POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Spring

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

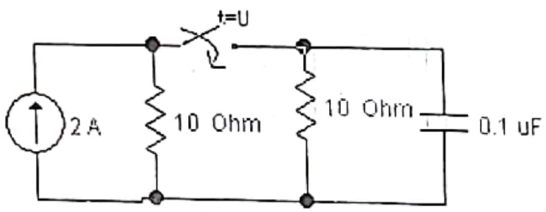
Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) A series circuit containing R = 7 Ω, L = 1H and C = 0.1F is connected to 20 V dc supply at t = 0 sec. Find the expression of voltage across capacitor at any time using classical method considering inductor has zero current and capacitor has zero voltage initially. 8

   b) Find the total response $v_c(t)$ for the voltage across the capacitor in circuit given below using classical method. The switch S is closed at t=0. 7



2. a) Derive an expression for current i(t) for second order network consisting of resistance R inductance L Henry and capacitance C Farad when a step voltage of V volts is applied at time t = 0. Determine the *natural frequency* and *damping coefficient* of the network. Also sketch i(t). 8

   b) A sinusoidal voltage 25 sin 10t is applied at time $t = 0$ to a series ***R-L*** circuit comprising $R = 5\Omega$ and $L = 1H$. By the method of Laplace transformation, find current i(t). Assume zero current through inductor before application of voltage. 7

3. a) What are the advantages of laplace transform over classical method? For the network given below, obtain the voltage transfer function 8

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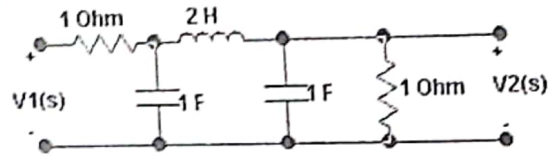
V2(s)/V(s).



b) The denominator polynomial of a network is given as 7
$S^4+S^3+S^2+S+K=0$
Determine the range of K for which the system is stable using Routh-Hurwitz criteria.

i. a) Sketch the Bode plot 8

$$Z(s) = \frac{200(s+20)}{s(2s+1)(s+40)}.$$

b) Show the poles and zeros in s-plane and obtain v(t) from pole-zero diagram. 7

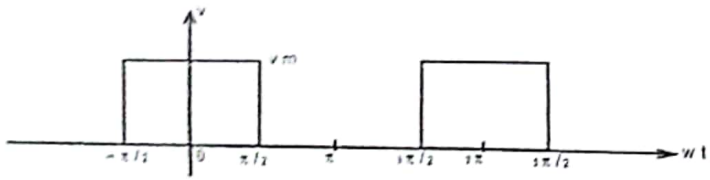
$$V(s) = \frac{10s}{(s+3)(s+2)}$$

i. a) Show that the given function is positive real 8
$G(s)=\{(2s^2+2s+1)/(s^3+2s^2+s+2)\}$

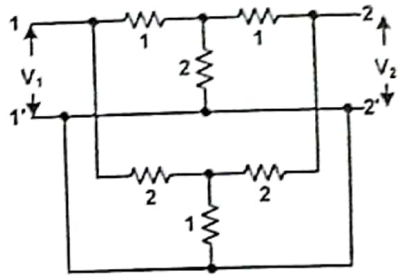
b) Realize the following RC driving point impedance function in 7
i. Foster I form and in
ii. Cauer I form

$$G(s) = \frac{S2+6s+8}{s2+4s+3}$$

i. a) Obtain the trigonometric form of the Fourier series for the following function. 8



b) Find the short circuit admittance parameters of two port network as shown below. Assume all resistors are in ohm. 7



7. Write short notes on: ***(Any Two)***
a) Filter and types
b) Network symmetry
c) Properties of RC impedance function.

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Fall

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

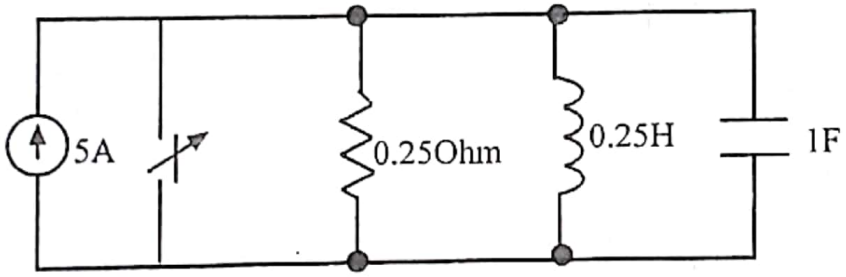
Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

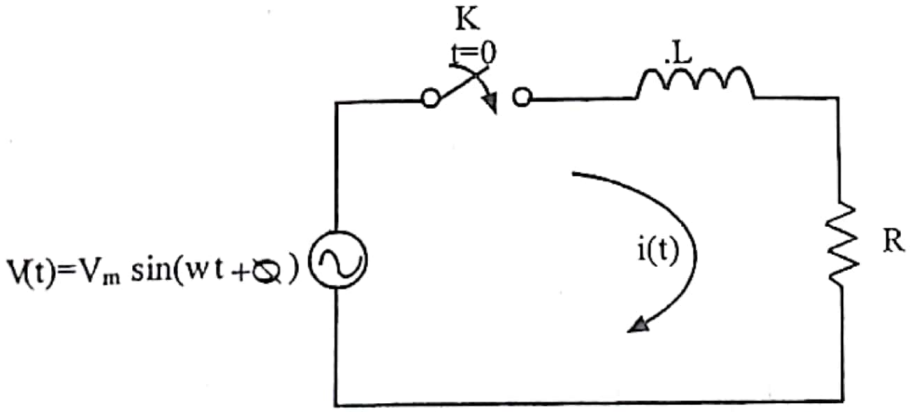
Attempt all the questions.

1. a) In the series RLC network V = 100V, L = 0.2H, R = 30Ω and C = 40μF. Obtain the expression for i(t) using classical approach. Assume there is no initial charge on the capacitor or current in the inductor. 7

b) Determine $V(0+)$, $dV(0+)/dt$, $dV^2(0+)/dt^2$ on the given RLC parallel circuit. 8



2. a) An R-L circuit is connected to an ac voltage $v(t) = V_m\sin(wt+\alpha)$. The switch is closed at t=0Find the response of current using classical method. 8



b) In the series RLC circuit, V_o= 10V, R= 5Ω, L=1H and C=0.25F, the switch is closed at time t=0, using Laplace technique obtain the particular solution for I (t) through the circuit. Assume that there is 7

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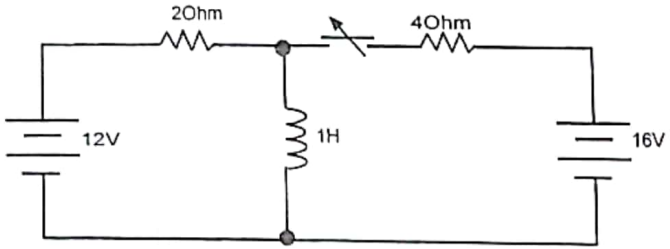
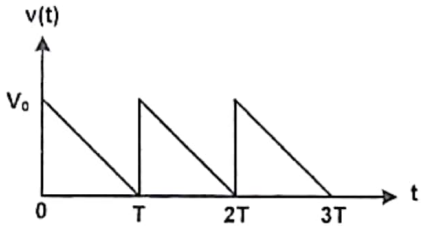
zero current through inductor and zero charge across capacitor before switching.

3. a) Find i(t) for t>0 in the circuit shown in figure below using Laplace transform. Switch is opened at t=0. 8



b) From pole zero plot, obtain the time response for $I(s) = \dfrac{4s}{(s+1)(s+3)}$ also determine the value of i(t) for t=1 sec. 7

4. a) For the following periodic waveform, find the Fourier series expansion. 8



b) Draw the Bode diagram for the given network function: 7

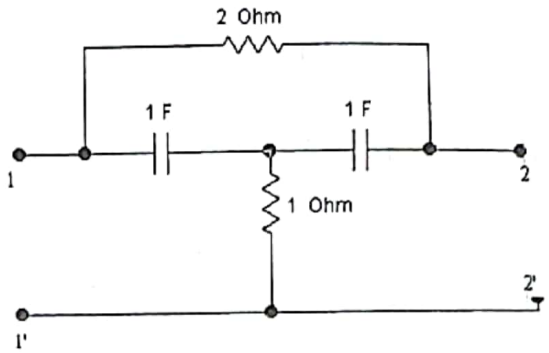
$$H(s) = \frac{2000(s+4)}{(s+16)(s+100)}$$

5. a) Check for PRF when $F(S) = \dfrac{(S+2)(S+4)}{(S+1)(S+3)}$ 7

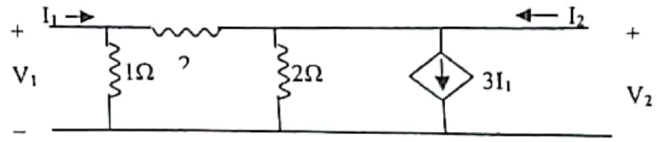
b) Synthesize the given LC network function in Foster and Cauer first forms. 8

$$Z(s) = \frac{(s^2+4)(s^2+25)}{s(s^2+16)}$$

6. a) Find the equivalent T network for the given ∏ network from the given network. 7



b) For the following network, find the open circuit parameters.



7. Write short notes on: **(Any two)**

a) Laplace transform and its advantage

b) Reciprocity and symmetry network

c) Step response of R-C series circuit.

