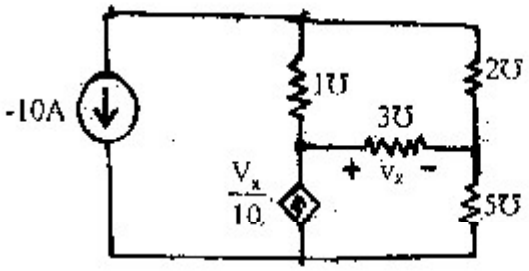
27 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

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)*

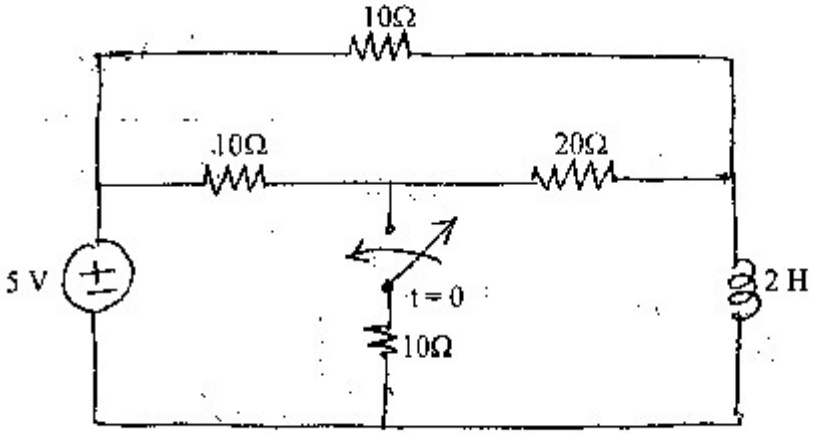
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Semilog graph paper will be provided.*
- ✓ *Assume suitable data if necessary.*

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

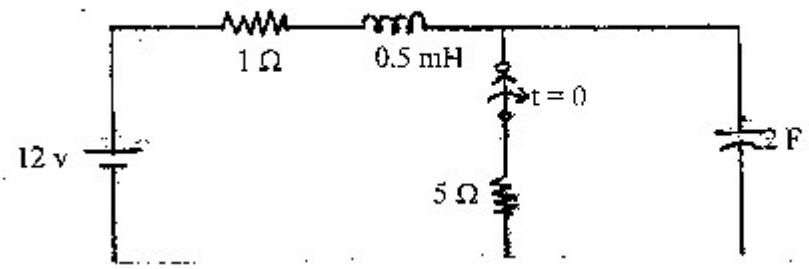


b) With the help of phasor diagram, explain the phenomenon of resonance of a parallel ac circuit and also derive the expression for the resonant frequency. [4]

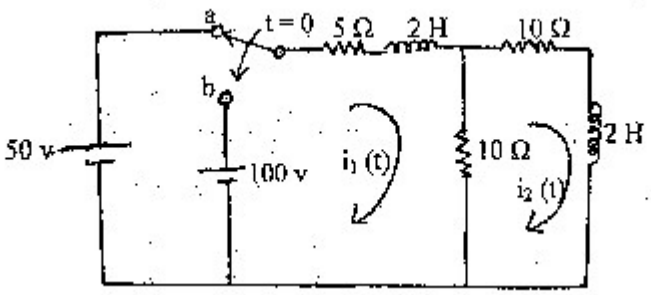
c) Find the voltage and current of each element at t = 0+ in the network of the following figure. [6]



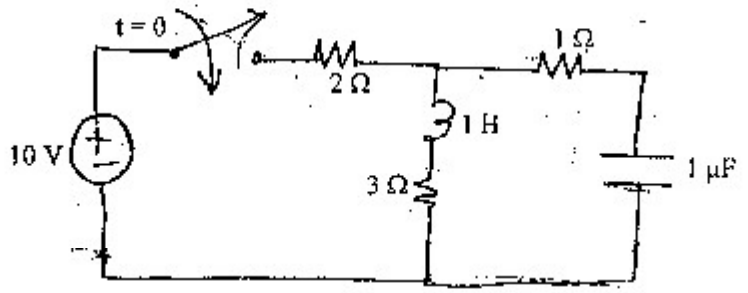
2. a) If the switch is opened at t = 0, find expression for voltage across capacitor in the circuit shown below using classical method. [8]



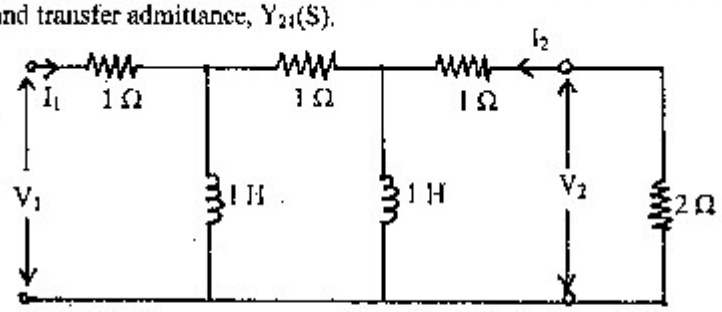
b) In the circuit shown, switch is changed from position "a" to "b" at t = 0. Find the expression for current $i_1(t)$ and $i_2(t)$ using Laplace transformation method. [8]



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

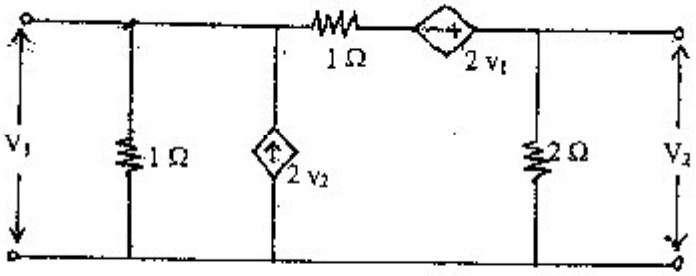


b) For the 2-port network shown in figure below, find voltage ratio transfer function, $G_{21}(S)$ and transfer admittance, $Y_{21}(S)$. [6]

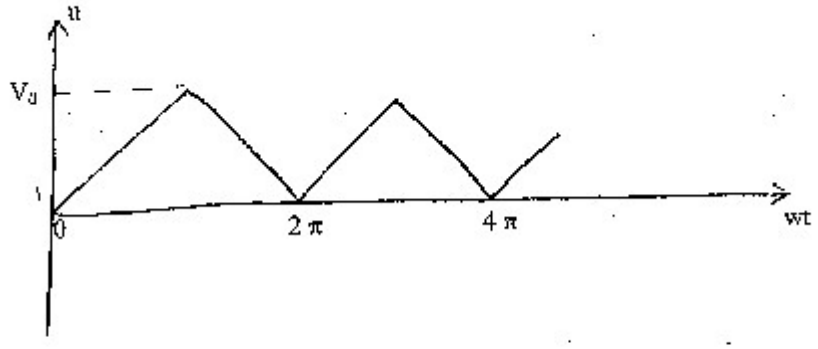


c) Express transmission (ABCD) parameters of the Two port Network in terms of Z parameters. [4]

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



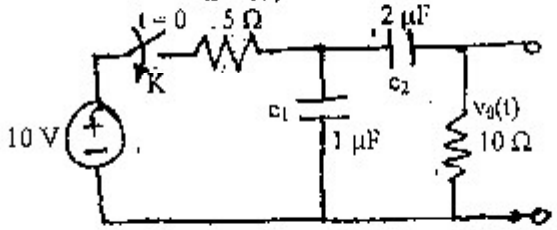
b) Find the trigonometric form of Fourier Series and plot the line spectrum for the following wave form. [8]



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]

***

21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Asbad

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.

