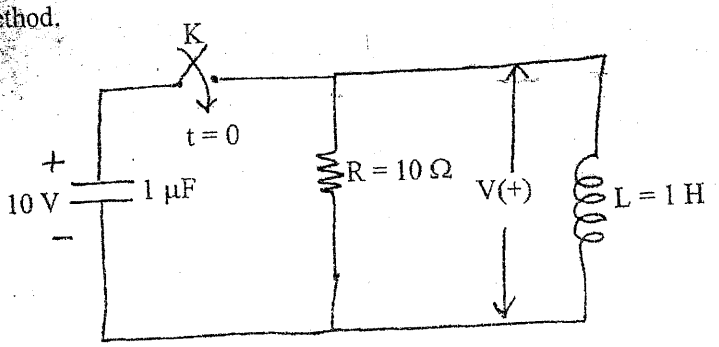
   b) In the circuit shown in figure below, switch K is closed at time t = 0. Find the values of i_1, i_2, di_1/dt, di_2/dt, d^2i_1/dt^2, d^2i_2/dt^2 at t =0+. [8]



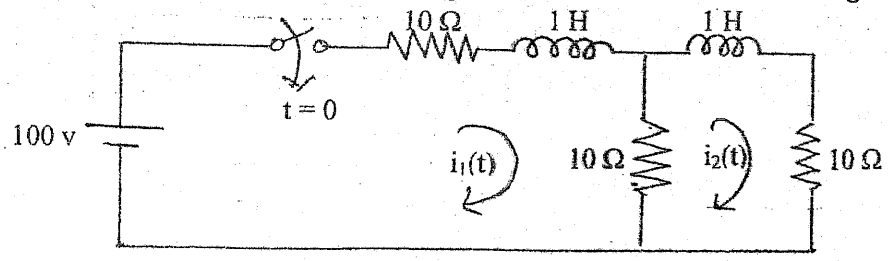
2. a) In the circuit of the figure below, the switch K is open and the circuit reaches a steady state. At t = 0, K is closed. Find the current in the inductor t > 0. Use classical method. [8]



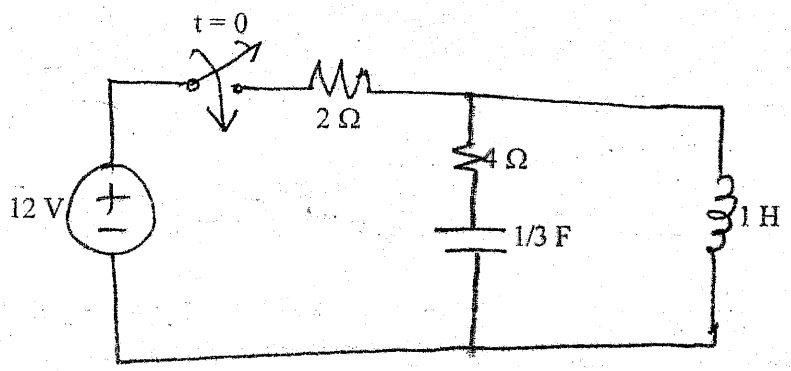
   b) In the circuit shown in figure below capacitor C has an initial voltage V_C = 10 volts and at the same instant, current through the inductor L is zero. The switch K is closed at t = 0. Find out the expression for the voltage V(t) across the inductor L using classical method. [8]



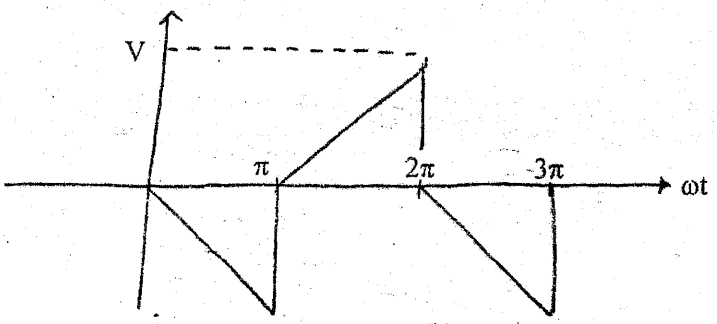
3. a) Using Laplace transform method find the expressions for $i_1(t)$ and $i_2(t)$ in the given two mesh network shown in figure below provided that the network is unenergised. [8]



b) Using Laplace Transform method, find the current of inductor and capacitor for $t > 0$ in the circuit shown in figure below. [8]



4. a) Find the trigonometric Fourier series for the waveform shown in figure below and plot the line spectrum. [8]

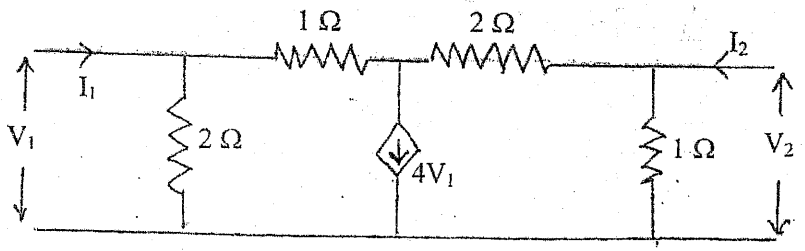


b) For the network shown in figure below find the voltage ratio transfer function and transfer impedance. [8]

5. a) Sketch the bode plot for the transfer function given by [6]

$$G(S) = 20(S+1)/(S^2+4S+2)(S^2+5S)$$

b) Find Z-parameters and hence the T-parameters for the 2 port network shown in figure below. [6]



c) What do you understand by reciprocal two-port network? Also derive the condition for the same in terms of T parameters. [4]

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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

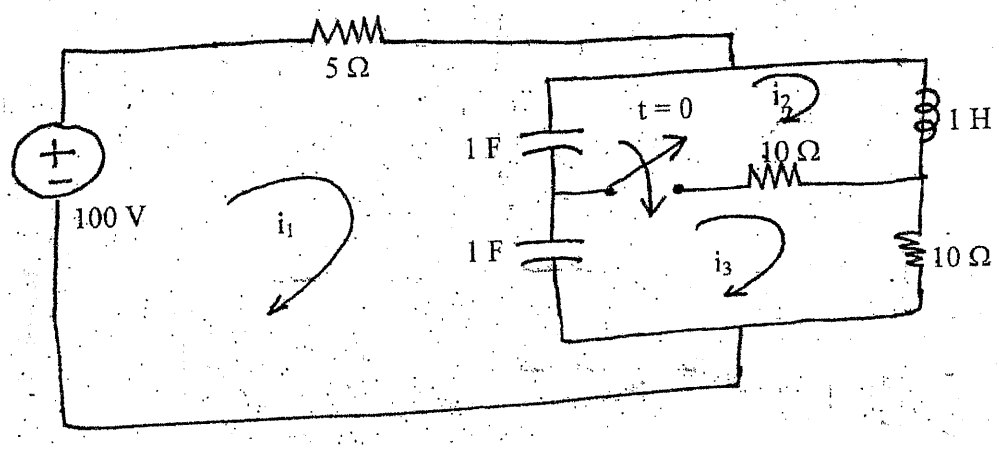
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

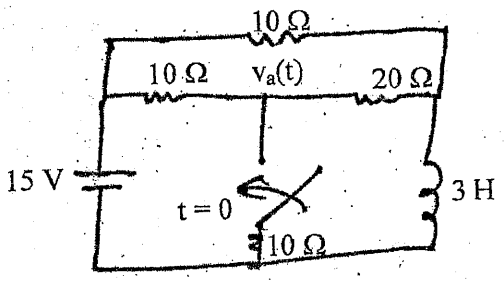
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain the phenomenon of Resonance in parallel RLC circuit and derive expression for resonance frequency. [8]

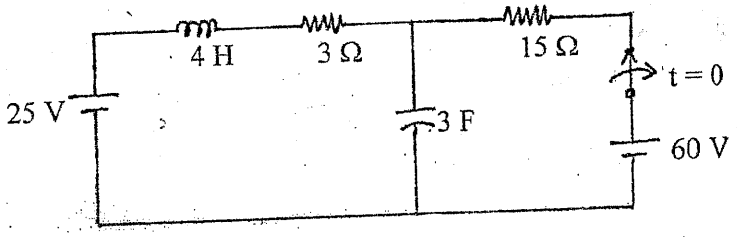
   b) In the circuit shown in following figure, find the loop currents i_1, i_2, i_3 at $t = 0^+$. [8]