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester:Spring

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

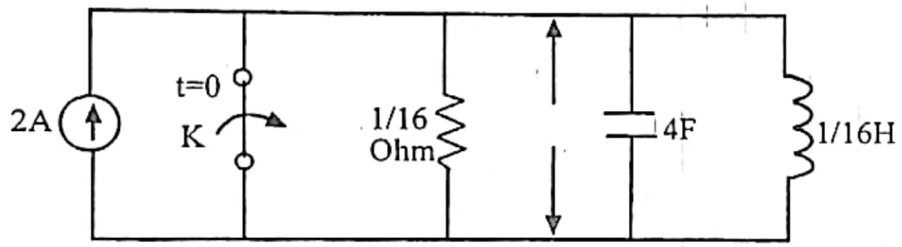
Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

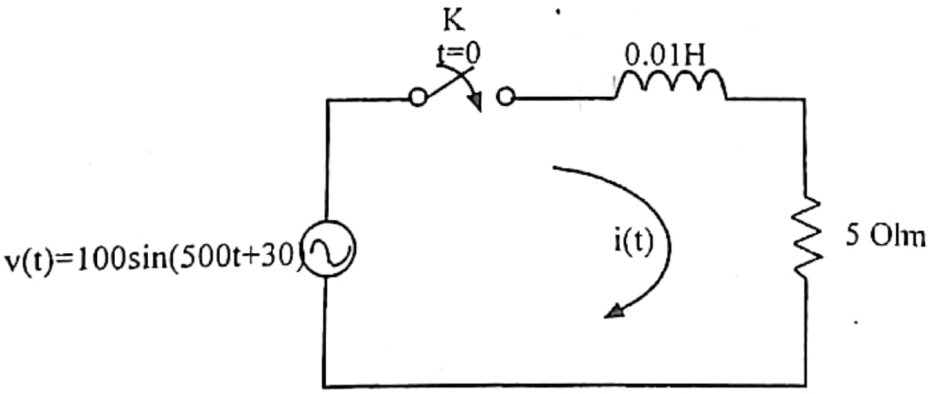
Attempt all the questions.

1. a) An exponential voltage $V=4e^{-3t}$ is applied to a series RLC circuit consisting of resistor R=10Ω, inductor L=1H and capacitor C=0.04F at time t=0. The inductor and capacitor are initially uncharged. Obtain the complete solution for the current i(t) in the circuit. 7

b) At t = 0, the switch K is opened. Determine v(0+), dv/dt(0+), $d^2v/dt^2(0^+)$. 8



2. a) An R-L circuit is connected to an ac voltage v(t) = 100sin (500t + 30) volts at t = 0, R = 5Ω □and L = 0.01 H. Find the equation for the current using classical method. Also find the value of circuit current at t = 0.01sec. 7



b) What are the advantages of laplace transform over classical method? The response v(t) in a series RLC circuit is described by the 8

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differential equation

$d^2v/dt^2+4\,dv/dt+8v=8\,u(t)$

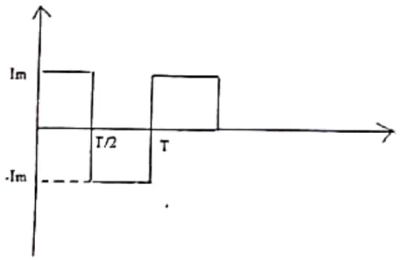
the initial conditions are $v(0)=3$ and $dv/dt(0)= -4$. Find the complete response for $v(t)$ using Laplace Transform method.

3. a) Write the advantages of Laplace method over classical method. The series circuit of R-L-C network consists of R= 5Ω, L= 1 H and C = 0.25 F with supply voltage of 10 V. Find i(t) using Laplacian approach. $I_L(0^-) = 0$ and $V_C(0^-) = 0$. 8

b) The characteristics equation of the system is given by $S^3+3S^2+3S+A=0$. Where A is adjustable. Determine the stability of the system using Routh-Hurwitz criteria. 7

4. a) Draw magnitude plot and phase plot for the given transfer function, $G(s) = 100(s+10)/s(s+2)(s+5)$ 7

b) Obtain the Fourier series representation of the waveform shown. 8



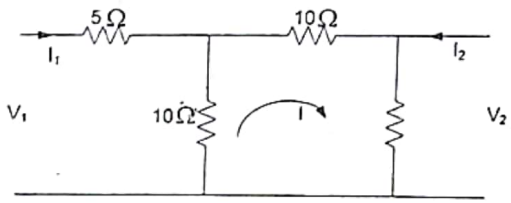
5. a) Write three necessary and sufficient conditions PRF, check given function is PRF or not. 7

$(s+2)(s+4)/(s+1)(s+3)$

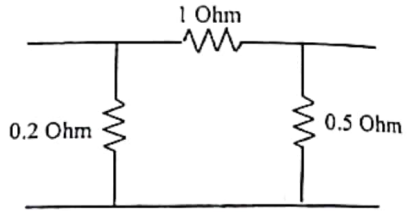
b) Synthesize the Foster I and Cauer II forms of RC driving function. 8

$Z_{RC} = \frac{(S+1)(S+4)}{S(S+2)(S+5)}$

6. a) For the network shown, find the Z and Y parameters 7



b) Find the equivalent T network for the given ∏ network. 8



7. Write short notes on: **(Any two)**

a) Bode plot

b) Type of Filters

c) Steady and transient response of network

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Spring

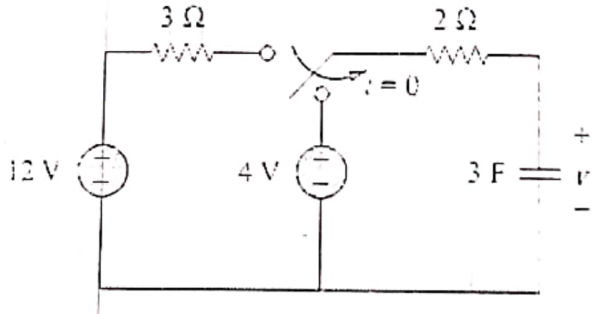
Year : 2016
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

a) Determine the solution of current differential equation $i''(t)-3i'(t)-2i(t)=4e^{t}$ with initial conditions $i(0-)=1$, $i'(0-)=-1$ using classical method. 7

b) A dc voltage of 100V is applied to a series RC circuit at t =0, having R = 10 Ω and C = 4 μF. Use Classical method to find the current through the capacitor $i_c(t)$ for t>0. Assume initial charge on the capacitor $q_c(0) = 800$ μC. 8

a) Initially the switch is connected to 12V and at t=0 switch connects to 4V source. Find the current through capacitor and voltage across capacitor at t>0. 7



b) A 50hz. 300 V sinusoidal voltage is applied at t=0 to a series R-L circuit having resistance of 2.5 Ω and inductance 0.1 H .Find an expression of current at any instant t. Also calculate the value of the transient current, steady state current and total current at 0.01 sec after switching on using Laplace transform method. 8

c) Plot the *poles and zeros* in s-plane for the network function: 8

$$V(s) = \frac{10s(s-1)}{(s+3)(s+2)(s+5)}$$

Also, obtain v(t) using pole-zero diagram.

d) Obtain the Fourier series representation of the waveform shown.

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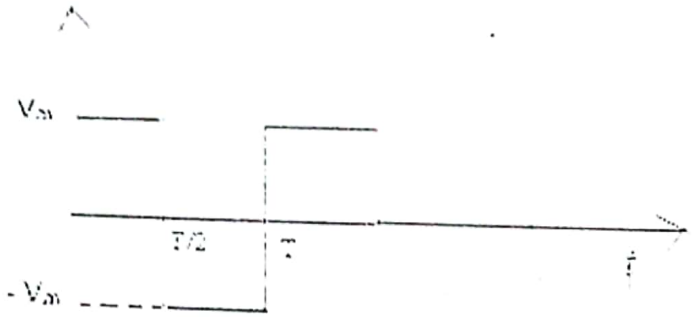
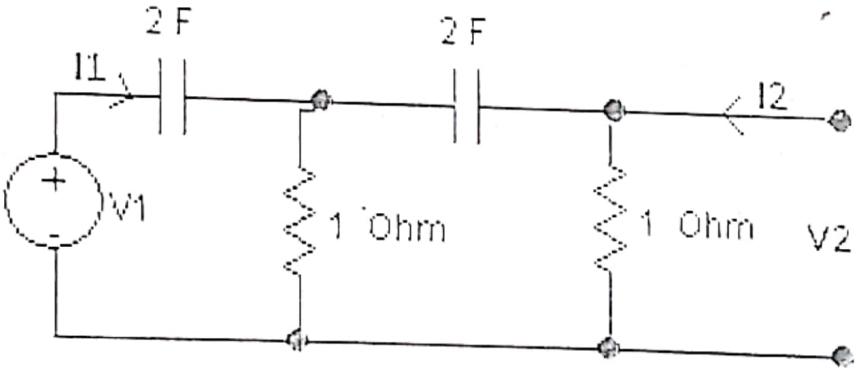


4. a) Plot the straight line asymptotic magnitude response and phase response of 8

$$G(s)=\frac{(2s+10)}{(0.5s+1)(2s+2)}$$

b) Describe high pass, low pass and band pass filter in detail with necessary diagram. 7

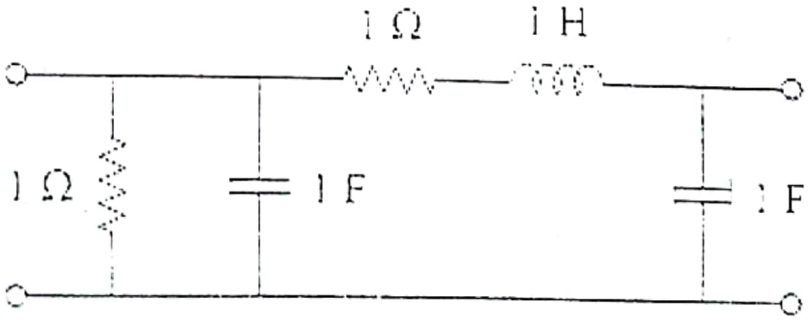
5. a) Find z parameters of the given network. 7