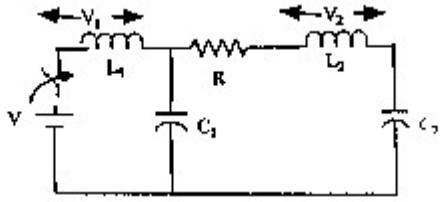
Subject: - Electrical Circuit Theory *(EE501)*

- ✓ 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.*

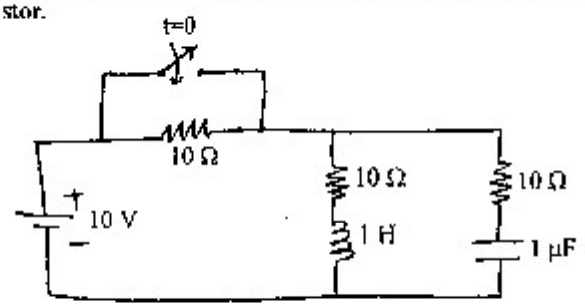
1. a) How resonance occurs in electrical RLC series circuit? Also show that bandwidth of circuit is independent of capacitor value. [6]

   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]

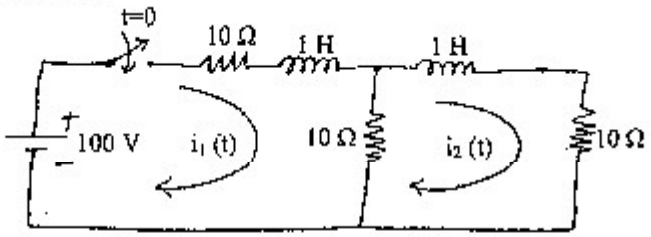
   c) Discuss the behavior of inductor and Capacitor at initial and final condition for dc excitation. Determine V_1, V_2, dV_1/dt, dV_2/dt at $t = 0+$ when switch is closed at $t = 0$. [2+4]



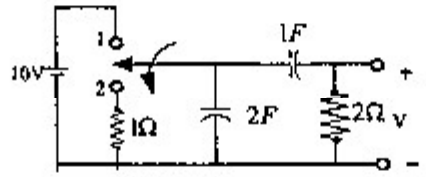
2. a) Circuit given in figure below was under steady state before the switch is closed at $t = 0$. At $t = 0^+$, find current through inductor, voltage across capacitor and current through each resistor. [8]



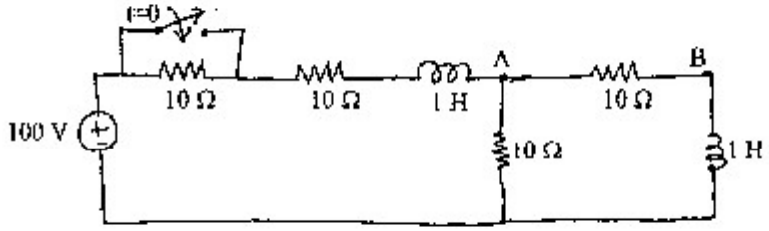
   b) In the circuit shown in figure below the switch is closed at $t = 0$, find the expression for $i_1(t)$ and $i_2(t)$ using Laplace transform method, if the circuit is unenergised before the switch is closed. [8]



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]

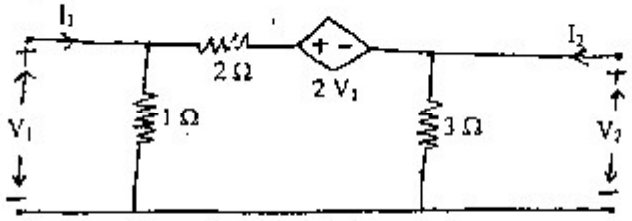


b) The network shown in figure below is under steady state condition. The switch is closed at t = 0. Determine the current through 10 Ω resistor connected between terminals AB. [use classical method] [6]

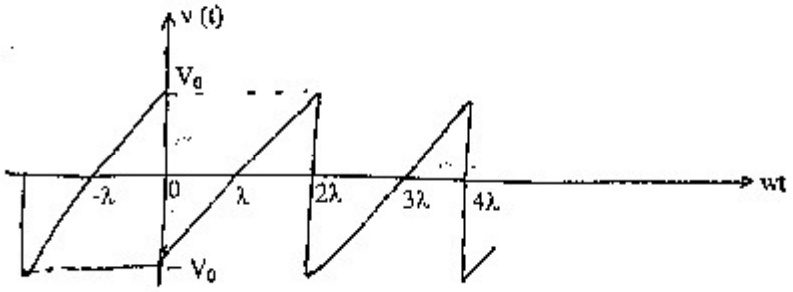


c) Express Transmission (ABCD) parameters of the two-port network in term of Y-parameters. [4]

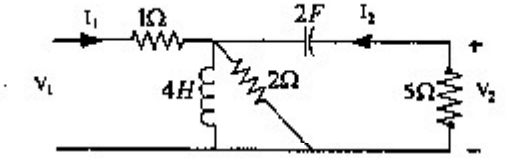
4. a) Find the Z-parameters of the circuit shown in figure below and also find whether the network is reciprocal or not. [8]



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 $G_{21}(S)$, $Z_{21}(S)$ and $\alpha_{21}(S)$ [8]



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

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

***

24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

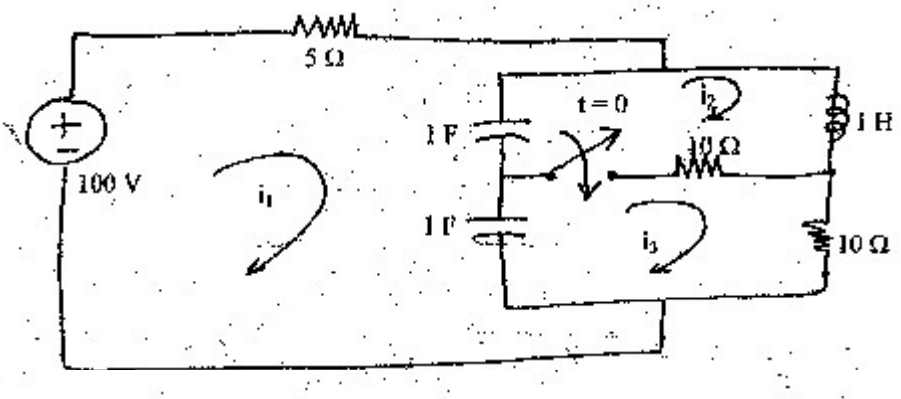
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory *(EE501)*