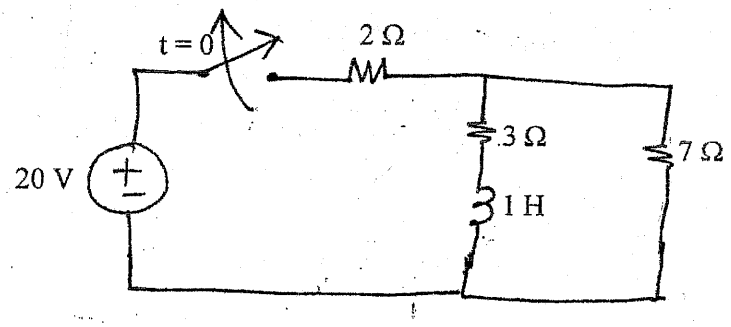
2. a) Find $v_a(t)$ for $t > 0$ in the figure below using classical method. [8]



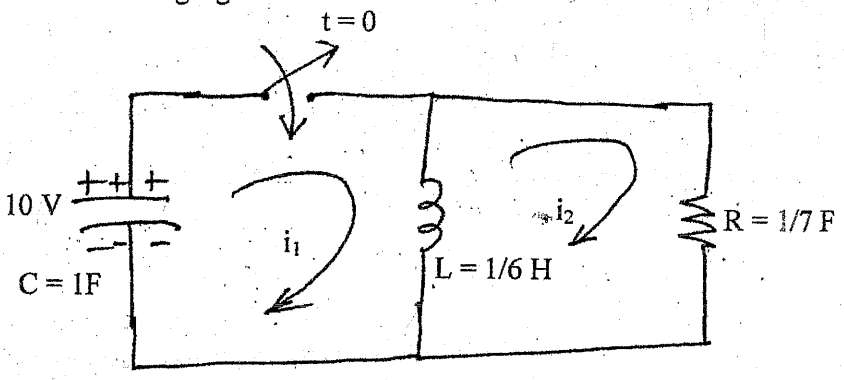
   b) Keeping the switch closed for a long time, if the switch is opened at t = 0 in the circuit shown in figure below, find expression for voltage across capacitor in the circuit shown in below using classical method of solution. [8]



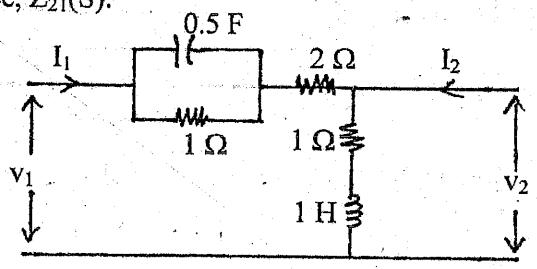
3. a) Using Laplace Transform method, find the current and voltage across inductor for $t > 0$ in the circuit shown in figure below. [8]



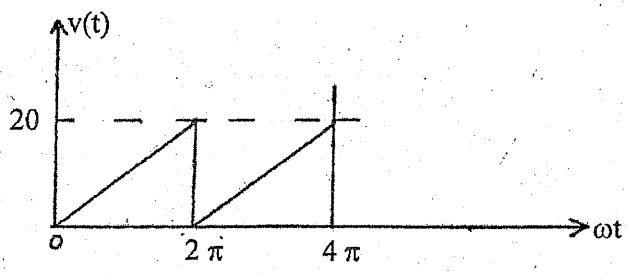
b) Using Laplace transform method, find he loop currents i_1 and i_2 for $t > 0$ in the circuit shown in the following figure. [8]



4. a) For the 2-port network shown in figure below, find voltage ratio transfer function, $G_{21}(S)$ and transfer admittance, $Z_{21}(S)$. [8]



b) Obtain trigonometric Fourier series of the waveform in figure below and sketch the line spectra. [8]



5. a) For the transfer function below, draw the asymptotic Bode plot [8]

$$G(s) = \frac{20(s+5)}{S(s+20)(s^2+80s+200)}$$

b) The Y-parameters of two TPNS are given as: [8]

$\begin{bmatrix} 1/4 & -5/4 \\ -1/4 & -3/4 \end{bmatrix}$ and $\begin{bmatrix} 1/3 & -1/3 \\ -1/3 & 1/3 \end{bmatrix}$. If these two TPNS are connected in series. What will be the equivalent Transmission parameter of the combination?

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24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

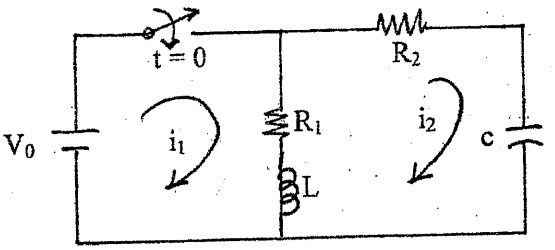
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

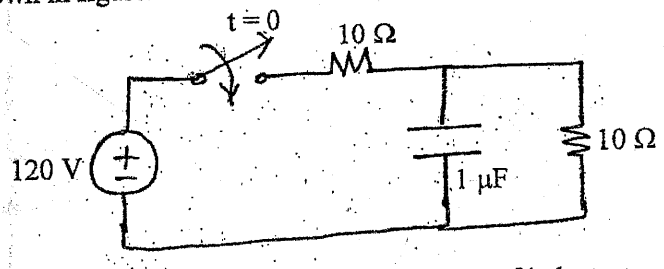
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) How does the resonance occurs in RLC series circuit? Define the half power frequencies and bandwidth for RLC series circuit and also obtain the expression for them. [8]

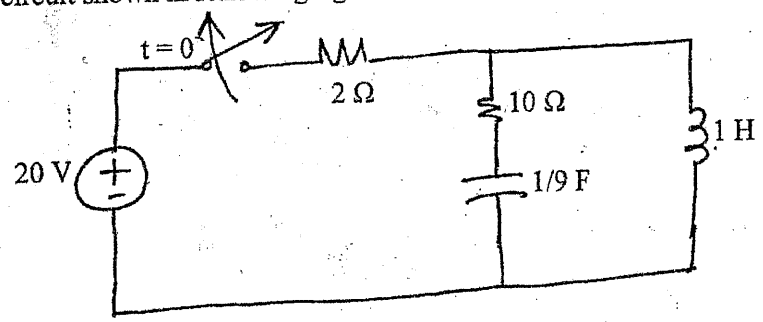
   b) If the switch is closed at t = 0 in the circuit shown in figure below, Obtain the value of $i_1, i_2, di_1/dt, di_2/dt, d^2i_1/dt^2$ and d^2i_2/dt^2 at $t = 0^+$ [8]



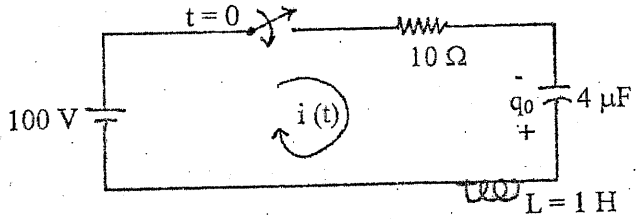
2. a) Using classical method, Find the current and voltage of capacitor for t > 0 in the circuit shown in figure. [8]



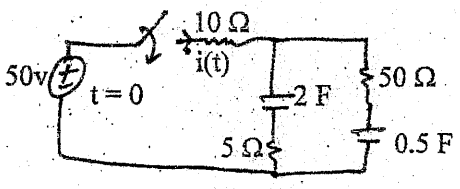
   b) Using classical method, find the current and voltage of inductor and capacitor for t > 0 in the circuit shown in following figure. [8]