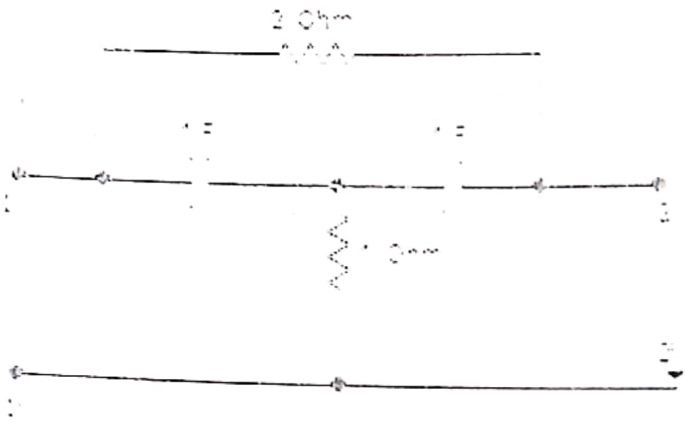
b) Test whether the given function F(S) represents a PRF or not? 8

$$F(S)=\frac{S+3}{S^2+5S+1}$$

6. a) Obtain Hybrid parameters for the given network. 8



b) Find the equivalent T network for the given ∏ network from the given network. 7



7. Write short notes on: (Any two) 2×5

a) Mesh Analysis

b) Operational Impedance

c) Reciprocity and symmetry of a two port network

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Fall

Year : 2016
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

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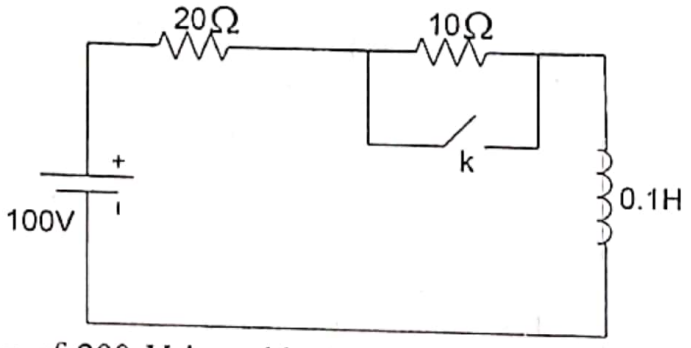
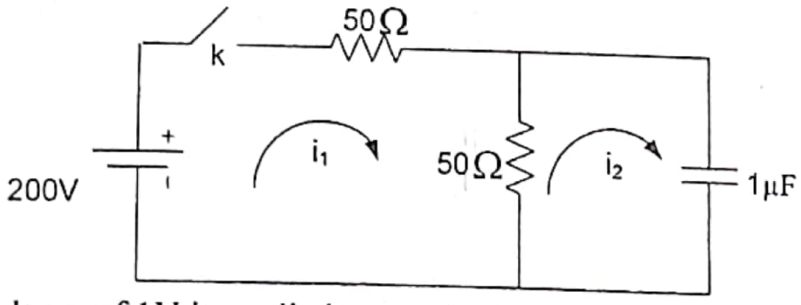
Attempt all the questions.

1. a) A dc voltage of 100 V is applied in the adjoining circuit and the switch K is open. The switch K is closed at time t=0. Find the complete expression for the current. 7



b) A dc voltage of 200 V is suddenly applied in the network shown in figure below. Find the transient currents in both the loops and obtain the transient voltage across the capacitor. 8



2. a) A dc voltage of 1V is applied to a series RC circuit at t =0, having R = 4 Ω and C = 1/16 F. Use Classical method to find the voltage across the capacitor $v_c(t)$ for t>0. Assume initial voltage across capacitor $v_c(0) = 9$ V. 8

b) An exponential voltage $v(t) = 6e^{-2t}$ is suddenly at time t = 0 to a series 7

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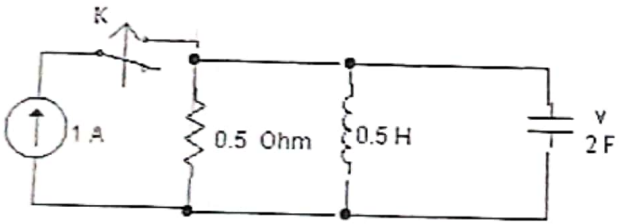
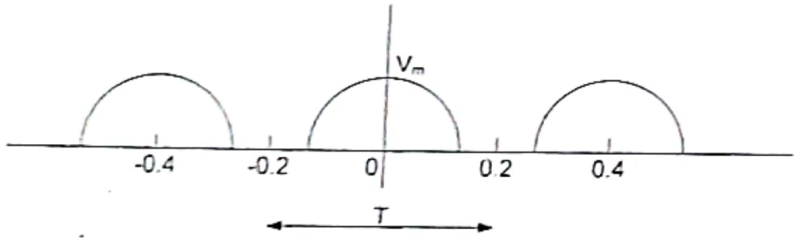
RL circuit consisting of R = 2Ω and L = 1H. Using Laplace Transform method, find the particular solution for i(t) through the circuit. Assume no initial current through the inductor before switching.

3. a) In the given RLC parallel circuit, the switch K is closed at t=0. Determine v(0+),dv/dt(0+),d^2v/dt^2(0+). 8



b) Find the Fourier series for the voltage obtained at the output of a half wave rectifier shown in the following figure. 7



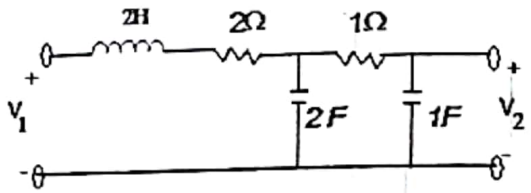
4. a) List the advantages of laplace transform over classical method. The response i(t) in a circuit is described by the differential equation; $d^2i/dt^2 - i = 25 + e^{2t}$ 8

all the initial conditions are zero. Find the response i(t) using Laplace Transform method.

b) Synthesize the given LC network function in Foster I and II forms. 7

$$Z(s) = \frac{8(s^2+4)(s^2+25)}{s(s^2+16)}$$

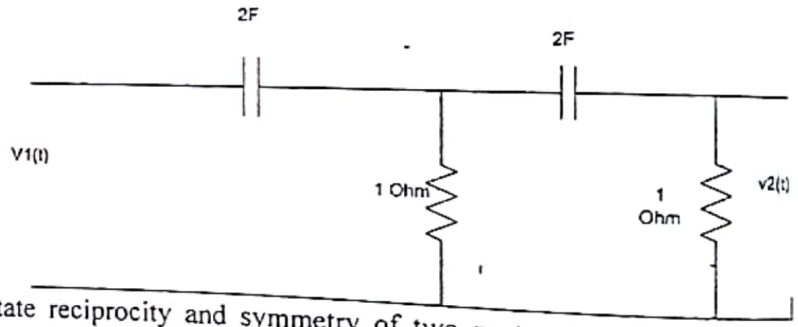
5. a) Find $V_{2(s)} / V_{1(s)}$ for the following network.



b) Check the following function for its positive realness.

$$F(s) = \frac{2s^2+2s+1}{s^3+2s^2+s+2}$$

6. a) Obtain Z parameter of the given two port network.



b) State reciprocity and symmetry of two port network. What are the types of interconnections of two port network? Explain them.

7. Write short notes on: **(Any two)**

a) Band Pass and Band Stop Filters

b) Initial and Final Value theorem

c) Symmetry and Reciprocity in two port network.

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Fall

Year : 2017
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

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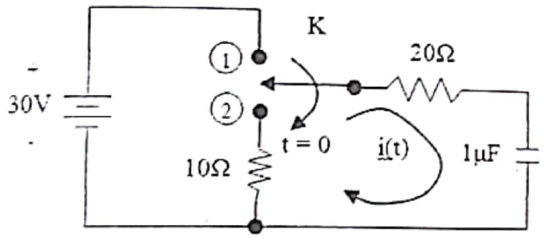
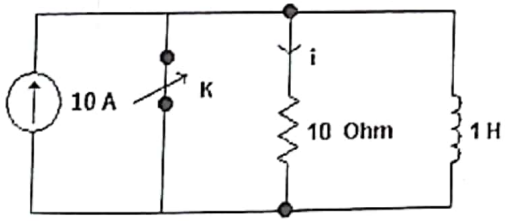
The figures in the margin indicate full marks.
Attempt all the questions.

a) In the circuit, switch K is changed from position (1) to (2) at time, t = 0, steady-state condition having reached before switching. Find: 7

$$i(t),\ \frac{di(t)}{dt}\ and\ \frac{d^2i(t)}{dt^2}\ \text{at } t = 0$$



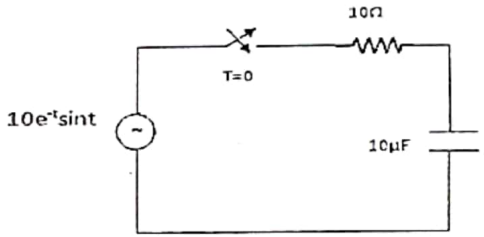
b) In the given circuit, the switch K is opened at time t = 0. Find the solution for current i(t) using classical method. At t = 5 seconds, what is the value of i(t)? 8



3) In the series RLC network V= 100V, L = 0.2H, R=30Ω and C = 40μF. Obtain the expression for i(t) using classical approach. Assume there is no initial charge on the capacitor or current in the inductor. 7

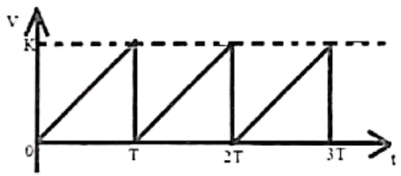
b) Determine the current i(t), from the differential equation $\ddot{i}(t)+5\dot{i}(t)+6i(t)=0$, i(0)=0 and $\dot{i}(0)=5$. Use Laplace transform method. 8

3. a) In the circuit shown below the switch is closed at t=0 with capacitor initially unenergized. For the values given find the value of current passing through the 10Ω resistor using Laplace transform method. 7



b) Find the value of K for which $s^3+7s^2+10s+10K=0$ is stable. 8

4. a) Obtain the Fourier series representation of the waveform shown. 7



b) Sketch the Bode plot for the following transfer function 8
$2s^2/\{(1+0.25s)(1+0.02s)\}$

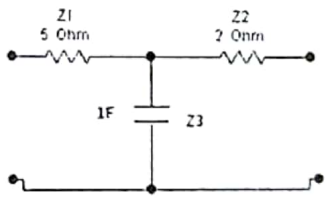
5. a) Check whether the given function is PRF or not. 7
$Z(s) = s(s^2+2) / (s^2+1)(s^2+3)$

b) The Driving point impedance of a LC network is given by 8

$$Z(s) = \frac{(S^2+1)(S^2+8)}{S(S^2+4)}$$

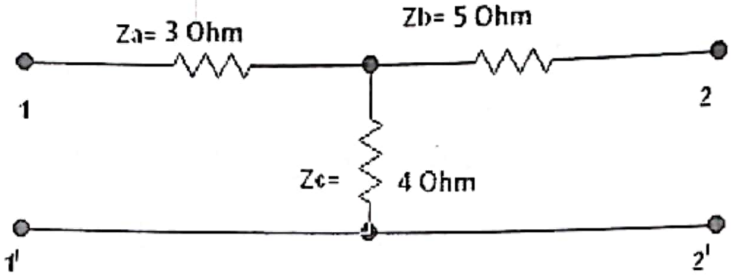
Obtain the cauer II form of Realization.

