

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Level : B. E.

Course : EEG 213

Year : II

Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

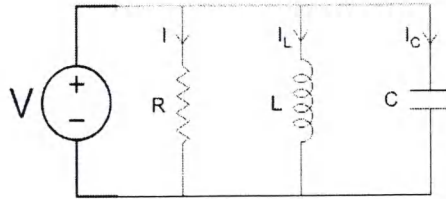
Date : JUL 06 2017

SECTION "A"

[20 Q. \times 1 = 20 marks]

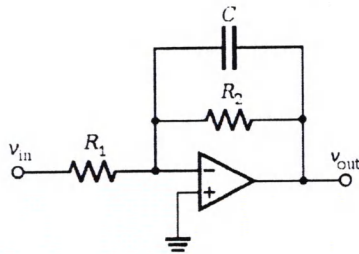
- 1) The network below has reached the steady state. The elements have value 1Ω , $1H$ and $1F$.
Current flows.....

- a) only through the resistor
b) only through the inductor
c) only through the capacitor
d) equally through all elements

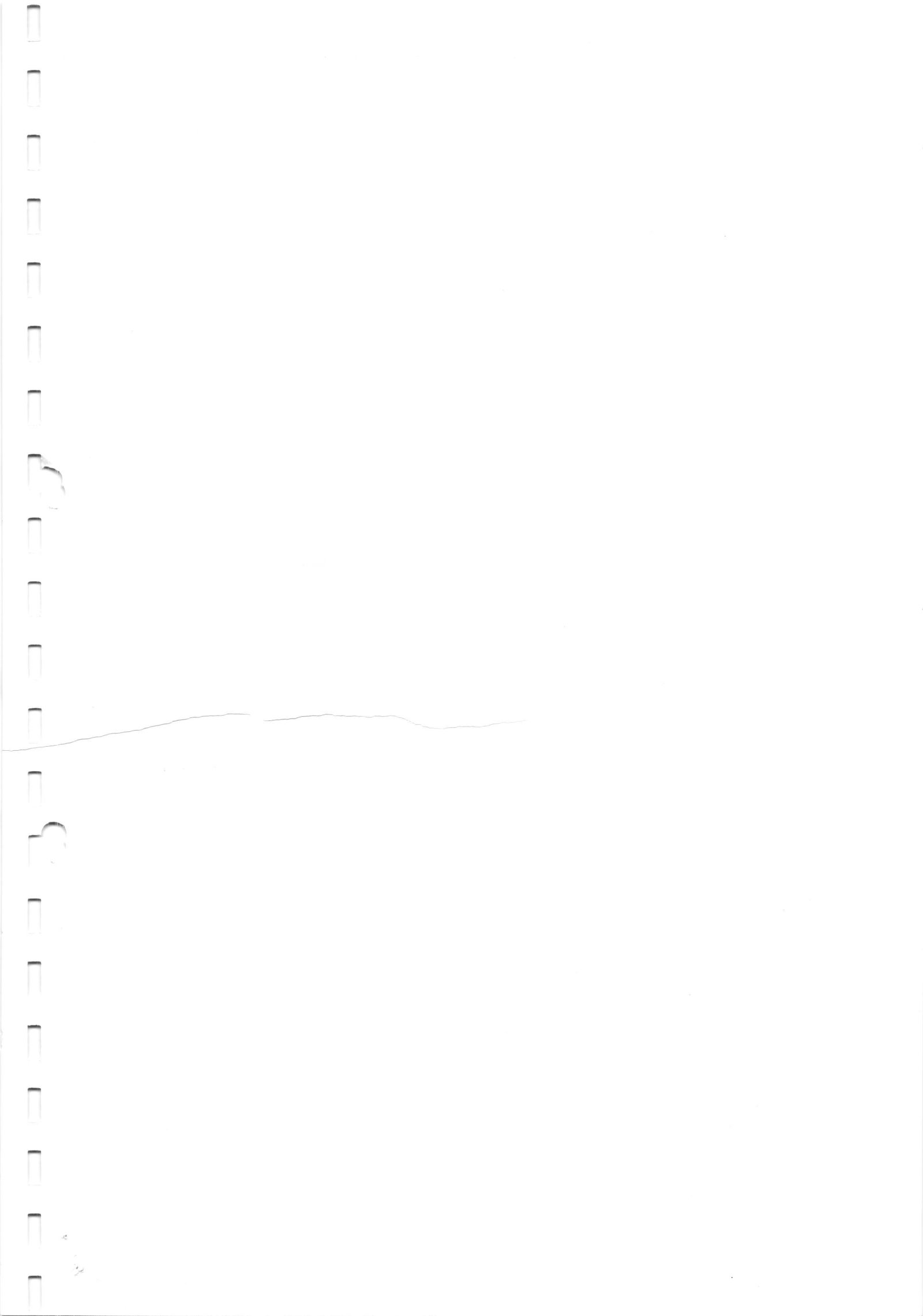


- 2) A capacitor of value $0.5 F$ has the impedance of.....
a) $\frac{s}{2}$ b) $\frac{2}{s}$ c) $\frac{0.5}{s}$ d) $\frac{1}{2s}$
- 3) For a second order system, damping ratio (ξ), is $0 < \xi < 1$, then the roots of the characteristic polynomial are:
a) real and distinct b) real and equal
c) complex conjugates d) imaginary
- 4) If the characteristic equation of a closed-loop system is $s^2 + 2s + 2 = 0$, the system is.....
a) over damped b) under damped
c) undamped d) critically damped
- 5) The time constant of a first order series RL circuit is...
a) $\frac{1}{RL}$ b) RL c) $\frac{R}{L}$ d) $\frac{L}{R}$
- 6) When a series RL circuit is connected to a voltage V at $t=0$, the current passing through the inductor L at $t=0+$ is.....
a) zero b) infinite c) $\frac{V}{R}$ d) $\frac{V}{L}$
- 7) If the source function is $x(t) = 2e^{2t}$, the possible forced response is
a) $2e^{2t}$ b) $2e^{st}$ c) ke^{2t} d) ke^{st}
- 8) The transient response occurs in the networks in which.....
a) only inductive elements are present
b) only capacitive elements are present
c) at least either inductive or capacitive or both elements are present
d) only resistive elements are present