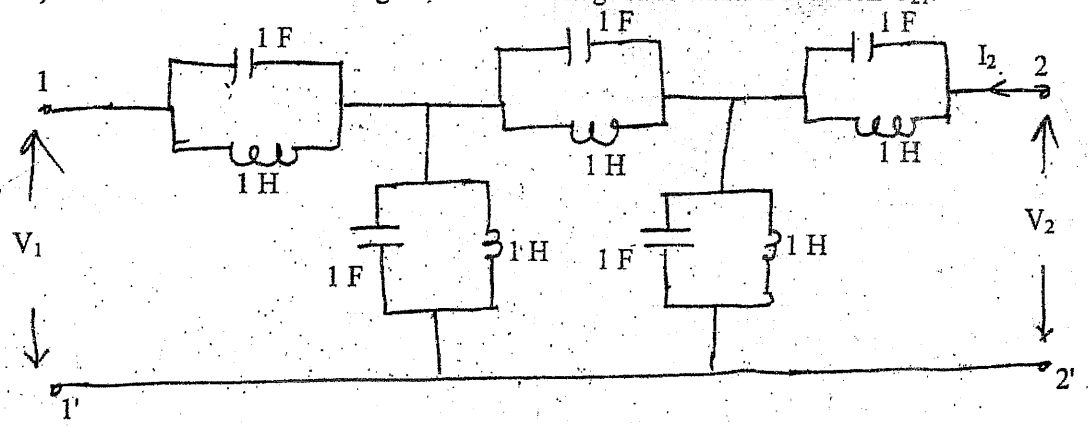
3. a) In the circuit shown in figure below, the capacitor has an initial charge of $q_0 = 800\ \mu C$ with polarity shown in the figure. Find current i(t) if the switch is closed at t = 0 using Laplace Transform method. [8]



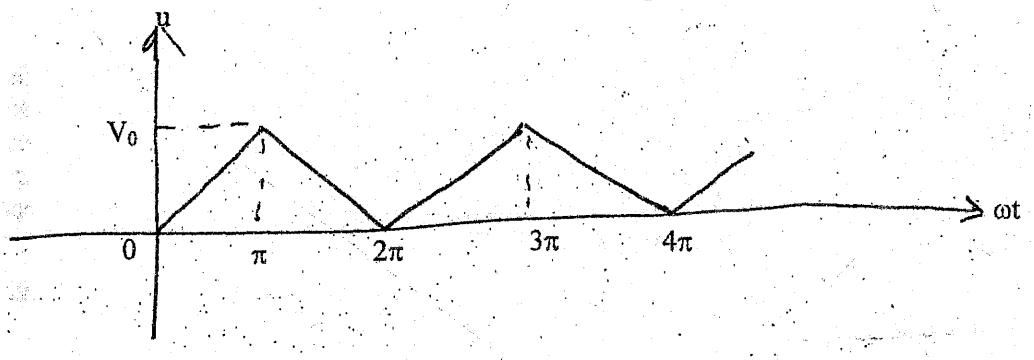
b) Solve for i(t) for t > 0 by using Laplace transformation. The switch closes time t = 0. Assume zero initial charge across the capacitors. [8]



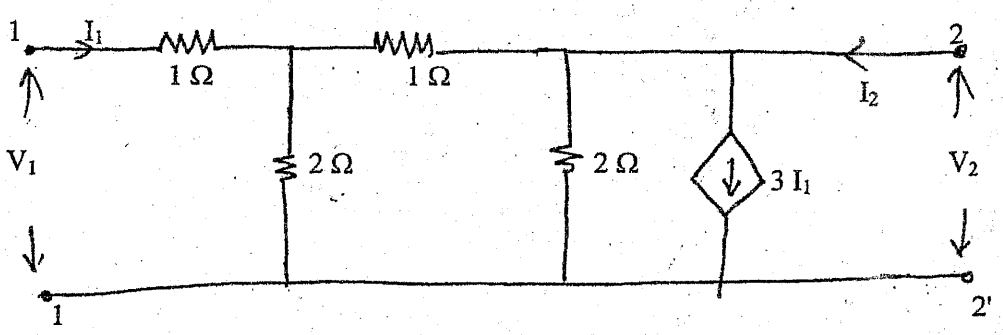
4. a) For the circuit shown in figure, find the voltage ratio transfer function G_{21}. [5]



b) For the waveform shown in figure below find the exponential form of Fourier series. [6]



c) For the two-port network shown in figure below. Find Z parameter. [5]



5. a) Draw the asymptotic Bode Plot for the transfer function. [8]

$$H(S) = \frac{(S+5)}{S(S^2+21S+20)(S^2+2S+10)}$$

b) What do you understand by reciprocity of two port network? Express the z-parameters and y-parameters in terms of ABCD parameters. Also derive condition for reciprocity in terms of transmission parameter. [8]

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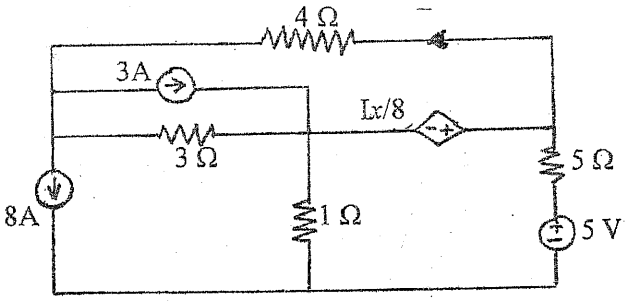
27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Shawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Semilog graph paper will be provided.*
- ✓ *Assume suitable data if necessary.*

1. a) Using node voltage method, find I_x in the circuit shown in figure below. [6]

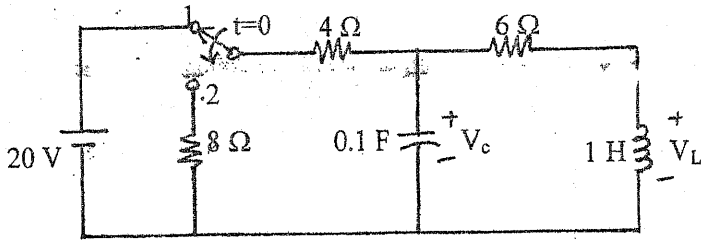


b) A 10Ω resistor is placed in series with a coil of self resistance R_L and inductance L a pure capacitor 'C' across a 50 V variable frequency supply. The current is maximum and has value of 1 A when the frequency is 500 HZ, At this frequency, voltage across the capacitor is 300 Volts, Calculate (i) capacitance of capacitor (ii) resistance and inductance of coil (iii) Power consumed in the circuit (iv) Voltage across the resistor and coil. [6]

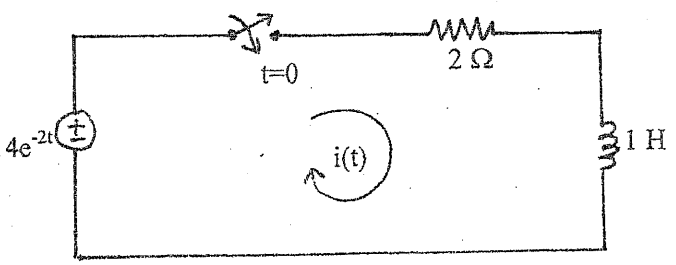
c) Define bandwidth of a series RLC circuit. How the quality factor changes with the change of R. [2+2]

2. a) With mathematical support show that current through inductor and voltage across capacitor do not change instantaneously. [2+2]

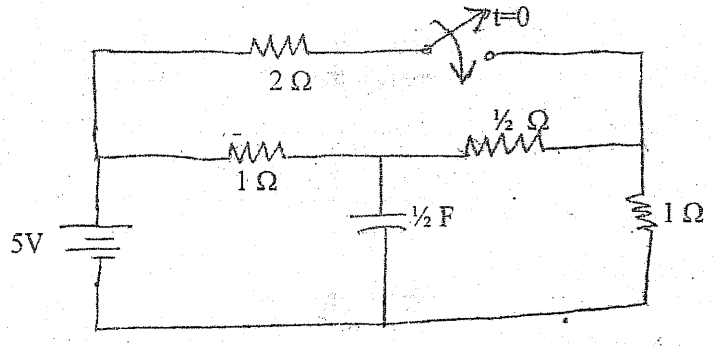
b) Keeping the switch at position 1 for a long time in the network shown in figure below, if it is changed to position 2 at t=0, find i_1, i_2, V_L, V_C, di_1/dt and dv_c/dt at $t=0^+$. [6]



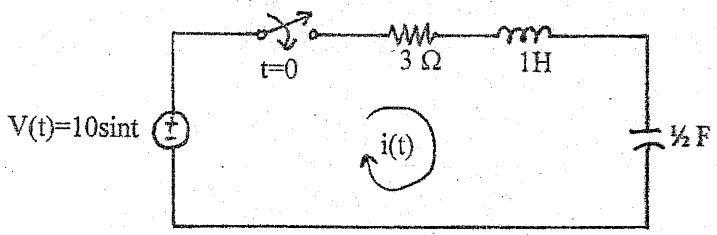
c) In a series RL circuit shown in figure below, if the switch is closed at t = 0, find particular solution for i(t) using classical method. [6]