6. a) Find the ABCD parameters of the following network. 7



CamScanner

b) Find the equivalent π-network for the given T-network. 8



7. Write short notes on: (**Any two**) 2×5

a) Transient and steady state

b) Poles and Zeros of network function

c) Filters

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Spring

Year : 2017
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

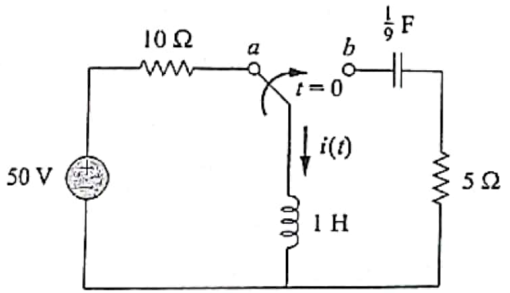
The figures in the margin indicate full marks.

Attempt all the questions.

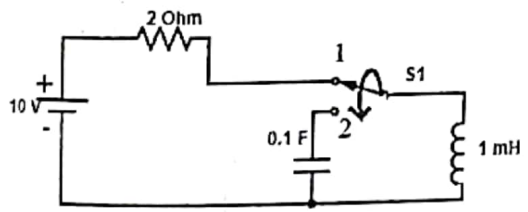
a) A series RLC circuit with R = 2 Ω, C = 0.5 F and L=1H is excited by a voltage of v(t)= Sint for t ≥0. For the elements values specified, find the current i(t) through the circuit if the switch is closed at t=0. 8

b) Find the complete response i(t) for the RL series circuit with R = 4.8 ohm , L = 4H , Supply voltage is 2sin(10t). Use classical approach. 7

a) Find the current through inductor for t>0. 7



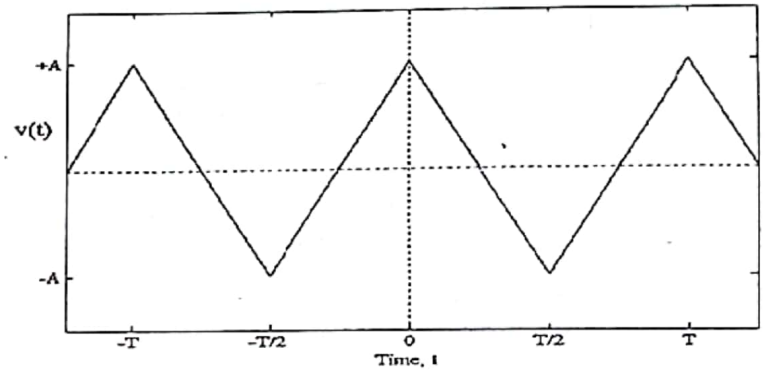
b) The voltage is applied across the RL circuit when switch S1 is in position 1 and steady state condition is reached. Later on, at time t=0, switch K is moved from position 1 to 2. Using Laplace Transformation, obtain expression for the current i(t) in the LC circuit and solve for i(t). 8



3. a) Find the number of poles in the given characteristics equation and determine the range of K for the system to be stable, where K is the adjustable loop gain. 7

$$q(s) = s^3 + 2s^2 + 4s + K$$

b) Obtain the Fourier series representation of the voltage waveform shown. 8



4. a) Sketch the magnitude plot for the transfer function $G(s) = \frac{10(0.2s+1)}{s(0.1s+1)}$. 8

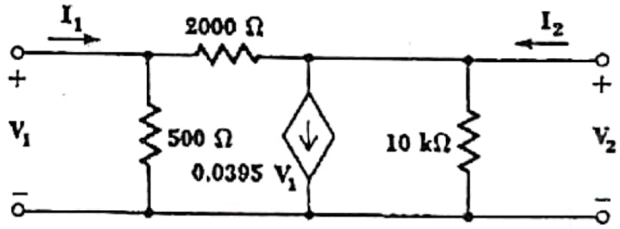
b) What do you mean by filter? Explain the concept of low pass, high pass and band pass filters. 7

5. a) Explain how Cauer and Foster design differ from each other? List the properties of positive real function. 7

b) Synthesize the RL network for the driving point impedance. Use Foster I Method. 8

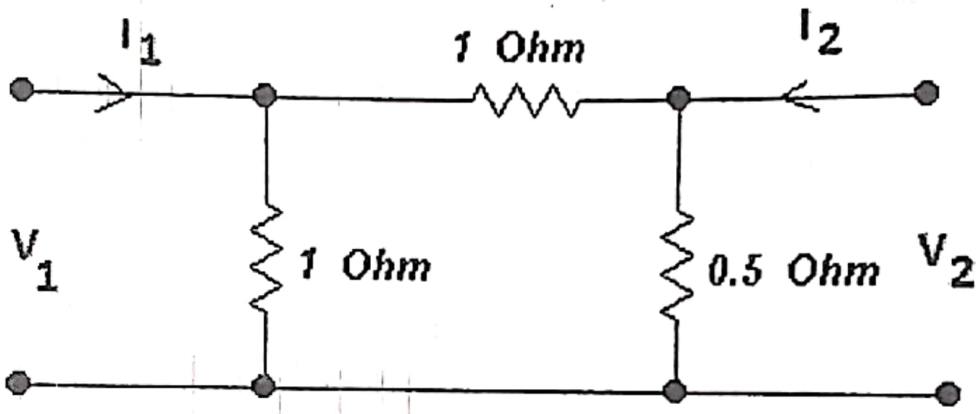
$$Z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)}$$

6. a) Find the impedance parameters for the given two port network. 7



CamScanner

b) Determine admittance parameters for the for the circuit given below: 8



7. Write short notes on: **(Any two)** 2×5

a) Operational Impedance

b) Common forcing functions for analysis of Electrical Network

c) Time domain behavior from pole zero location

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

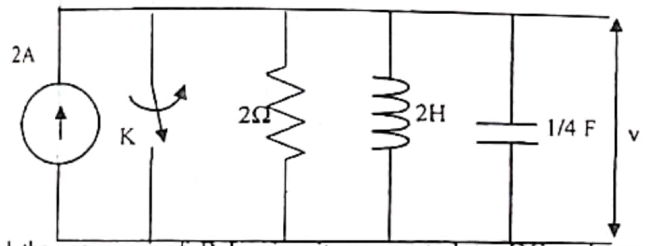
Semester: Fall

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

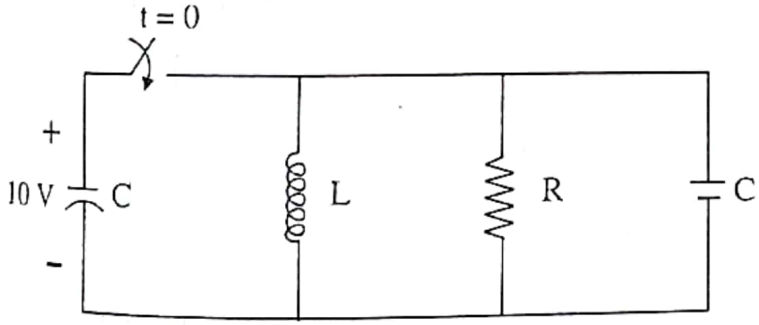
a) In the given RLC parallel circuit, the switch K is opened at t=0. Determine: 7

$$v(0^+), \frac{dv(0^+)}{dt}, \frac{d^2v(0^+)}{dt^2}$$

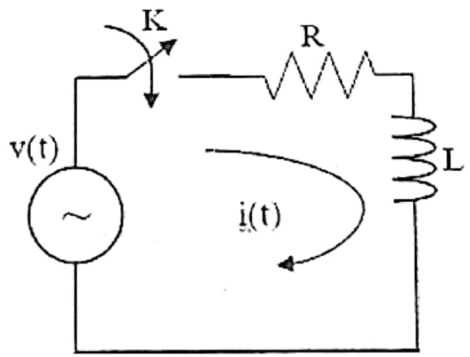


b) Find the response of R-L circuit connected to DC voltage source when switch is closed at t=0 and define the time constant for it. 8

c) Find the complete response v(t) for the parallel RLC circuit shown below with R=1/10 ohm, L=1/2 H and C=1 F. Capacitor has 10V initially and switch is closed at t=0. Use classical approach. 8



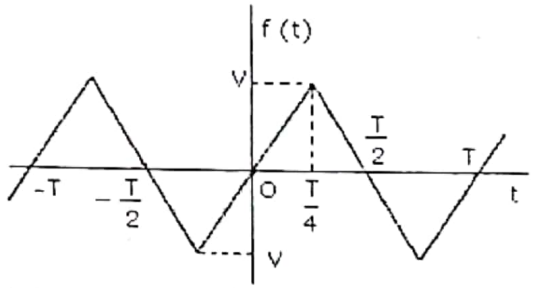
b) An R-L series circuit is connected to an AC voltage $v(t) = 80\cos(400t + 20)$, $R = 10\ \Omega$ & $L = 0.05H$. At t=0, the switch K is closed. Find the equation for the current using laplace method. 7