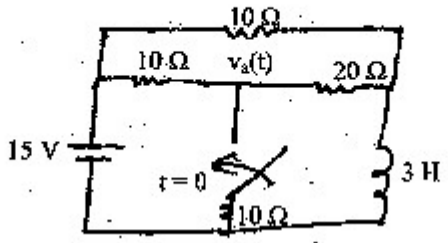
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

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

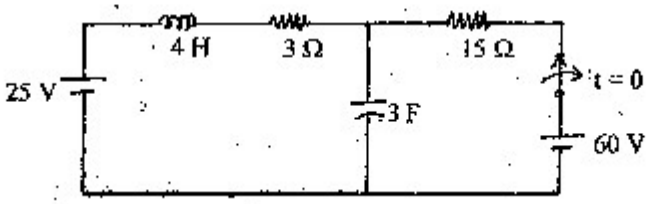
   b) In the circuit shown in following figure, find the loop currents i_1, i_2, i_3 at $t = 0^+$. [8]



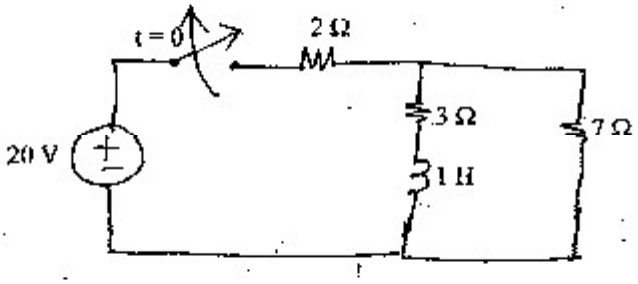
2. a) Find $v_a(t)$ for $t > 0$ in the figure below using classical method. [8]



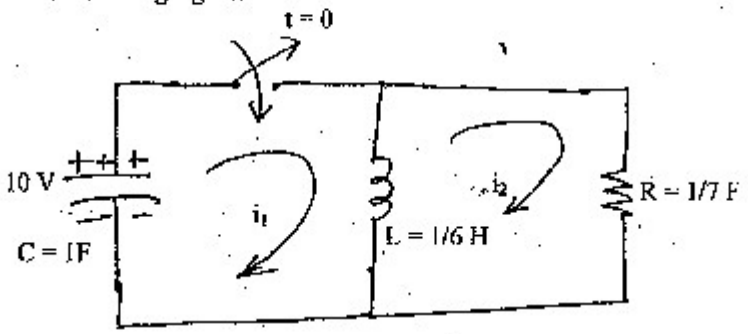
   b) Keeping the switch closed for a long time, if the switch is opened at $t = 0$ in the circuit shown in figure below, find expression for voltage across capacitor in the circuit shown in below using classical method of solution. [8]



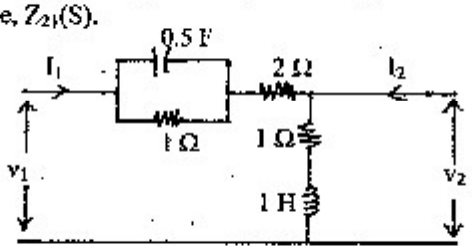
3. a) Using Laplace Transform method, find the current and voltage across inductor for $t > 0$ in the circuit shown in figure below. [8]



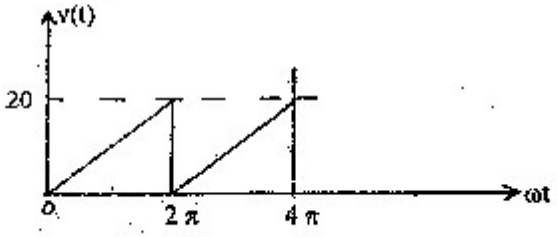
b) Using Laplace transform method, find he loop currents i_1 and i_2 for $t > 0$ in the circuit shown in the following figure. [8]



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?

***

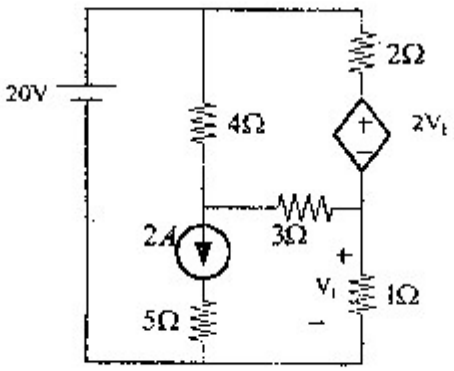
21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

Exam.	Regular		
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.*

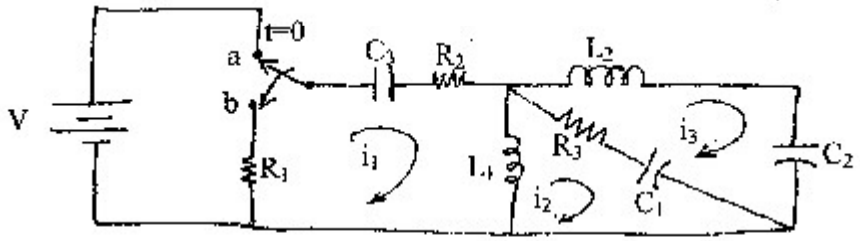
1. a) In the given circuit determine voltage across 1Ω resistor using mesh analysis method. [6]



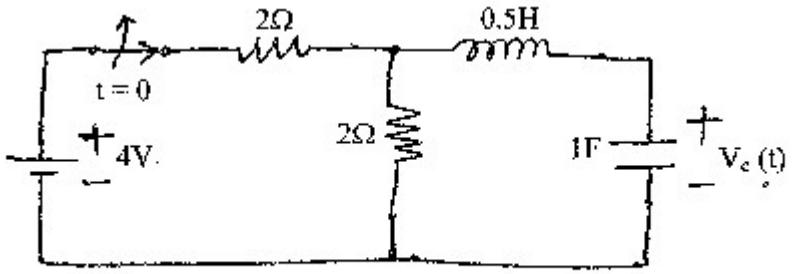
b) Explain the phenomenon of resonance in RLC series circuit. Derive the expression for resonant frequency, bandwidth, half power frequencies and quality factor. [6]

c) Derive an expression with necessary diagrams for resonance frequency of a circuit consisting of a coil in parallel with a capacitor excited by a sinusoidal AC voltage. [4]