- 18) Which of the following is not the property of LC impedance or admittance?
- Highest power of numerator must be smaller than highest power of denominator
 - They are ratio of even to odd or odd to even polynomials
 - Poles and zeros are interlaced
 - All poles and zeros lie in imaginary axis
- 19) The cut off frequency of a first order low pass RC filter is.....
- $\frac{2\pi}{RC}$ Hz
 - $\frac{1}{2\pi RC}$ Hz
 - $2\pi RC$ Hz
 - $\frac{2\pi}{RC}$ rad/s
- 20) What is the transfer function of the following active first order Low Pass Filter.....



- $\frac{R_1 Cs}{1+R_2 Cs}$
- $\frac{R_1 Cs}{1+R_2 Cs}$
- $\frac{1+R_2 Cs}{R_1 Cs}$
- $-\frac{1+R_2 Cs}{R_1 Cs}$



SECTION "B"

[5Q × 11 = 55 marks]

Attempt ANY FIVE questions.

1. a. For the electric network shown in figure 1, find the expressions for the operational impedances Z_{ab} and Z_{bc} . Also find the driving point operational impedance across terminals $a-d$ and $c-d$. Use differential operator P . [3]

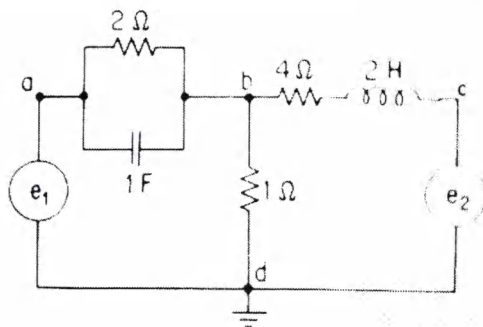


Figure 1

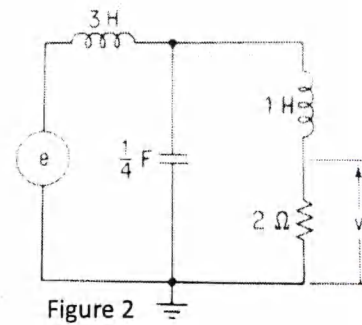


Figure 2

- b. For the circuit shown in figure 2, find the differential equation that relates resistor voltage v to the source voltage e . Consider that the source voltage may be time varying. Also, find the operational network function in terms of differential operator P that relates v to the source voltage e . [4]

- c. Define forced response and transient response of a network. [4]
For the circuit shown in figure 3, the switch has stayed open for a long time enough to reach a steady state and all elements are de-energized. At time $t = 0$, the switch is closed. Find the initial conditions for the current: $i_1(0+)$, $i_2(0+)$, $\frac{di_1(0+)}{dt}$ & $\frac{di_2(0+)}{dt}$. Also find the equation that relates current i to the source E .