3. a) What is Routh-Hurwitz criteria? Form Routh array for the following characteristic equation and state whether the system is stable or not. 7

$$Q(s) = 5s^5 + 3s^4 + 2s^3 + 2s^2 + s + 1$$

b) Find for the following waveform; find the trigonometric Fourier series expansion. 8



4. a) Plot the straight line asymptotic magnitude response for 7

$$G(s) = \frac{40(s+10)}{s(s+1)(s^2+7s+16)}$$

b) Write three necessary and sufficient conditions of PRF. Check given function is PRF or not: {(s+2)(s+4)}/{(s+1)(s+3)}. 8

5. a) The driving point impedance of a LC network is given by 8

$$z(s) = \frac{10(s^2+4)(s^2+10)}{s(s^2+9)}$$

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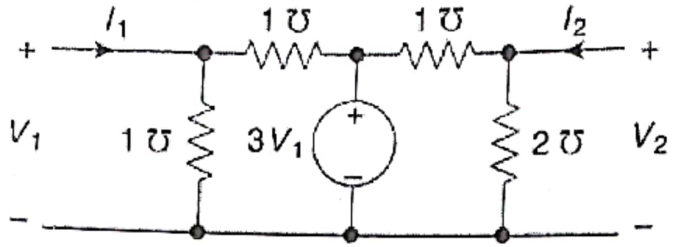
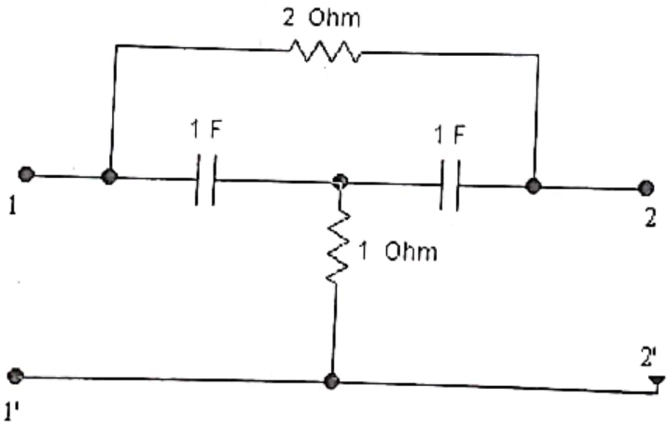
Obtain the Foster I form of realization.

b) Determine admittance parameters for the for the circuit given below: 7



6. a) Find the equivalent T network for the given ∏ network from the given network. 7



b) Define Filter. Explain the concept of band pass filters with magnitude plot. 8

7. Write short notes on: **(Any two)** 2×5

a) Nodal Analysis

b) Transfer Function

c) Exponential response of R-C series circuit

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POKHARA UNIVERSITY

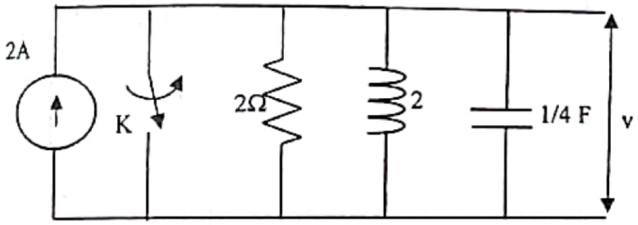
Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Spring

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

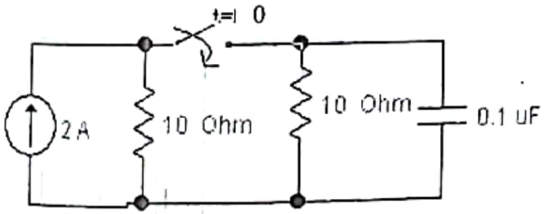
Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

a) In the given RLC parallel circuit, the switch K is opend at t=0. Determine 7

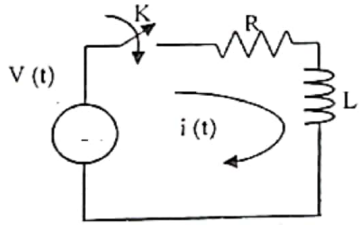


$$v(0^+), \frac{dv(0^+)}{dt}, \frac{d^2v(0^+)}{dt^2}.$$

) Find the total response $v_c(t)$ for the voltage across the capacitor in circuit given below using classical method. The switch S is closed at t=0. 8



An R-L circuit is connected to an AC voltage $v(t) = 80\sin(400t + 20)$ *volts at* $t = 0, R = 10\,\Omega\ \&\ L = 0.5\,H$. Find the equation for the current using classical method. 7

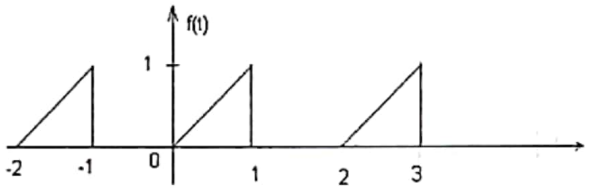


b) Obtain the sinusoidal response of RLC series circuit with necessary assumption. 8

3. a) From pole zero plot, obtain the time domain response for i(t) using pole zero plot method. 7

$$I(s) = \frac{3s}{(s+2)\,(s+3)}$$

b) Obtain the Fourier series for the periodic function shown in the figure. 8



4. a) Plot the straight line asymptotic magnitude response for 8

$$G(s) = \frac{40(s+100)}{s(s+10)(s^2+70s+1000)}$$

b) Explain the concept of high pass, low pass and band pass filter with neat sketch. 7

5. a) Write the necessary and sufficient condition for a function to be positive real function (prf). Check the given function for prf. 7

$$H(s) = \frac{s^2+6+8}{s^2+4s+3}$$

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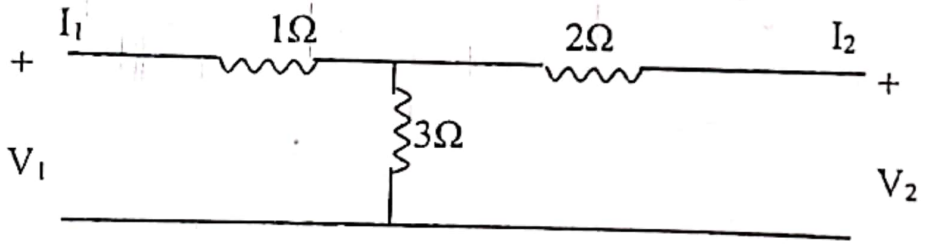
b) Synthesize the given LC network function in Foster and Cauer First forms. 8

$$Z(s) = \frac{(s^2+4)(s^2+25)}{s(s^2+16)}$$

6. a) Explain how equivalent T and π section representation of performed in any network. 7

b) For the network shown, find the Z and Y parameters. 8



7. Write short notes on: **(Any two)** 2×5

a) Mesh and Nodal analysis

b) differential operator

c) Initial and Final Value theorem

CamScanner

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Fall

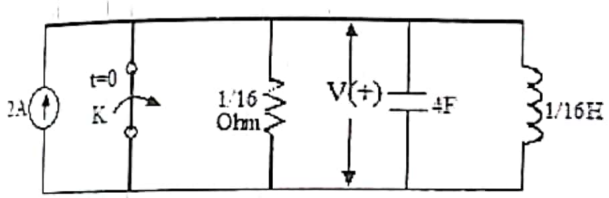
Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

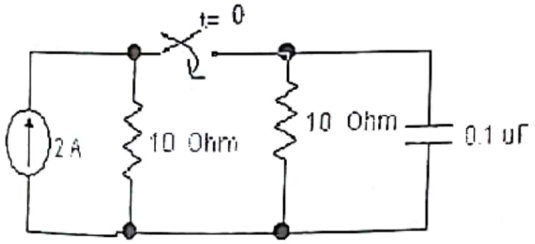
The figures in the margin indicate full marks.

Attempt all the questions.

a) At t = 0, the switch K is opened. Determine v(0+), dv/dt(0+), $d^2v/dt^2(0^+)$. 8



b) Find the total response $v_c(t)$ for the voltage across the capacitor in circuit given below using classical method. The switch S is closed at t=0. 7



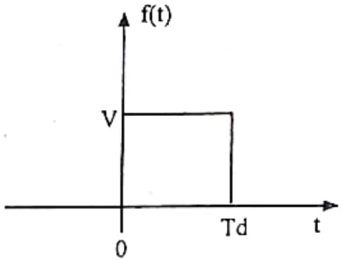
2. a) Obtain the step response of series RLC circuit using classical method. Assume that there is no current flowing through the inductor and zero voltage across capacitor before switching. 7

b) A voltage source of $V=8e^{-t}$ is supplied to series RC circuit. Find the expression for i(t) Given that R=2 ohm and C=0.25F when switch K is closed at t=0.Assume zero charge in capacitor initially using laplace transform method. 8

3. a) Using Routh Hurwitz criteria check the stability of the system and determine how many roots of the following polynomial are in the right half of s-plane and left half of s plane. 8

$$Q(s)= s^5+s^4+4s^3+24s^2+3s+63$$

b) Compare Fourier series and Fourier Transform. Determine the Fourier Transform of a pulse of duration T_d= 5sec and amplitude V=10volt as shown in figure below: 7



4. a) Plot the straight line asymptotic magnitude and phase response for 8

$$G(s) = \frac{(s+10)}{s(s+0.5)(s+50)}$$

b) Check whether the given function is PRF or not? 7

$$F(s) = \frac{(s+1)(s+3)}{(s+2)(s+4)}$$

5. a) Synthesize the network Z(S) for the driving point impedance Z(S) using Foster II form. $Z(s) = \frac{S^2+5s+4}{(S+2)S}$ 8

b) Define filters in electric network. Classify filter accroding to their ranges of their bands with example. 7