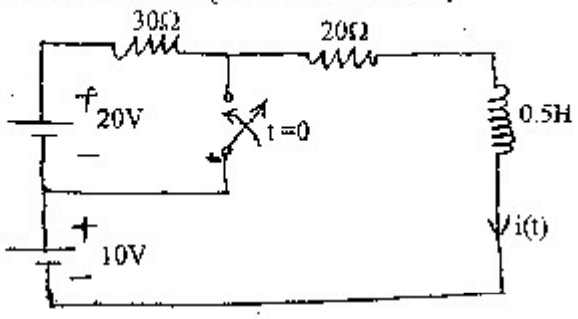
2. a) In the network shown in figure below the switch is changed from a to b at t = 0. Show that at $t = 0^+$ $i_1 = i_2 = -\frac{V}{R_1 + R_2 + R_3}$ and $i_3 = 0$. Also find the voltage across C_1, C_2, C_3, L_1 and L_2 at $t = 0^-$ **[8]**



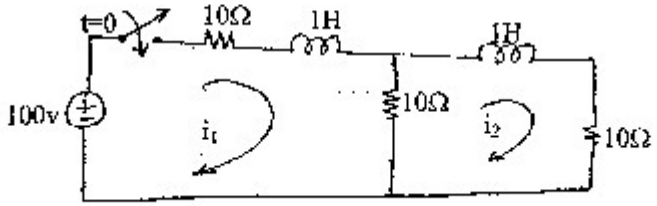
b) Switch in the circuit is suddenly opened at t = 0 after steady state has been reached in the closed position of the switch. Use classical method to determine the expression for voltage across capacitor for t > 0. [8]



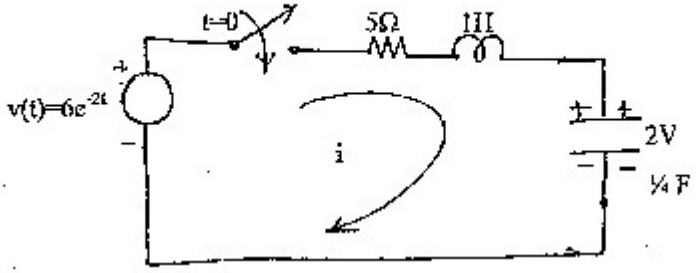
3. a) In the circuit shown switch is opened for a long time and then it is suddenly closed at t = 0. Obtain the expression for current through inductor for t > 0. Also calculate the voltage across inductor after 10mSec. [Use classical method] [8]



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

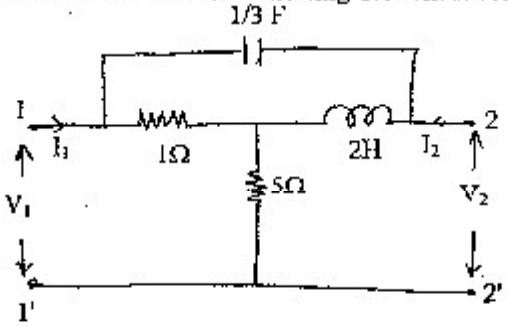


4. a) In a series RLC, as shown in figure below find the value of current for t > 0, also find the voltage across capacitor for t > 0, using Laplace transform method. [6]



b) With necessary circuit diagram, obtain the equivalent Y-parameter if three two-port networks are connected in parallel. [4]

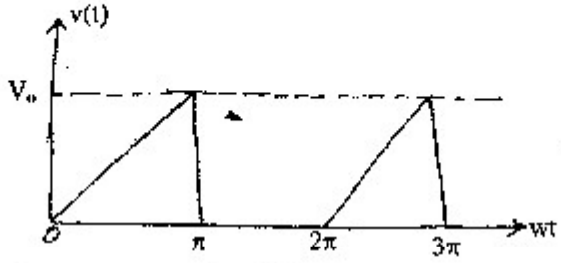
c) If the two port network, shown in figure below is terminated with a 2Ω resistor at port 2 then for this terminated network find following network function. (i) G_{21} (ii) α_{21} [6]



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

$$N(S) = \frac{10(S+10)}{S(S^2+5S+4)(S+40)}$$ [8]

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



***

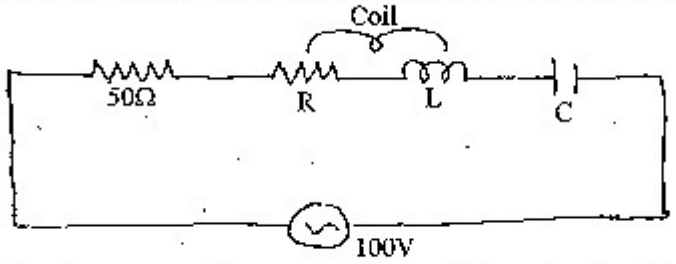
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Baishakh

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

Subject: - Electric Circuit Theory

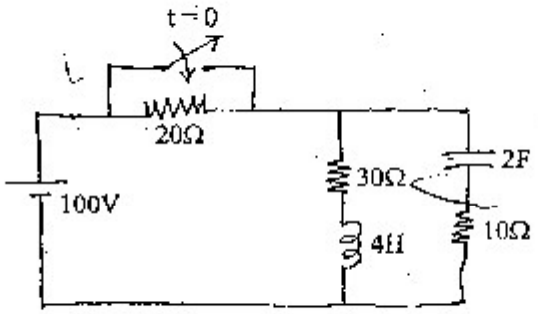
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semilog graph paper is attached herewith.***
- ✓ *Assume suitable data if necessary.*

1. a) A 50Ω resistor is connected in series with a coil having resistance R and inductance L, a capacitor "C" and 100V variable frequency supply as shown in figure below. At a frequency of 200Hz, the maximum current of 0.7Amp flows through the circuit and voltage across the capacitor is 200V. Determine the value of R, L, and C. [6]

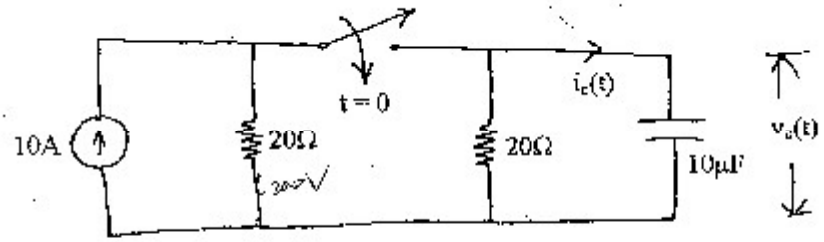


b) Explain the phenomenon of resonance of a parallel ac circuit and hence derive the expression for the resonant frequency. [6]

2. a) The switch has been opened for a long time as shown in figure below. At time t = 0, it is suddenly closed. At t = 0⁺, find current through inductor, voltage across capacitor, charge across capacitor, current and voltage across each resistor. [8]

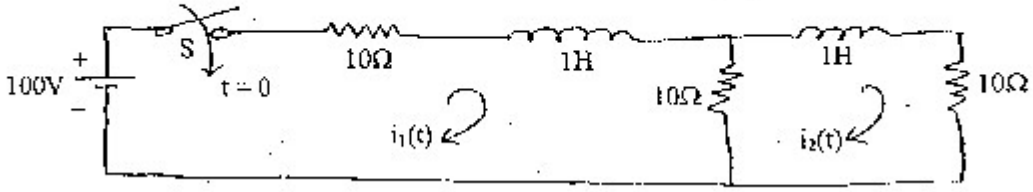


b) At t = 0, switch is closed in the circuit of figure below. Find the $V_c(t)$ and $i_c(t)$ using classical method. [8]