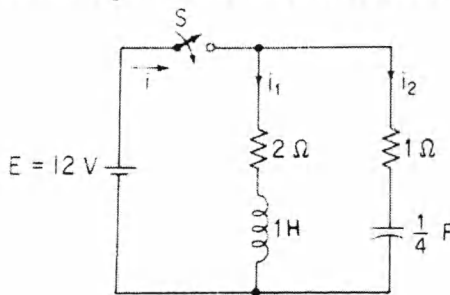


Figure 3

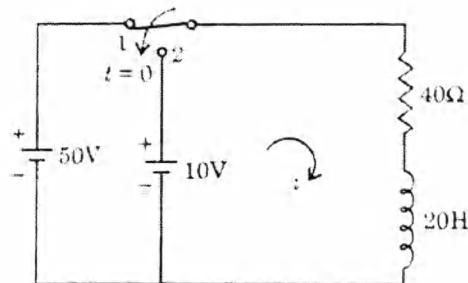


Figure 4

2. a. Consider the circuit in figure 4. Assuming that the circuit has been in steady state for a long time with the switch at position 1, determine the differential equation and solve it to find the complete time expression for the current i after the switch is moved to position 2 at time $t = 0$. Identify the transient and steady state components. (Use the classical method to solve the differential equation.) [4]

- b. In the network of figure 5, switch is closed at time $t = 0$. Using the Laplace transform method, obtain the transformed network, and solve for $i_2(t)$. [4]

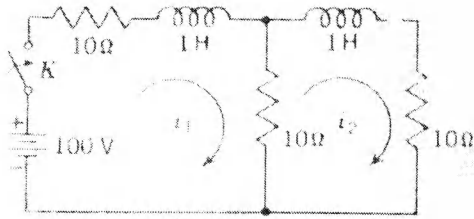


Figure 5

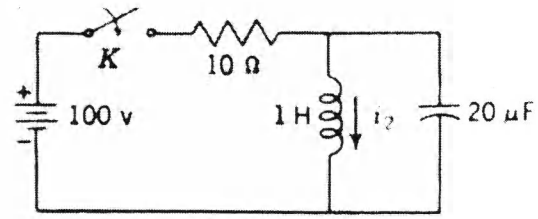


Figure 6

- c. Find the inverse Laplace transform using partial fraction expansion: [3]

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

3. a. In the network shown below in figure 6, the switch K is closed and the network reaches steady state. At time $t = 0$, the switch is opened. Find the expression for the current through the inductor for all times $t > 0$. Sketch the current and identify the time constant. (Use classical method to solve the differential equation) [4]

- b. In the network of figure 7, switch is opened at time $t = 0$. Using the Laplace transform method, obtain the transformed network, and solve for $i(t)$. [4]

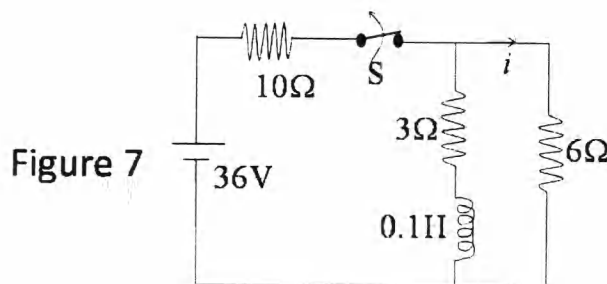


Figure 7

- c. Derive the response of a series RL circuit for the step input. Explain the term 'time constant' and its importance. [3]

4. a. For the network function provided below, obtain the Bode magnitude and phase plot. Use provided semi-log graph paper for the purpose. [5]

$$G(s) = \frac{10(s+2)}{s(0.5s+1)(0.1s+1)}$$

- b. Check whether the following network function of a one port network is PRF or not. [3]

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

- c. What do you understand by poles and zeros of a network? Explain with examples. [3]

5. a. Realize following network function in Foster-I and Foster-II forms: [5]

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

What type of networks do you obtain?

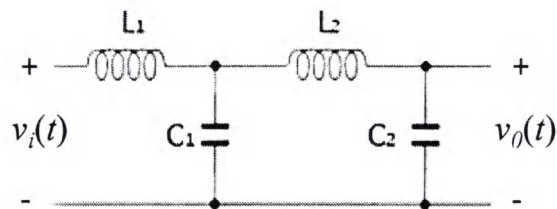
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- b. What do you understand by Bode plot? [4]
 For the network function provided below, convert it to standard form and obtain the asymptotic Bode magnitude plots for the individual factors. [Draw on your answer sheet, not the semilog graph and label the plots clearly].