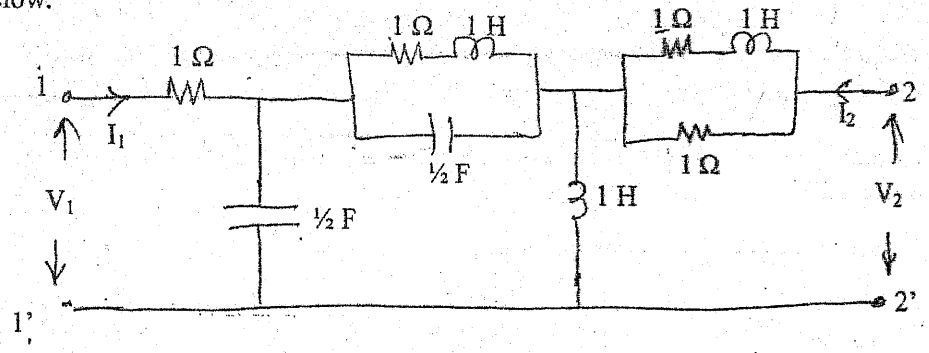
3. a) Using classical method, find the current through capacitor for $t > 0$ in the network shown in figure below. [8]



b) If the voltage source is applied at t=0 in the circuit shown in figure below, find the expression for current i(t) using transform method. Assume inductor and capacitor are initially de-energized. [8]



4. a) Find the voltage ratio transfer function of the two-port network shown in figure below. [6]

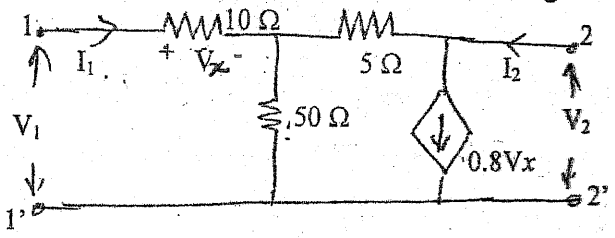


b) Sketch the Bode Plot for the transfer function given by:

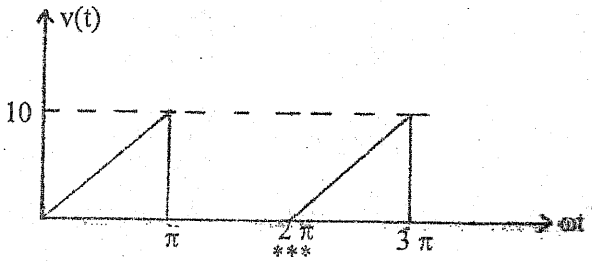
$H(S) = 80(S+20)/[(S^2+5S)(S^2+20S+1600)]$. [10

5. a) Explain poles and zero of the network function and its application in circuit analysis. [4]

b) Find Z and T-parameter of the two port network shown in figure below. [6]



c) Obtain trigonometric Fourier series of the waveform shown in figure below and sketch the line spectra. [6]



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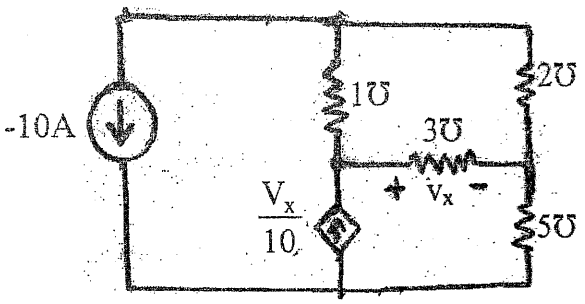
27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

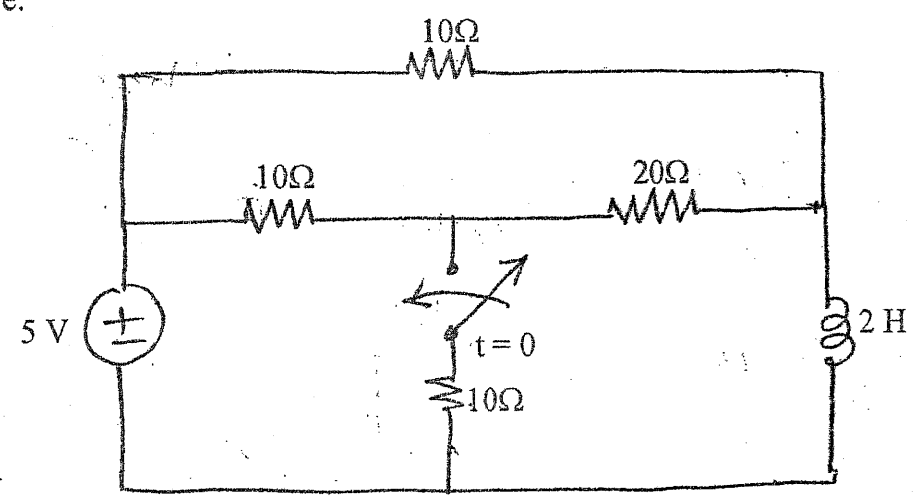
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Semilog graph paper will be provided.*
- ✓ *Assume suitable data if necessary.*

1. a) In the network shown, find current through each resistor using nodal analysis. [6]

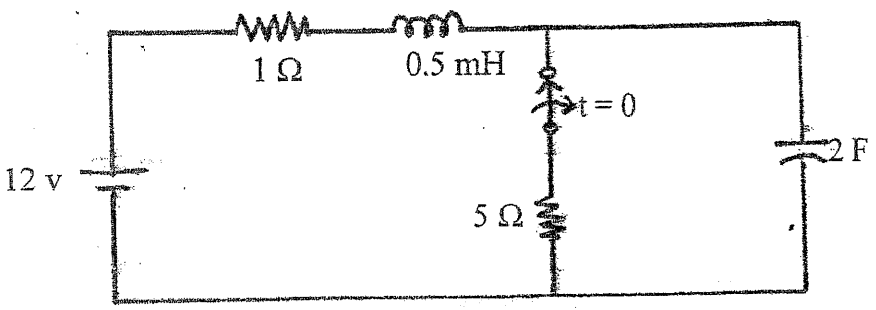


b) With the help of phasor diagram, explain the phenomenon of resonance of a parallel ac circuit and also derive the expression for the resonant frequency. [4]

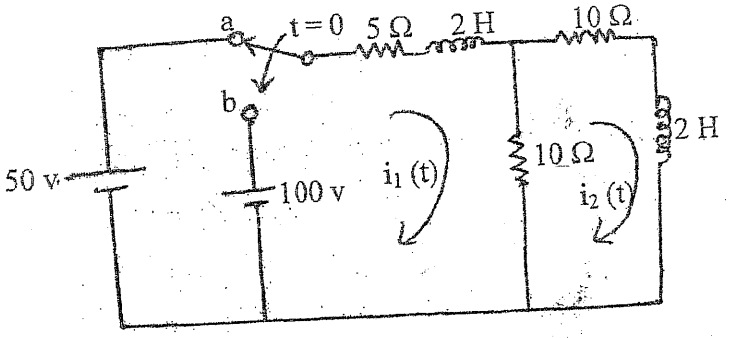
c) Find the voltage and current of each element at t = 0+ in the network of the following figure. [6]



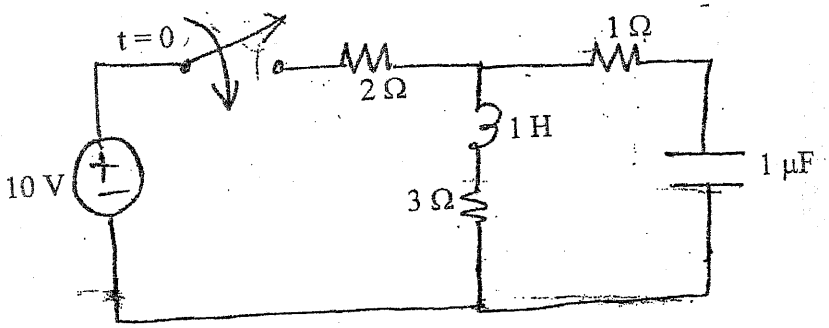
2. a) If the switch is opened at t = 0, find expression for voltage across capacitor in the circuit shown below using classical method. [8]