3. a) In a series R-L circuit the applied voltage is $v(t) = 10 \sin(10^4 t + \frac{\pi}{6})$ with R = 2Ω, L = 0.01H. v(t) is applied at t = 0. Obtain the particular solution for current i(t) through the circuit. Assume zero initial current through the inductor. [Use classical method]. [8]

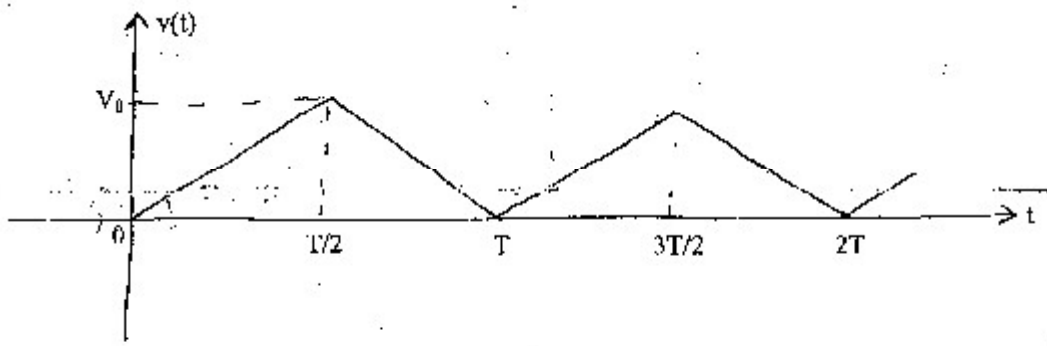
b) In the network shown below, the switch is closed at t = 0. With the network parameter values given, find the expression for $i_1(t)$ and $i_2(t)$ using Laplace transform method. The network is in energized before the switch is closed. [8]



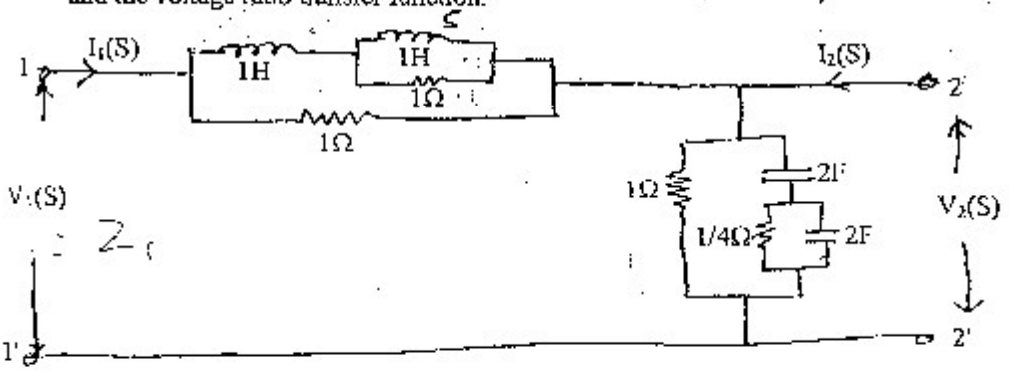
4. a) Sketch the Bode plots for the transfer function given by

$$N(S) = \frac{10(S+10)}{(S^2+40S)(S^2+5S+4)}$$ [8]

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



5. a) For the two port network shown below, find the driving point impedance of port one and the voltage ratio transfer function. [10]



b) What do you understand by frequency response of networks and hence highlight the role of complex frequency in studying the frequency response. [6]

c) With necessary circuit diagram, obtain the equivalent Z - parameter if three two port networks are connected in series. [4]

***

21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

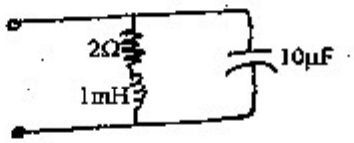
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

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

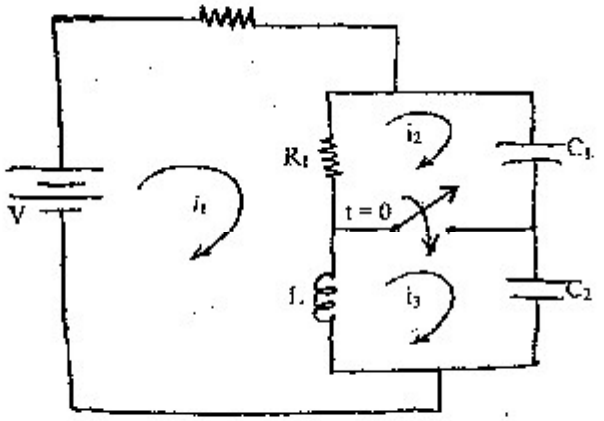
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

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]

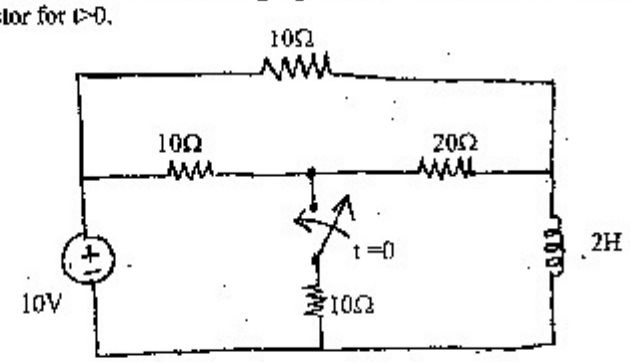
   b) In the parallel resonant circuit as shown in the figure below, find resonance frequency, Q factor and band width. [8]



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

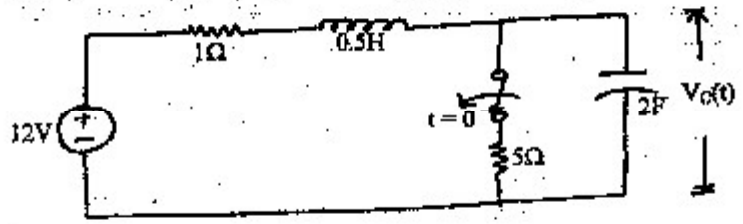


   b) For the circuit shown in following figure, use classical method to find the current in the inductor for t>0. [8]

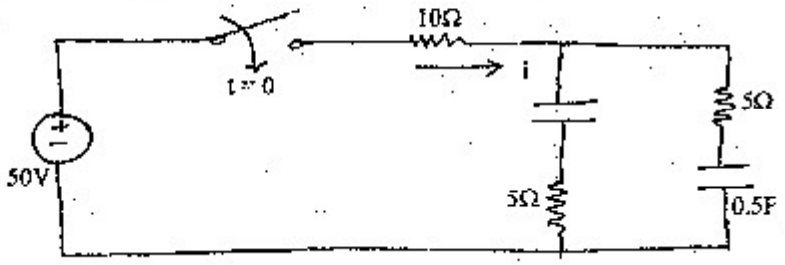


3. a) An exponential voltage $v(t) = 2e^{-4t}$ is applied at time $t = 0$ to a series R-L circuit comprising a resistor R = 1Ω and a inductor L = 0.25H. Obtain the particular solution for current i(t) through the circuit. Assume zero initial current through the inductor. Use classical approach. [8]