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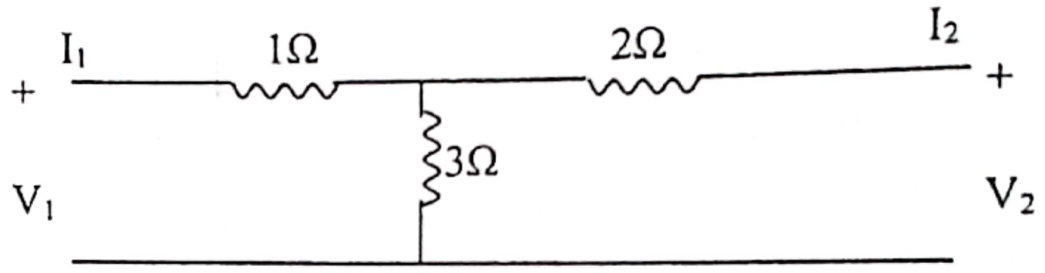
6. a) For the network shown, find the Z and Y parameters. 7



b) Define two port networks. Express Z- parameters in terms of T-parameter. 8

7. Write short notes on: (**Any two**) 2×5

a) Super mesh Analysis

b) Operational Impedance of passive elements

c) Laplace transform of common forcing function

CamScanner

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Spring

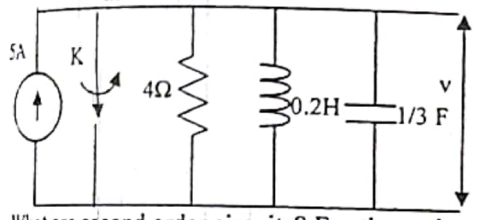
Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

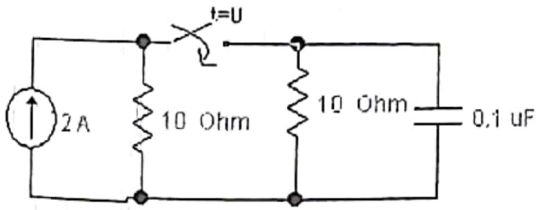
Attempt all the questions.

a) For the network shown in figure below, the switch k is opened at t = 0. Find $i(0^+), \frac{di}{dt}(0^+), \frac{d^2i}{dt^2}(0^+)$. 7



b) What are second order circuits? For the series circuit having R = 100Ω, C = 1μF with initial charge 50 micro coulombs. A voltage V = 100 volts is applied at t = 0. Find the expression for the resulting current in the circuit for t ≥ 0. 8

) Find the total response $v_c(t)$ for the voltage across the capacitor in circuit given below using classical method. The switch S is closed at t=0. 8

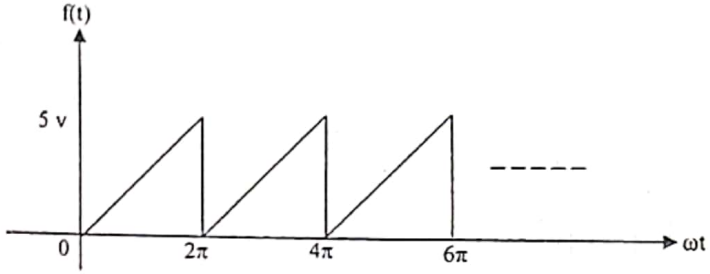


The series circuit of RLC network consists of R = 5 Ω, L = 1 H and C = 0.25 F with supply voltage of 10 V. Find i(t) using Laplace transform. Assume zero initial current through inductor and zero initial voltage across capacitor. 7

3. a) From pole zero plot, obtain the time domain response for i(t). 7

$$I(s) = \frac{3s}{(s+2)\,(s+3)}$$

b) Find the exponential Fourier series for the signal below 8



4. a) Construct the asymptotic magnitude Bode plot for the given transfer function. 8

$$H(s) = \frac{10(s+1)\,(s+10)}{s^2(s+5)\,(s+100)}$$

b) Plot the straight line asymptotic magnitude and phase response for 7

$$G(s) = \frac{(s+10)(s+1)}{s(s+50)}$$

5. a) Synthesize the given LC network function in Foster and Cauer First forms. 7

$$Z(s) = \frac{(s^2+4)(s^2+25)}{s(s^2+16)}$$

b) Write the necessary and sufficient condition for a function to be positive real function (prf). Check the given function for prf. 8

$$H(s) = \frac{s^2+9s+3}{s^2+7s+9}$$

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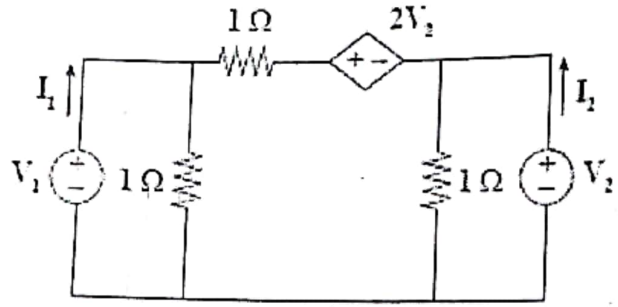
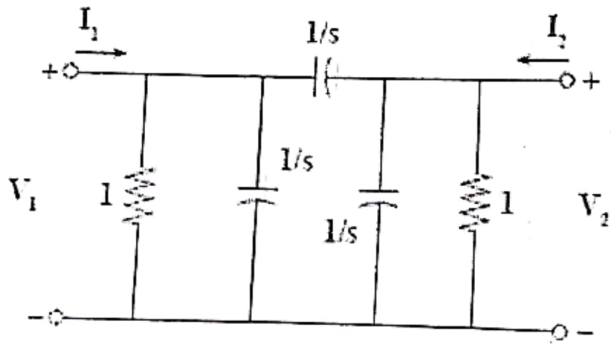
6. a) Obtain the Z-parameter for the given two port network. Also draw the general equivalent circuit showing Z-parameters. 7



b) Obtain ABCD parameters for the given network. Also Check the reciprocity and symmetry of the given network 8



7. Write short notes on: (**Any two**) 2×5

a) Mesh and Nodal analysis

b) Types of filter.

c) Initial and Final Value theorem

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Fall

Year : 2020
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

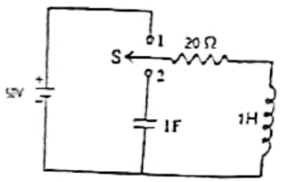
Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

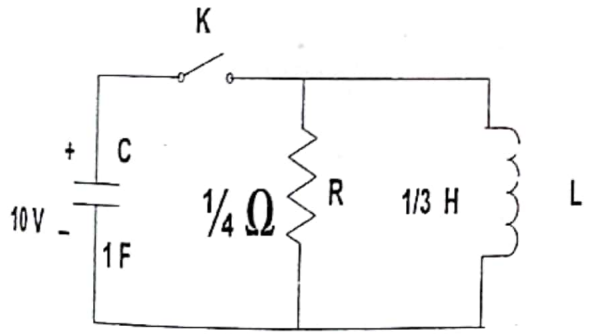
Attempt all the questions.

a) Obtain the voltage-current relationship for passive elements in time domain and frequency domain. Also draw their equivalent circuits in both domain showing initial values. 7

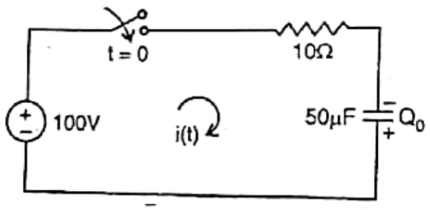
b) The switch S is changed from position '1' to '2' at t=0. Find value of i(0+), di(0+)/dt, $d^2i(+)/dt^2$. 8



a) In the given circuit below, capacitor C has an initial voltage $V_C(0^-) =$ 10 Volts and at the same instant current in the inductor L is zero. Switch k closed at time t=0. Obtain expression for the voltage v(t) across the inductor L using classical approach. 8

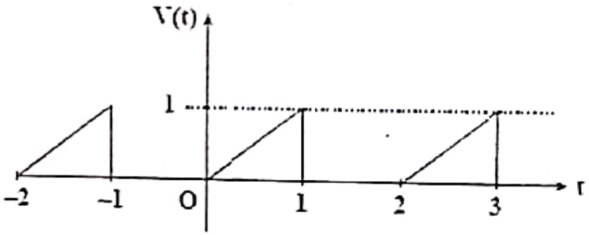


b) In the series R-C circuit, the capacitor has initial charge 2.5Mc. At t=0, the switch is closed and a constant voltage source V=100V is applied, find i(t) by using Laplace Transform method. 7



3. a) Define Transfer Function. From the pole zero plot, obtain the time domain response of given function. $I(s) = \frac{s(s+1)}{(s+4)(s^2+6s+8)}$ 2+6

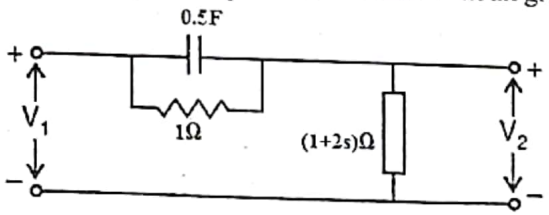
b) Obtain the exponential Fourier series representation of the given waveform. 7



4. a) Sketch the Bode magnitude plot for the given transfer function: 7

$$G(s) = \frac{300(s+4)}{5(2s+1)(3s^2+11s+12)(s+10)}$$

b) In Find the driving point impedance $Z_{11}(s)$ and voltage transfer function $G_{21}(s)$ in Laplace domain in the circuit given below: 8