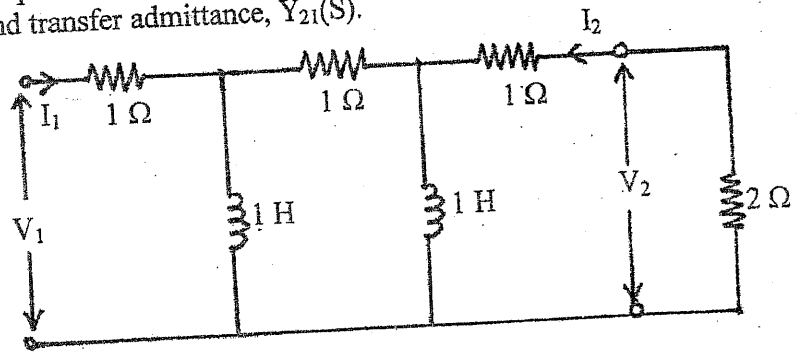
b) In the circuit shown, switch is changed from position "a" to "b" at t = 0. Find the expression for current $i_1(t)$ and $i_2(t)$ using Laplace transformation method. [8]



3. a) Using Laplace transform method find the current through inductor in the network shown in figure below. [6]

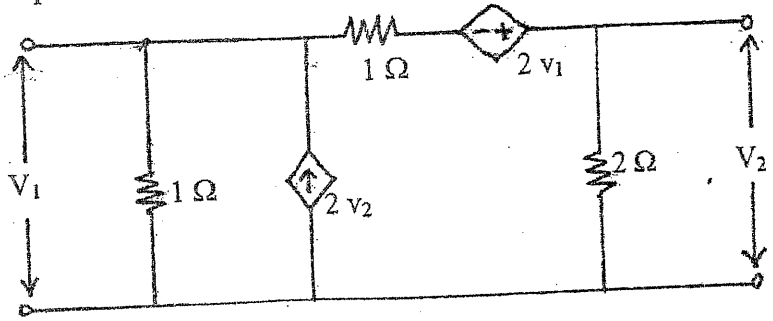


b) For the 2-port network shown in figure below, find voltage ratio transfer function, $G_{21}(S)$ and transfer admittance, $Y_{21}(S)$. [6]

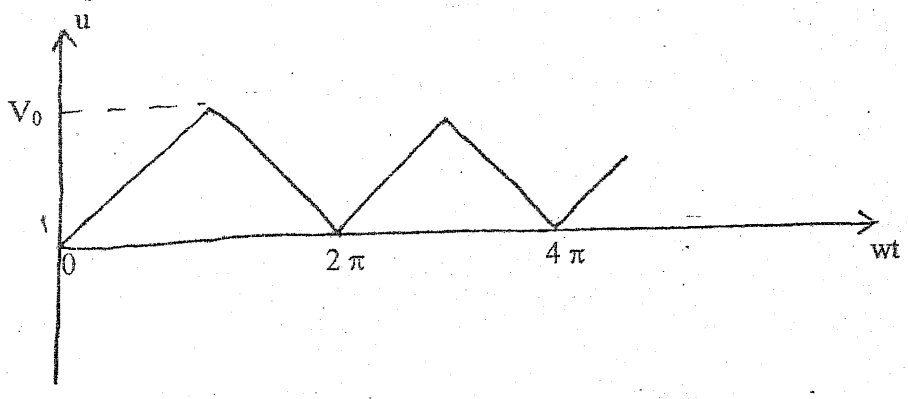


c) Express transmission (ABCD) parameters of the Two port Network in terms of Z parameters. [4]

4. a) Determine Y-parameters of the 2-port network shown in figure below. [8]



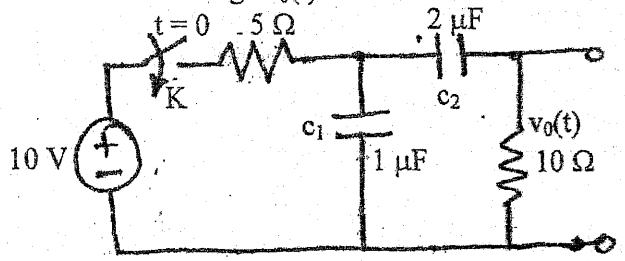
b) Find the trigonometric form of Fourier Series and plot the line spectrum for the following wave form. [8]



5. a) Plot the asymptotic Bode-diagram for the transfer function: [6]

function $G(S) = \dfrac{20(s+1)}{s(s^2+2s+10)(s+5)}$

b) In figure below, the capacitors C_1 and C_2 are initially discharged. The switch K is closed at t = 0. Find the voltage $v_0(t)$ for t > 0. [4]



c) Find the expression for Equivalent T-parameter equation if three two-port networks are connected in cascade. [6]

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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

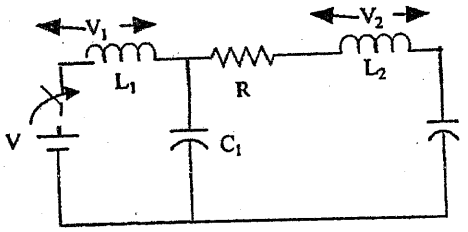
Subject: - Electrical Circuit Theory *(EE501)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Semi log paper will be provided.*
- ✓ *Assume suitable data if necessary.*

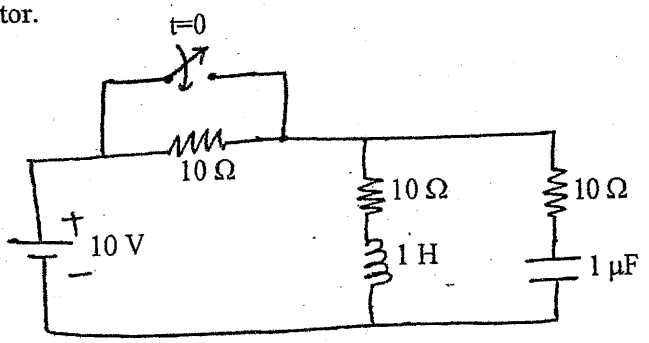
1. a) How resonance occurs in electrical RLC series circuit? Also show that bandwidth of circuit is independent of capacitor value. [6]

   b) A 220 V, 100 Hz source supplies a series R-L-C circuit. What value of capacitor would produce resonance at 100 Hz if the resistance and inductance of the circuit are 50 mΩ and 5 mH respectively? Also calculate the Q-factor and half - power frequencies of the circuit. [4]

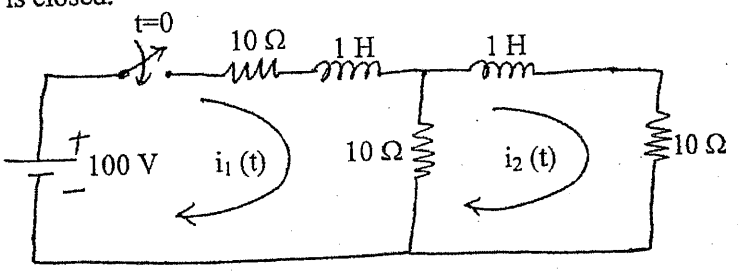
   c) Discuss the behavior of inductor and Capacitor at initial and final condition for dc excitation. Determine V_1, V_2, dV_1/dt, dV_2/dt at $t = 0+$ when switch is closed at $t = 0$. [2+4]



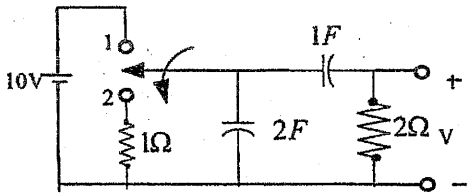
2. a) Circuit given in figure below was under steady state before the switch is closed at $t = 0$. At $t = 0^+$, find current through inductor, voltage across capacitor and current through each resistor. [8]



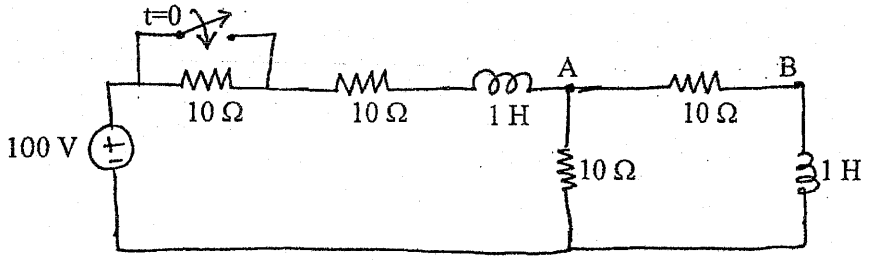
   b) In the circuit shown in figure below the switch is closed at $t = 0$, find the expression for $i_1(t)$ and $i_2(t)$ using Laplace transform method, if the circuit is unenergised before the switch is closed. [8]