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]

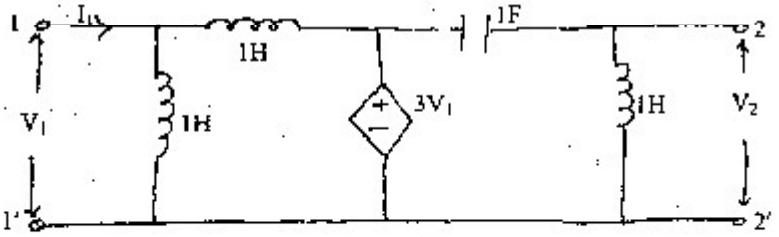


4. a) Using laplace transformation technique, find the expression for current i(t) in the network shown below for t > 0 when the switch is closed at t = 0. Assume zero initial charge across the capacitors. [6]



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

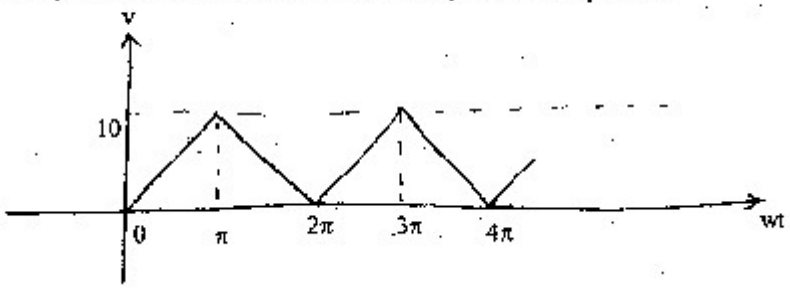
c) Find the Z-parameters in the network shown below and also check for its reciprocity and symmetricity. [6]



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]



***

21 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Shrawan

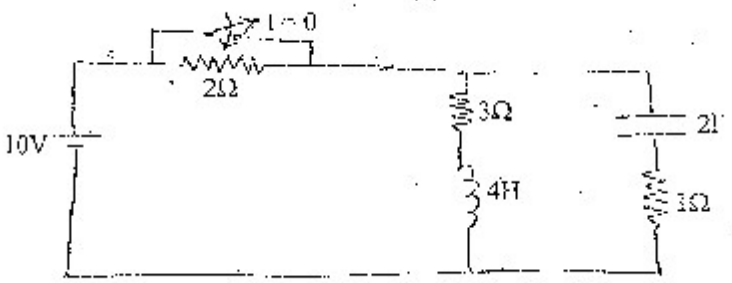
Exam.	New Back (2066 Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, SCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Electric Circuit Theory

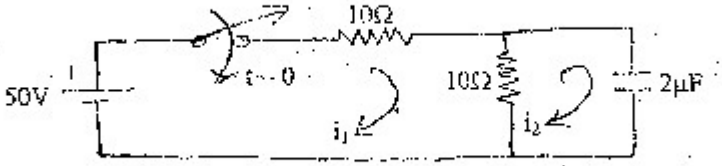
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any <u>Five</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ ***<u>Semilog graph paper will be provided.</u>***
- ✓ *Assume suitable data if necessary.*

1. a) Define half power points and bandwidth for a series RLC circuit and derive the expression for them. How is the bandwidth affected by quality factor of the circuit? [8]

   b) The switch has been open for a long long time in the circuit shown below and at t = 0 it is suddenly closed. Find i_L, v_C, $q_{2\Omega}$, $i_{2\Omega}$, $i_{3\Omega}$, i_{4H}, i_C, v_L, $v_{3\Omega}$, $v_{1\Omega}$, $v_{2\Omega}$ at $t = 0^+$. [8]

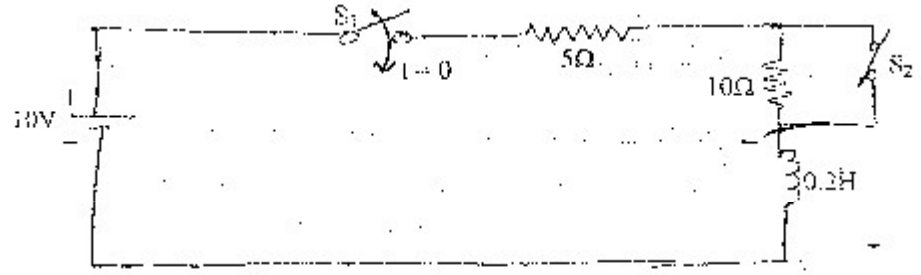


2. a) In the two mesh network shown in the figure below, the switch is closed at t = 0. Find the mesh currents $i_1(t)$ and $i_2(t)$ as shown, and the capacitor voltage $v_C(t)$. [Use classical approach]. [8]

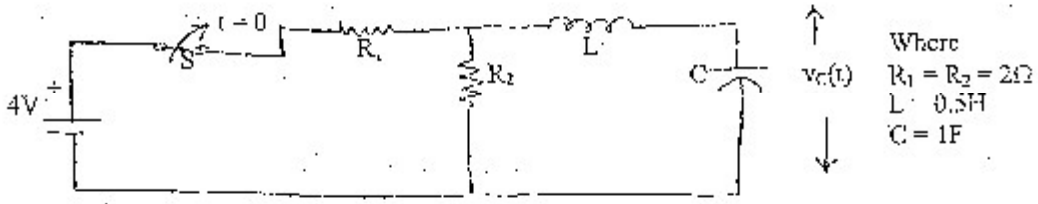


   b) An exponential voltage $v(t) = 20e^{-4t}$ is suddenly applied at time t = 0 to a series RC circuit with R = 1Ω, C = 0.25F. Obtain the particular solution i(t) in the circuit. Assume zero initial charge across capacitor. [Use classical method.] [8]

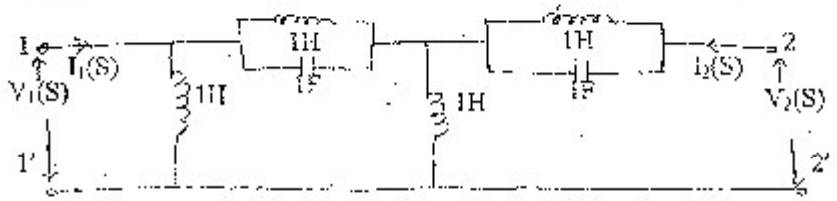
3. a) In the given circuit below, switch S_1 is closed at t = 0 and after 8ms, the switch S_2 is opened. Find the complete expression for current in the interval $0 < t < 8$ms and $t > 8$ms. Use Laplace Transform approach. [8]



b) The circuit shown below is in steady state with switch 'S' closed. The switch is opened at t = 0. Using Laplace Transform method, find $i_L(t)$ in the circuit. [8]