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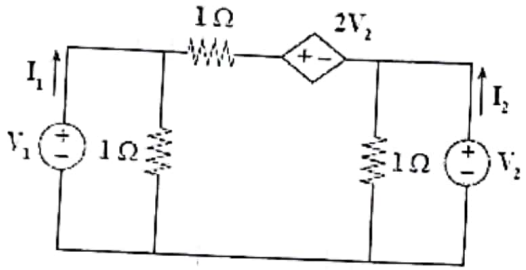
5. a) Write the necessary and sufficient condition for a function to be PRF. Check the given function for PRF. 8

$$H(s) = \frac{s^3 + 5s^2 + 9s + 3}{s^3 + 4s^2 + 7s + 9}$$

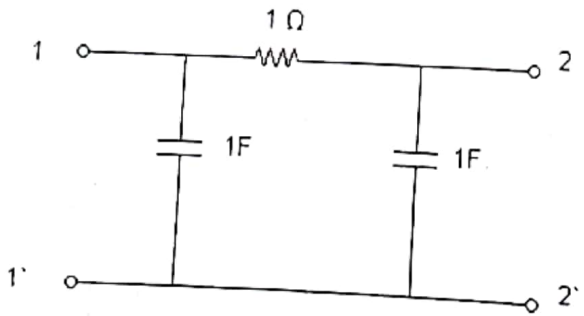
b) Synthesize the given transfer function using Foster-I & Cauer-I method. 7

$$Y(s) = \frac{s(s+2)(s+4)}{(s+1)(s+3)}$$

6. a) Define Z-parameters for two port network. Obtain the Y-parameter for the given two port network. Also draw the general equivalent circuit showing Y-parameters. 1+7



b) Find the hybrid parameters for the given RC network. 7



7. Write short notes on: **(Any two)** 2×5

a) Mesh and Nodal Analysis
b) Initial and Final Value Theorem
c) Symmetry and reciprocity in two port networks

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Fall

Year : 2021
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Use the mesh-current method for a circuit in Figure 1.1 to find i_o. 7

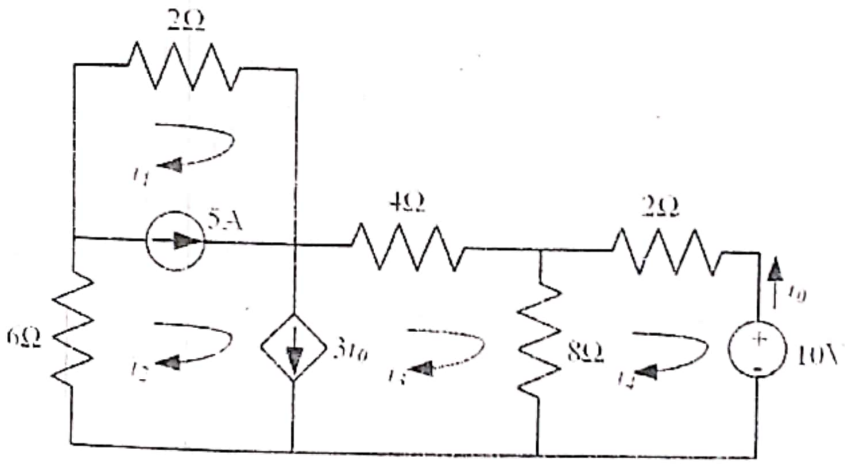
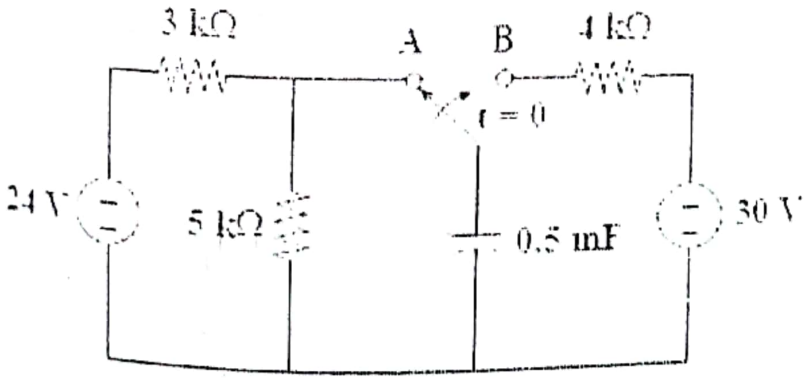
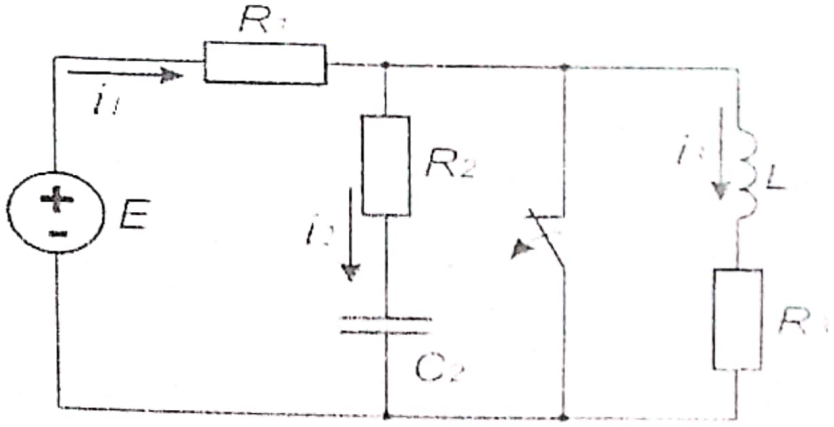


Figure 1.1

b) The switch has been in position A for the long time. At t=0, switch is connected to position B. Find the voltage across and current through the capacitor for t>0. 8

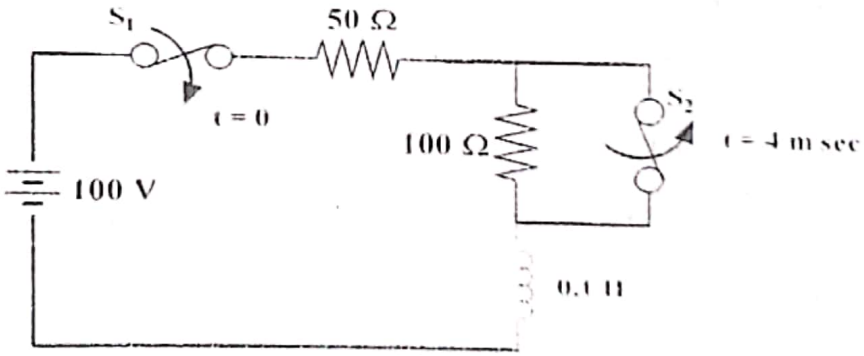


2. a) In the network shown in figure 2.1, switch is closed and the steady state is reached. At t = 0, the switch is opened. Find $V_{C_2}(t)$ if E = 140V, L3 = 0.2H, C2 = 50μF, R_1 = 20Ω, R_2 = 20Ω, R_3 = 50Ω. 13



b) Discuss the advantages of the Laplace transform method over the conventional classical methods of solving linear differential equations with constant coefficients. 2

3. a) In the circuit of Figure 3.1, S_1 is closed at t = 0, and S_2 is opened at t = 4 msec. Determine $i(t)$ for t > 0. Assume inductor is initially de-energized. (Use Laplace transform method to solve the problem). 7

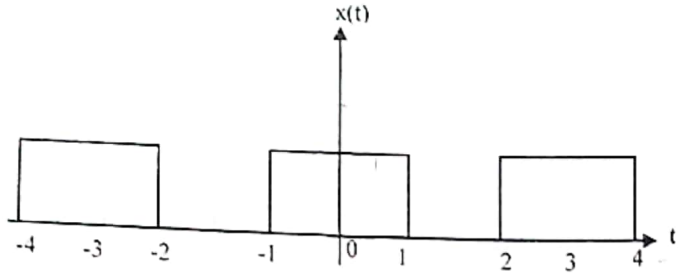


b) Construct the Bode plot for the given transfer function. 8

$$100\frac{(s+1)}{s^2+110s+1000}$$

Also, obtain v (t) using pole-zero diagram.

4. a) Determine the trigonometric Fourier series expansion for the given waveform: 8



b) Synthesize the given transfer function using Foster-I & Cauer-I method. 7

$$Y(s) = \frac{s(s+2)(s+4)}{(s+1)(s+3)}$$

5. a) What is the physical meaning of second order circuits in terms of passive elements (resistors, capacitors and inductors)? Write short notes on under damped, critically damped and over damped response with the help of characteristic equation and characteristic roots for second order differential equation. Draw simple waveform on how does the shape of the current looks like for each response to support your answer. 5

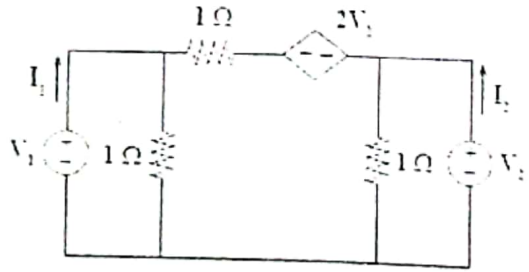
b) Explain Routh-Hurwitz Criterion for system stability? Also write the advantage and disadvantage of this criterion. 5

c) Plot the *poles and zeros* in s-plane for the network function: 5

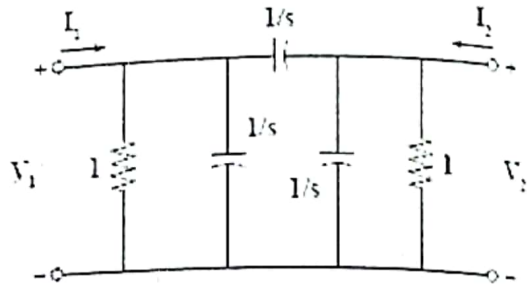
$$V(s) = \frac{10s(s+5)}{(s+8)(s+6)}$$

Also, obtain v (t) using pole-zero diagram.

6. a) Obtain the Y-parameter for the given two port network. Also draw the general equivalent circuit showing Y-parameters. 7



b) Obtain Transmission parameters for the given network.