3. a) Find the expression of output voltage V when the switch moved from position 1 to 2 after long time by using Laplace method. [6]

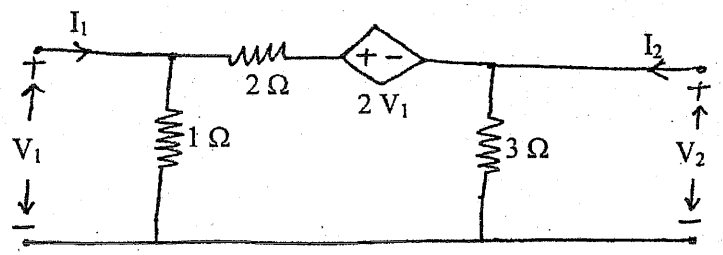


b) The network shown in figure below is under steady state condition. The switch is closed at t = 0. Determine the current through 10 Ω resistor connected between terminals AB. [use classical method] [6]

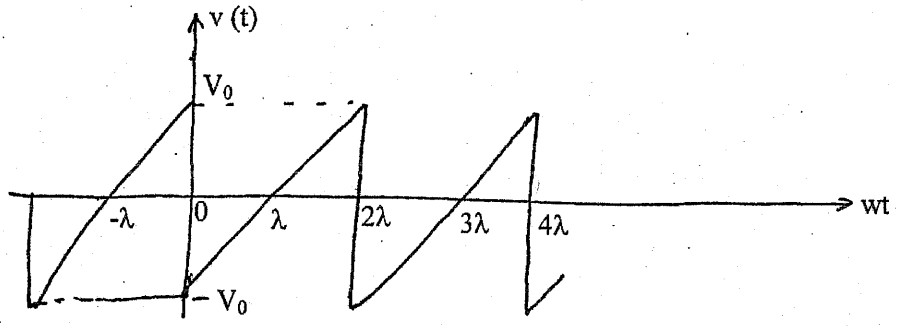


c) Express Transmission (ABCD) parameters of the two-port network in term of Y-parameters. [4]

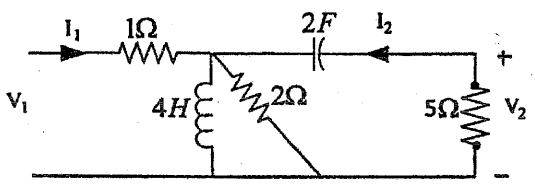
4. a) Find the Z-parameters of the circuit shown in figure below and also find whether the network is reciprocal or not. [8]



b) Find the trigonometric Fourier series for the Sawtooth Wave shown in figure below and also plot the line spectrum. [8]



5. a) In the given network determine $G_{21}(S)$, $Z_{11}(S)$ and $\alpha_{21}(S)$ [8]



b) For the network function given below draw the asymptotic Bode-plot. [8]

$$N(S) = \frac{210(S^2 + 45S + 200)}{S(S+20)(S^2 + 80S + 700)}$$

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21A TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Ashad

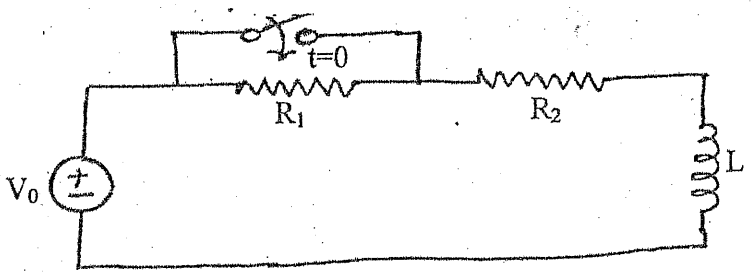
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

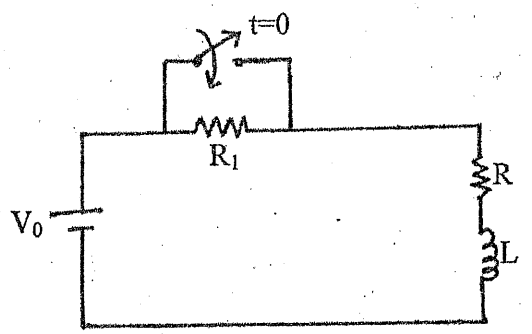
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semilog graph paper will be provided.***
- ✓ *Assume suitable data if necessary.*

1. a) Discuss why the shape of the resonance curve depends upon the Q-factor of a coil in a series RLC Circuit. [8]

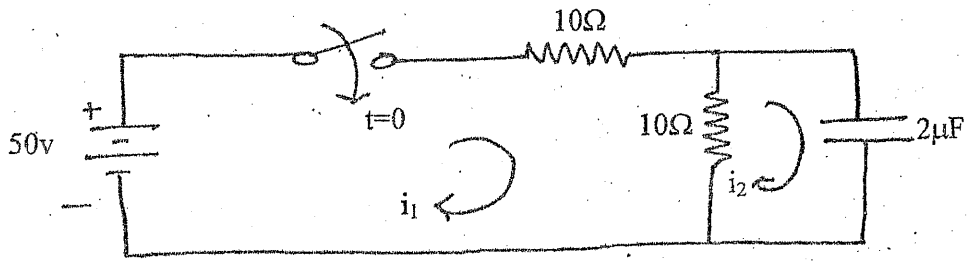
   b) Derive the expressions for i, V_{R2}, V_L, i' and i'' at $t = 0^+$ in the network shown below. [8]



2. a) Using classical method, find the expression of current flowing through the resistor 'R' of the circuit shown in the following figure and also find the voltage across inductor 'L' for t>0. [8]

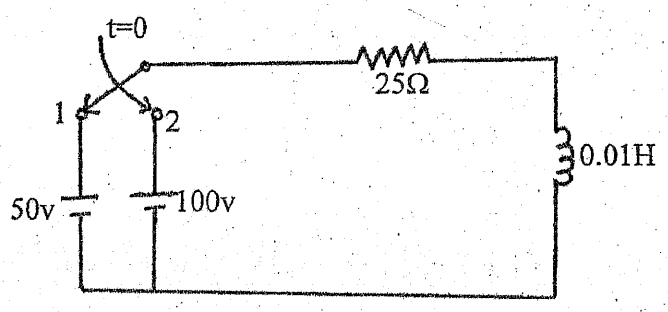


   b) In the two mesh network shown in the following figure, the switch is closed at t=0, Find the transient mesh currents i_1, and i_2 as shown and also the expression for transient capacitor voltage. [8]



3. a) An exponential voltage $v(t)=2e^{-4t}$ is applied at time t=0 to a series R-L circuit comprising a resistor R=1Ω and a inductor L=0.25H. Obtain the particular solution for current i(t) through the circuit. Assume zero initial current through the inductor. Use Laplace transforms method. [8]

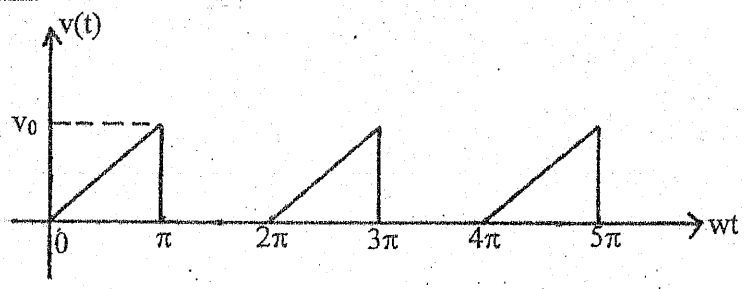
b) In the circuit shown below, steady state condition has been reached with switch in position'1'. Switch is changed to position '2' at t=0. Find the expression for current through inductor using transform method. [8]



4. a) For the given transfer function, draw the asymptotic Bode-Plot. [8]