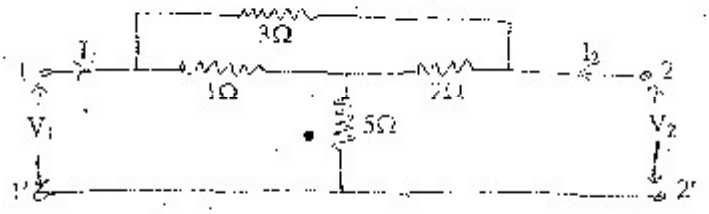
4. a) For the given 2-port network shown in figure below, find the voltage ratio transfer function. [8]



b) What do you understand by poles and zeros of a network function? State their significance in analyzing the time domain response of a network. [4]

c) Determine the equivalent Y-parameter if two port Networks are connected in parallel. [4]

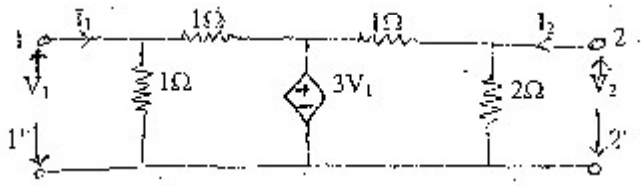
5. a) Obtain the T and Y parameters of the given 2-port network shown in following figure. Also check for the symmetry and/or reciprocity of the network. [8]



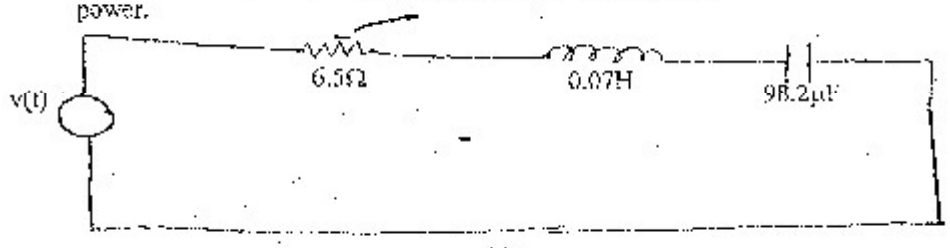
b) Sketch the asymptotic Bode plots for the transfer function given by [8]

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

6. a) For the network shown below, find the Z and g parameters and show that the network is neither reciprocal nor symmetrical. [8]



b) The network of figure shown below has an applied voltage of v(t) = (40 sin ωt + 80 sin 3ωt) volts where ω = 500 rad/s. Find the current response and hence the average power. [8]



***

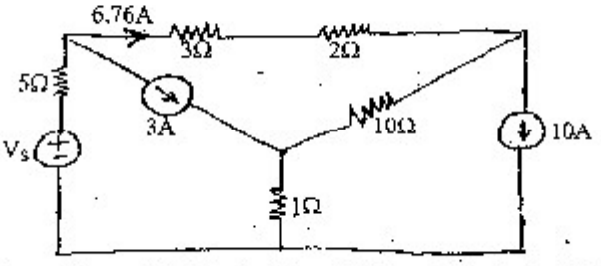
22 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

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

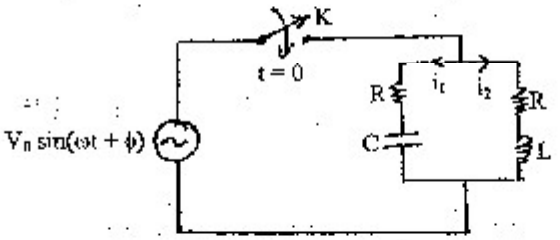
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Semilog graph paper will be provided.***
- ✓ *Assume suitable data if necessary.*

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]

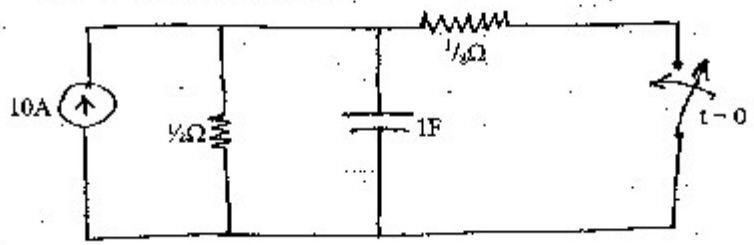


b) Mention the importance of initial conditions in the circuit analysis. Draw the equivalent circuit showing the initial and final condition for inductor and capacitor. [4]

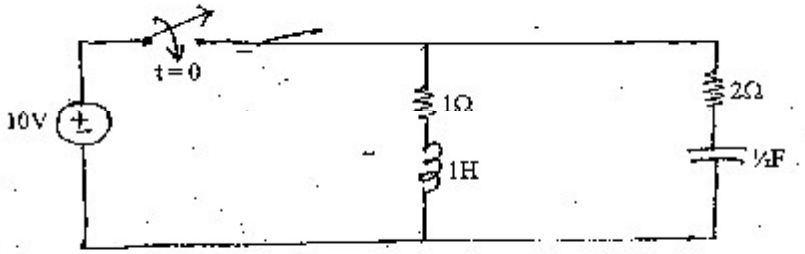
c) In the given circuit, switch K is closed at time t = 0. Find $i_1(0^-)$, $i_2(0^+)$, $\frac{di_1(0^+)}{dt}$ and $\frac{di_2(0^+)}{dt}$. [4]



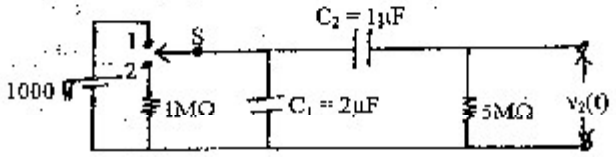
2. a) In the given circuit, after the switch has been in the open position for a long time, it is closed at t = 0. Find the voltage across the capacitor using classical method. [8]



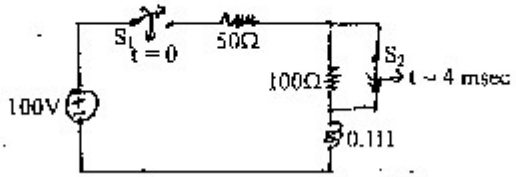
b) In the network shown, the switch is closed at t = 0. Find the current supplied by the source using Laplace transform method. [8]



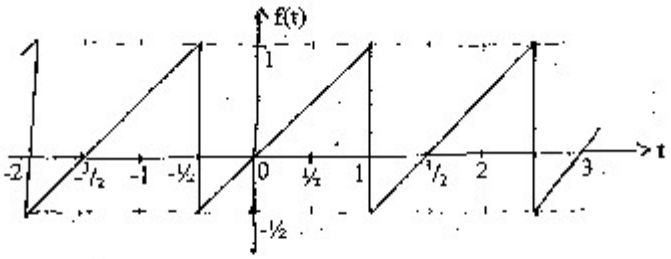
3. a) With the switch S in position 1, the circuit shown below attains equilibrium. At time t = 0, the switch is moved to position 2. Find the voltage across 5MΩ resistor. (Use Laplace transform method) [8]