7. Write short notes on: **(Any two)**

a) π to T transformation method

b) Fourier Transform and its applications

c) Band pass and band stop filter

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POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Network Theory

Semester: Spring

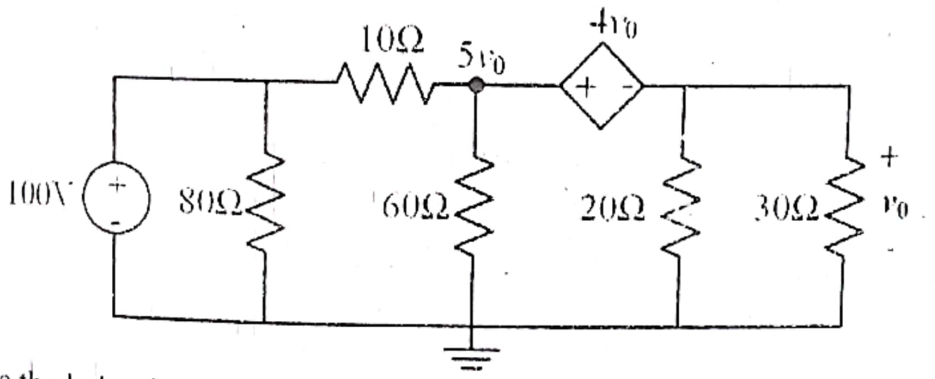
Year : 2021
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1 a) Find v_0 for the circuit given in the figure below using nodal analysis. 5



b) State the behaviour of inductor and capacitor at $t = 0^+$ and $t = \infty$ for DC excitation. How long will it take for the voltage or current in series connected RC circuit to get its final value considering its rate of decay? 2

c) Suppose that the switch in the network given in the figure has been closed for a long time and is opened at $t = 0$, draw the equivalent circuit to evaluate the initial conditions of the circuit and also evaluate $\frac{dv(0)}{dt}$ and $\frac{d^2v(0)}{dt^2}$, where v is the voltage across capacitor as shown in the figure. 8

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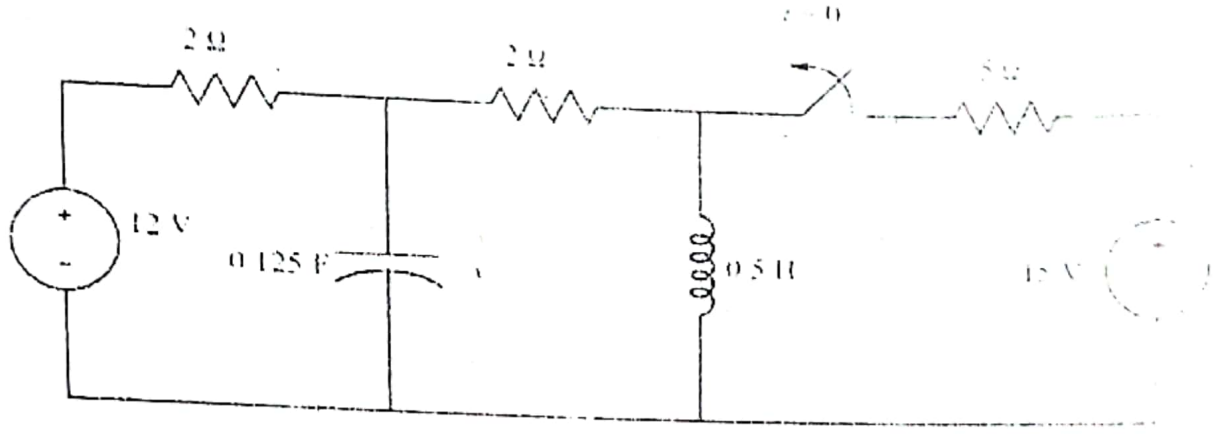
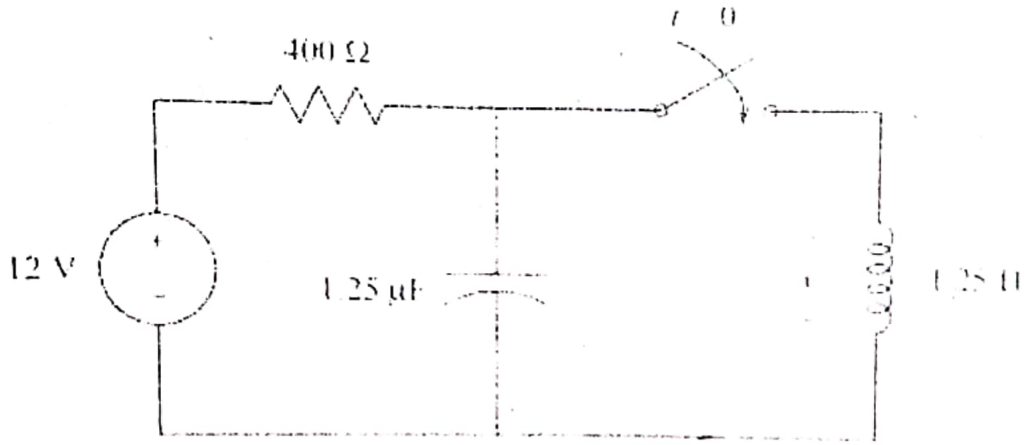
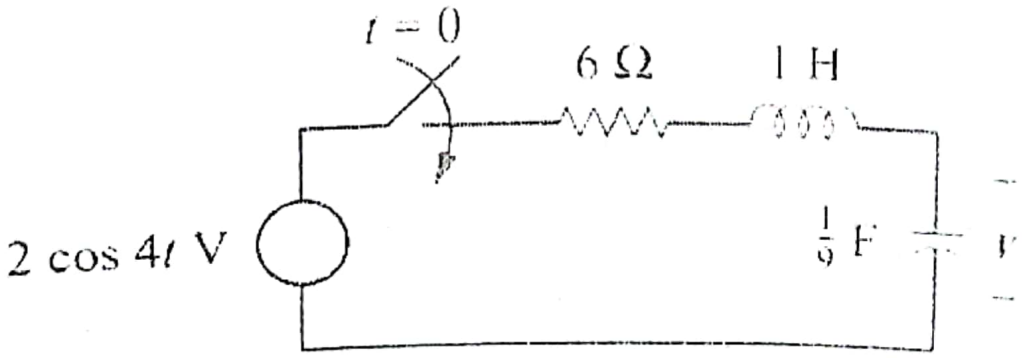


2 a) The switch in the circuit given below has been open for a long time before closing at $t = 0$. Find $v(t)$ for $t \geq 0$. 7



b) A $50Hz$ sinusoidal voltage of maximum value of $400V$ is applied to a series circuit of 10Ω resistance and $0.1H$ inductance. Find and expression for the value of the current at any instant after the voltage is applied, assuming that the voltage is zero at the time of application. Calculate its value at t=0.02s after switching on. 8

3 a) For the RLC circuit shown in the figure below, find the complete response if $v(0) = 2V$ when the switch is closed using Laplace transform method. Draw the equivalent circuit in s-domain for t>0. 7



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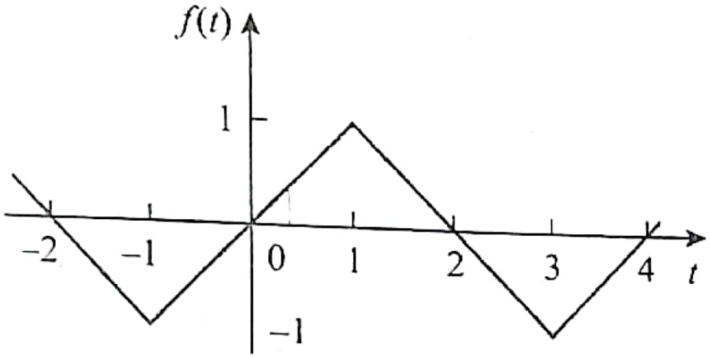
b) How would you determine system stability using system *poles*? Plot the *poles and zeros* in s-plane for the transfer function *G(s)* given below. 8

$$G(s) = \frac{1}{2}\frac{(s^2+4)(1+2.5s)}{(s^2+2)(1+0.5s)}$$

4 a) Calculate the Fourier series for the given function in the figure below. 7



b) Construct a bode plot for the given transfer function *G(s)*. 8

$$G(s) = \frac{100(s+10)}{s(s+2)(s+5)}$$

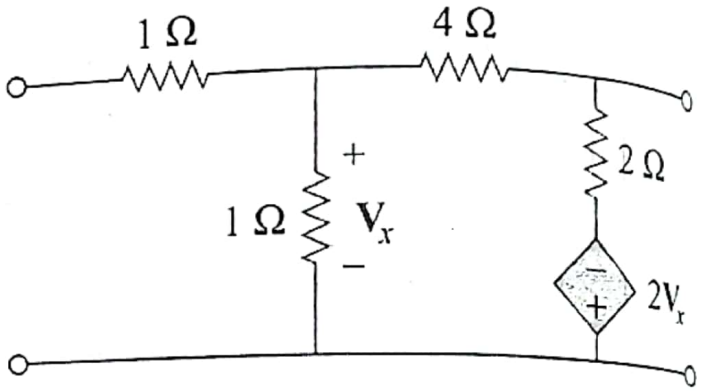
5 a) Check whether the given function F(s) is positive real function. 7

$$F(s) = \frac{s^2+2s+6}{s(s+3)}$$

b) Determine Foster-I and II realizations of the driving point RC impedance function given below. 8

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

6 a) Calculate the impedance-parameter equivalent of the circuit given in the figure below. 7



b) The governing equations for the two port network are given below. Find the Y-parameters, ABCD parameters and also draw the equivalent Π-network.

$$\left.\begin{aligned} I_1 &= 0.5V_1 - 0.2V_2 \\ I_2 &= -0.2V_1 + V_2 \end{aligned}\right\}$$

7 Write short notes on: **(Any two)**

a) Classification of filters

b) Initial and Final Value Theorems of Laplace transforms

c) Transfer function of an electrical network (assume network if required)

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