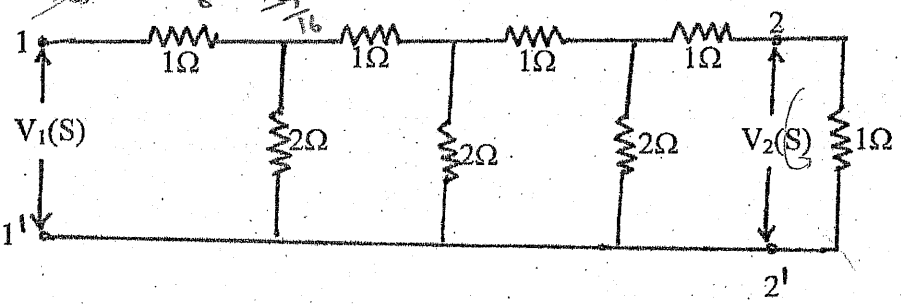
$$G(s)=\frac{250(S+1)}{S(S^2+15S+50)}$$

b) Find the trigonometric Fourier series for the waveform shown below and sketch the line spectrum. [8]

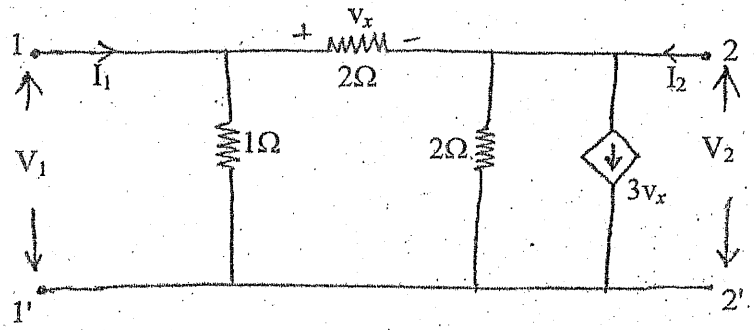


5. a) For the given resistive network, determine the numerical value of [8]

i) Z_{11} ii) G_{22} iii) Z_{21} iv) Y_{21} v) α_{21}



b) For the network shown below, Find y-parameter and h-parameter. [8]



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21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

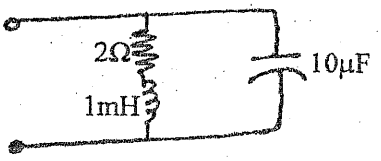
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE 501)*

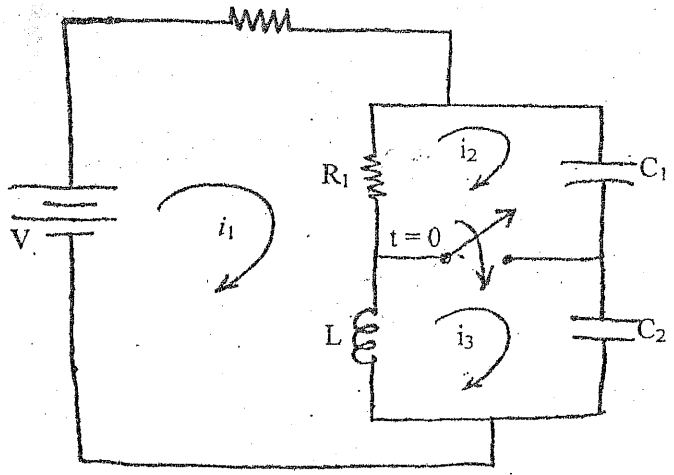
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) How does resonance occur in RLC series circuit? Define half power points and bandwidth for a series RLC circuit and derive the expression for them. [8]

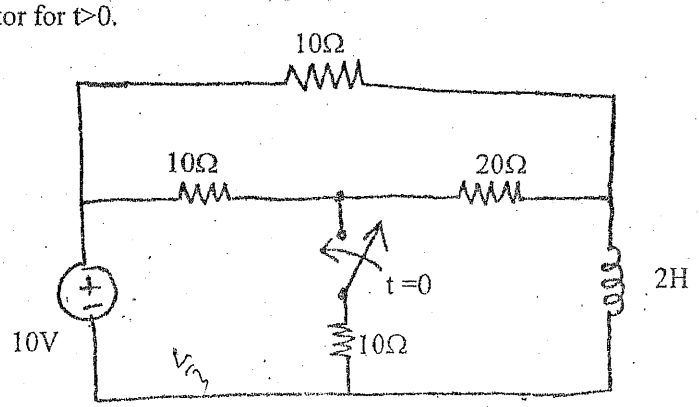
   b) In the parallel resonant circuit as shown in the figure below, find resonance frequency, Q factor and band width. [8]



2. a) For the circuit shown in following figure, find the current i_1, i_2, i_3 at $t = 0^+$. [8]

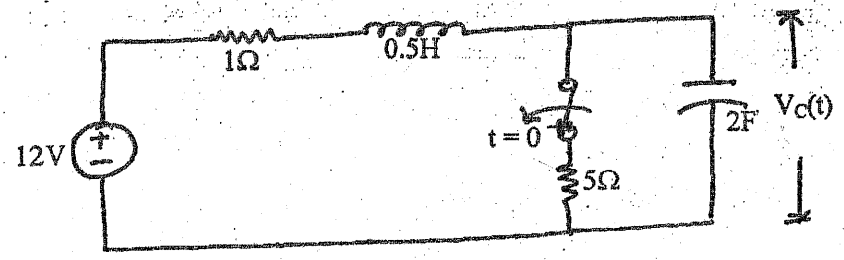


   b) For the circuit shown in following figure, use classical method to find the current in the inductor for t>0. [8]

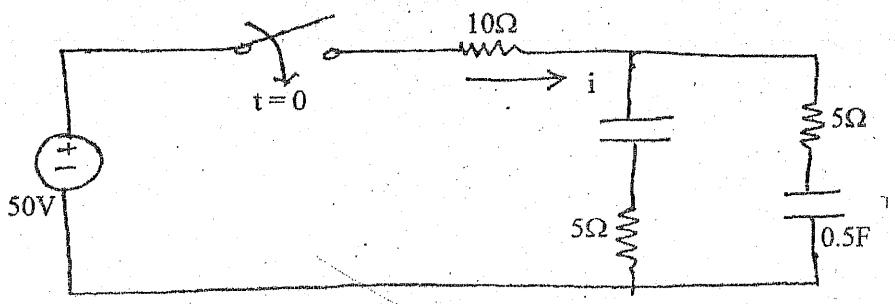


3. a) An exponential voltage $v(t) = 2e^{-4t}$ is applied at time t = 0 to a series R-L circuit comprising a resistor R = 1Ω and a inductor L = 0.25H. Obtain the particular solution for current i(t) through the circuit. Assume zero initial current through the inductor. Use classical approach. [8]

b) In the following network the switch was closed for a long time before it is being opened at t = 0. Find the expression for V_C (t) for t > 0. (Use classical method). [8]

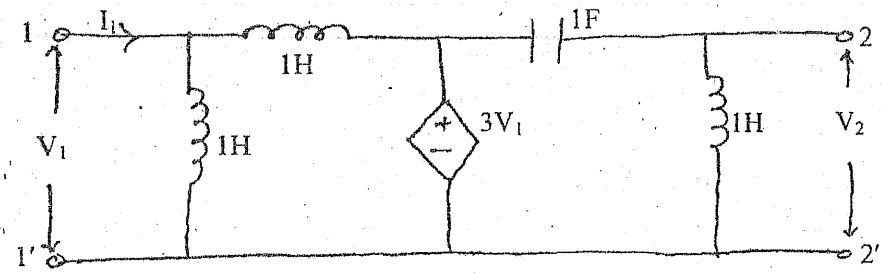


4. a) Using laplace transformation technique, find the expression for current i(t) in the network shown below for t > 0 when the switch is closed at t = 0. Assume zero initial charge across the capacitors. [6]



b) What do you understand by a reciprocal two port network? Derive the condition for reciprocity in terms of y-parameters. [4]

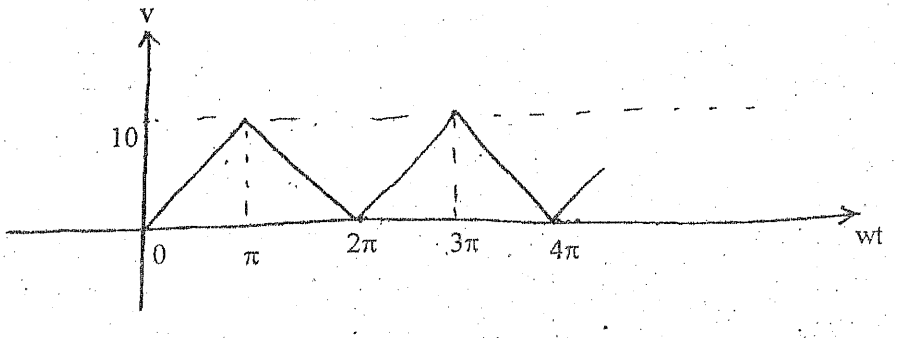
c) Find the Z-parameters in the network shown below and also check for its reciprocity and symmetricity. [6]