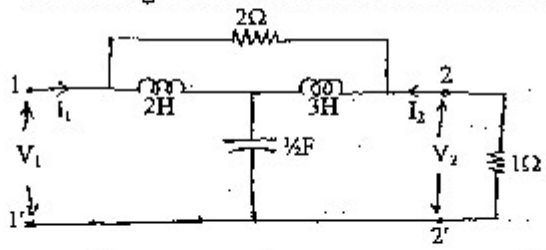
b) In the circuit shown below, switch S_1 is closed at t = 0 and S_2 is opened at t = 4 msec. Determine i(t) for t > 0. Assume that inductor is initially de-energized. (Use Laplace method) [8]



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



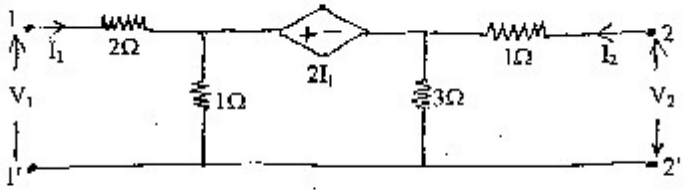
b) Find the current ratio and voltage ratio transfer function for the network given. [8]



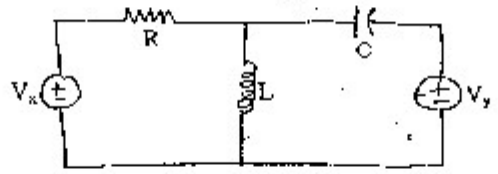
5. a) Sketch Bode-plot for the transfer function given by $G(S) = 10\dfrac{S(S+3)}{(S+1)(S^2+2S+16)}$. [8]

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]



***

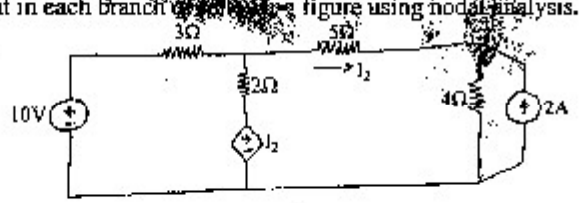
25 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Ashad

Exam.	Old Back (2065 & Earlier Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

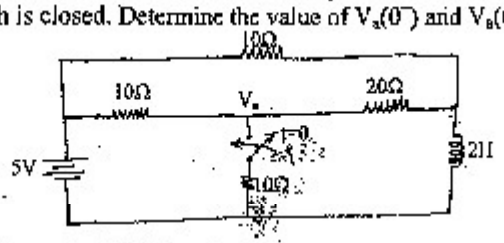
Subject: - Electric Circuit II (EG527EE)

- ✓ 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.*
- ✓ *Assume suitable data if necessary.*

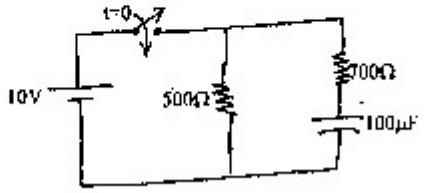
1. a) Find the current in each branch of the figure using nodal analysis. [8]



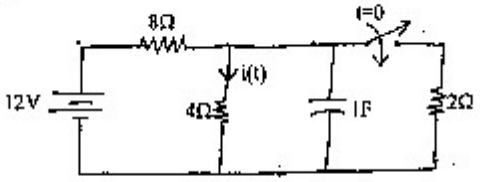
b) In the network shown in figure below, a steady state is reached with switch open. At t = 0, the switch is closed. Determine the value of $V_a(0^-)$ and $V_a(0^+)$. [8]



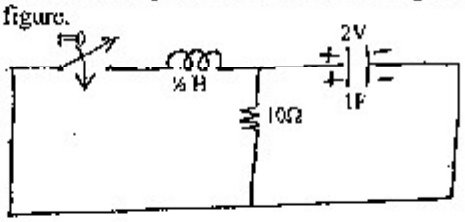
2. a) Using classical method, find the expression for the current supplied by the source in the network shown in figure. Also find the time taken by the source current to reach 25mA? [8]



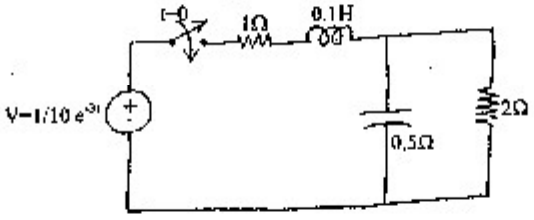
b) Using Laplace transform method, find the current i(t) for t>0 in the circuit shown in the figure below. [8]



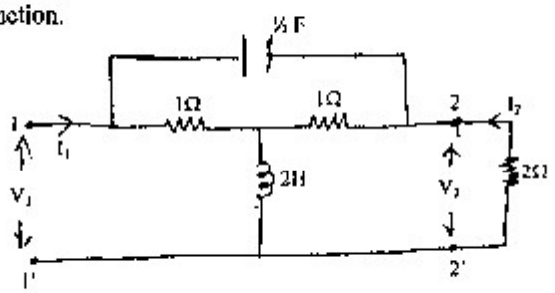
3. a) Using classical method find the expression for current through the inductor for t>0 in the circuit shown in figure. [8]



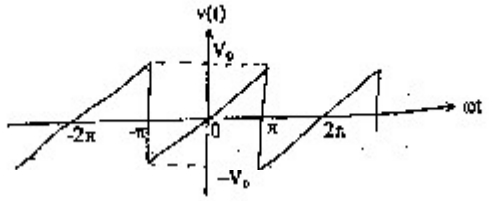
b) Using Laplace transform method, find the expression for current through 2Ω resistor for t>0 in the circuit shown in figure. [8]



4. a) For the two-port network, find the current ratio transfer function as well as voltage ratio transfer function. [8]



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

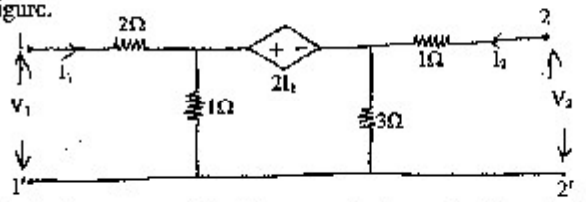


5. a) Sketch the asymptotic Bode-plot for the transfer function given by: [10]

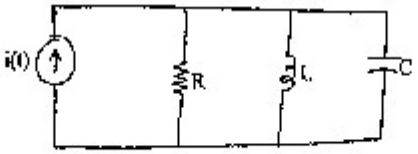
$$T(s) = \frac{10(S+10)}{S(S^2+5S+4)(S+40)}$$

b) Express transmission line parameters in terms of Y-parameter. [6]

6. a) Find the Z-parameter and T-parameter for the two-port network given in the following figure. [8]



b) Obtain the state model of the network shown in following figure. [8]



***