5. a) Sketch the asymptotic bode plots for the transfer function given by:

$$N(S) = \frac{2s^2(S+5)}{(S^2+22S+40)(S+10)}.$$ [8]

b) The following figure shows a voltage waveform in the form of a train of isosceles triangles. Determine the Fourier series and plot the line spectrum. [8]



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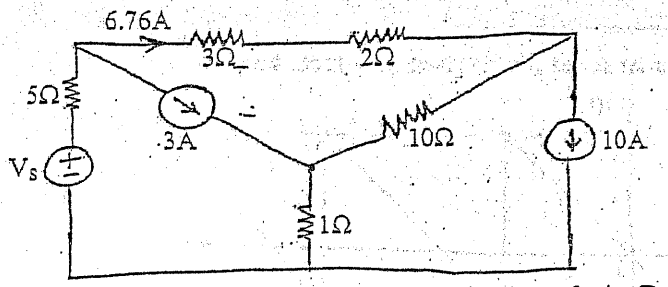
22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuits II

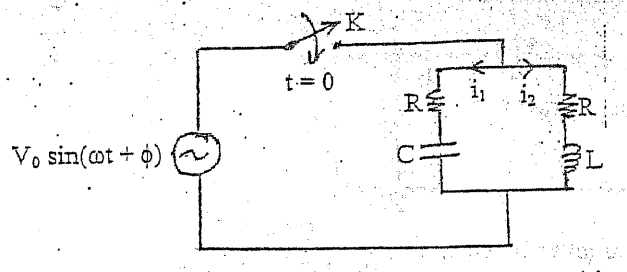
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any Five questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Semilog graph paper will be provided.*
- ✓ *Assume suitable data if necessary.*

1. a) Using mesh analysis, determine the value of V_S so that the current through 3Ω resistor is 6.76 Amp as shown in the following figure. [8]

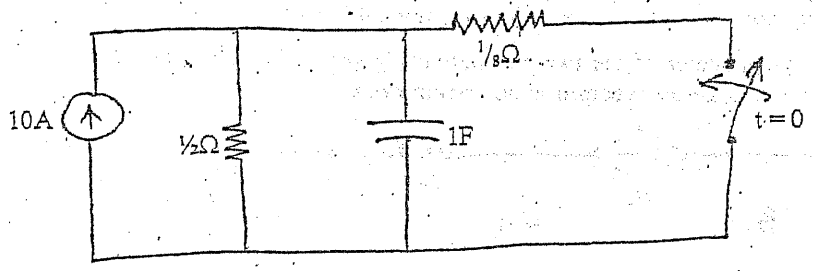


b) Mention the importance of initial conditions in the circuit analysis. Draw the equivalent circuit showing the initial and final condition for inductor and capacitor. [4]

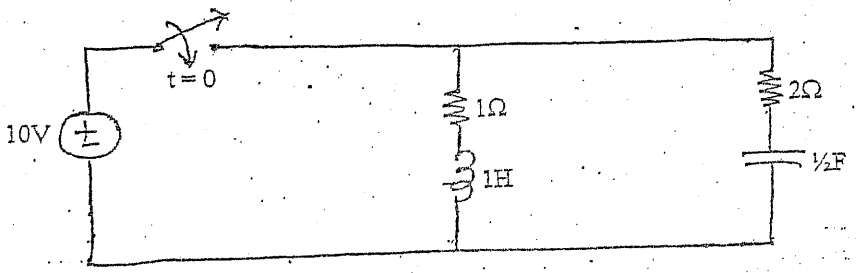
c) In the given circuit, switch K is closed at time t = 0. Find $i_1(0^+)$, $i_2(0^+)$, $\frac{d\,i_1(0^+)}{dt}$ and $\frac{d\,i_2(0^+)}{dt}$. [4]



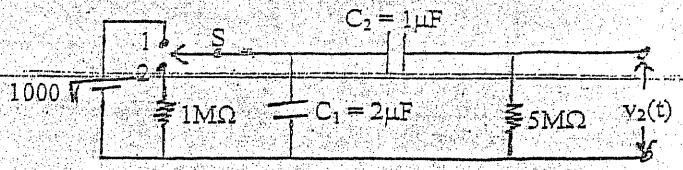
2. a) In the given circuit, after the switch has been in the open position for a long time, it is closed at t = 0. Find the voltage across the capacitor using classical method. [8]



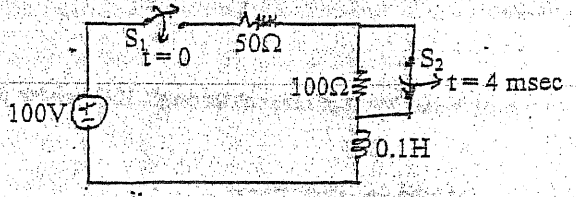
b) In the network shown, the switch is closed at t = 0. Find the current supplied by the source using Laplace transform method. [8]



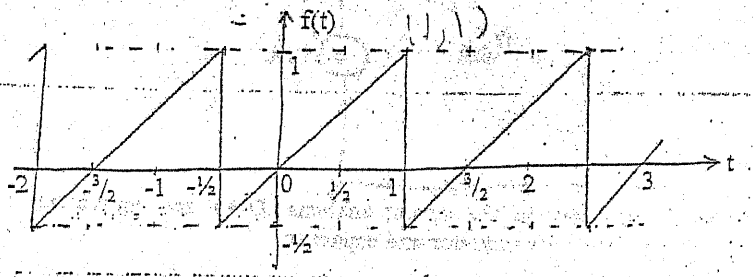
3. a) With the switch S in position 1, the circuit shown below attains equilibrium. At time t = 0, the switch is moved to position 2. Find the voltage across 5MΩ resistor. (Use Laplace transform method) [8]



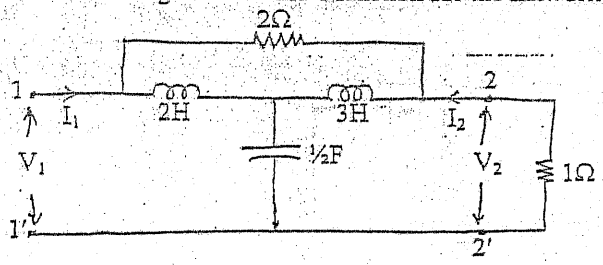
b) In the circuit shown below, switch S_1 is closed at t = 0 and S_2 is opened at t = 4 msec. Determine i(t) for t > 0. Assume that inductor is initially de-energized. (Use Laplace method) [8]



4. a) Find the exponential form of Fourier series for the given Saw-tooth wave. [8]



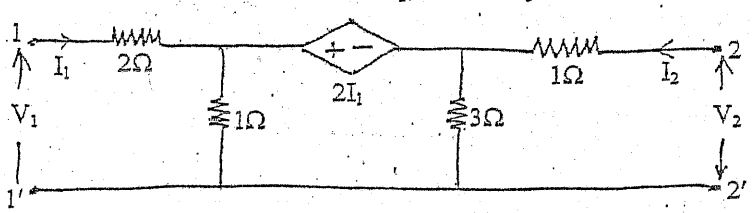
b) Find the current ratio and voltage ratio transfer function for the network given. [8]



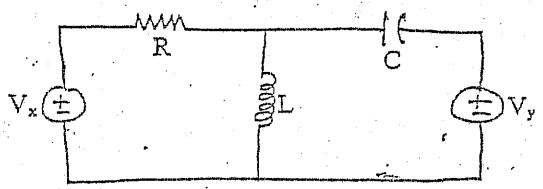
5. a) Sketch Bode-plot for the transfer function given by $G(S) = 10\dfrac{S(S+3)}{(S+1)(S^2+2S+16)}$. [8]

b) With a suitable example prove that the forced response of a network depends upon the nature of input excitation while the natural response never depends upon the input excitation. [8]

6. a) Find the transmission and y-parameter of the two port network given in the following figure and also prove that the network is neither reciprocal nor symmetrical. [8]



b) Write the state variable formulation of the circuit shown. [8]



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