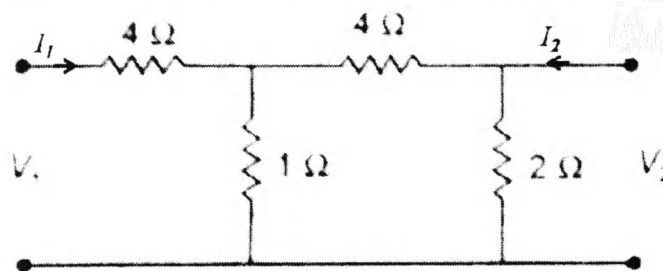
$$G(s) = \frac{40}{s(1 + 0.25s)(s^2 + 4s + 4)}$$

- c. Define Z, Y and h parameters of two port networks. [2]

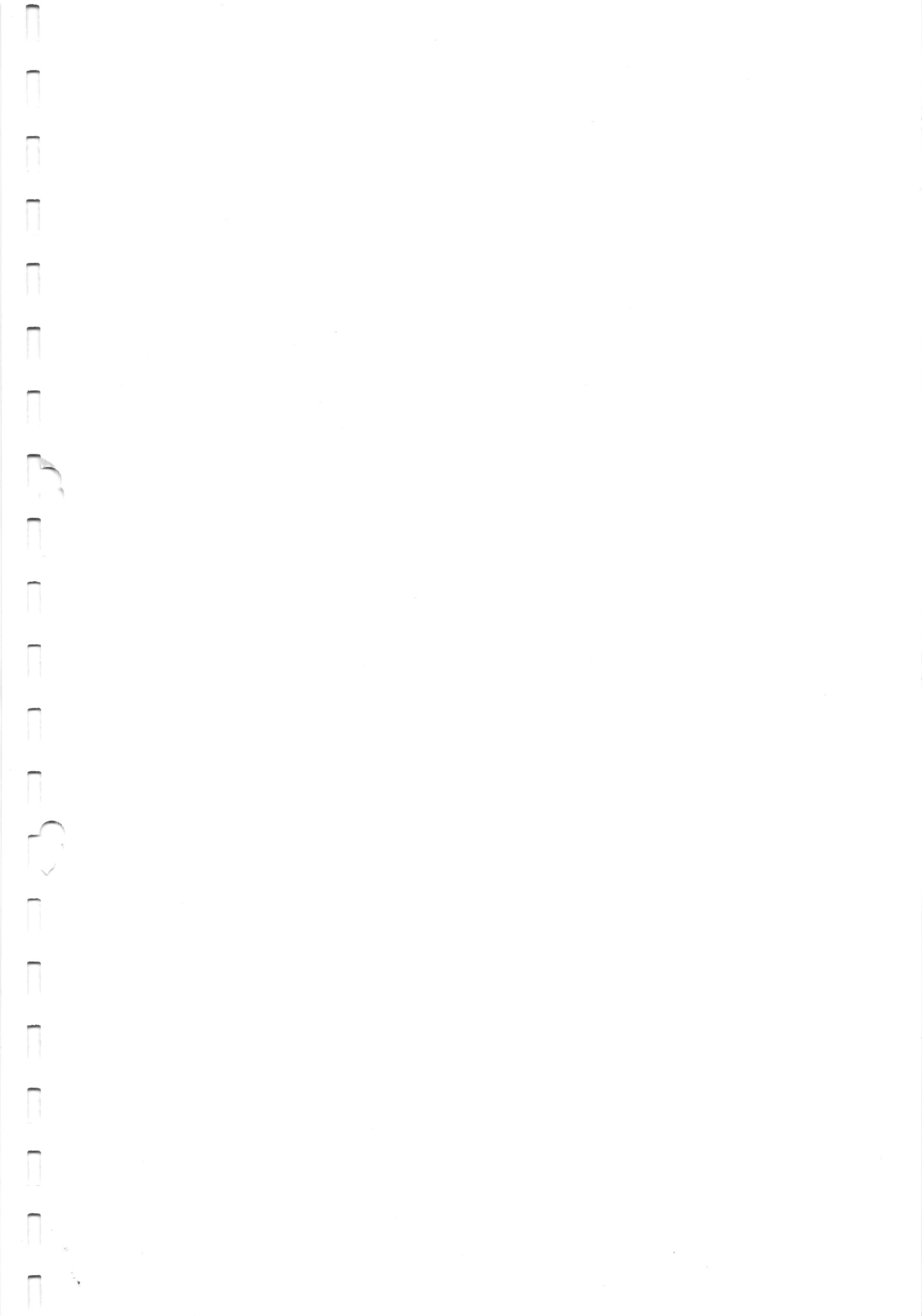
6. a. Find the transfer function $\frac{V_0(s)}{V_i(s)}$ for the network shown below. Consider $L_1 = 2 H$, $L_2 = 2 H$, $C_1 = C_2 = 1 F$. [4]



- b. Find the Y and Z parameters of the resistive network shown below: [4]

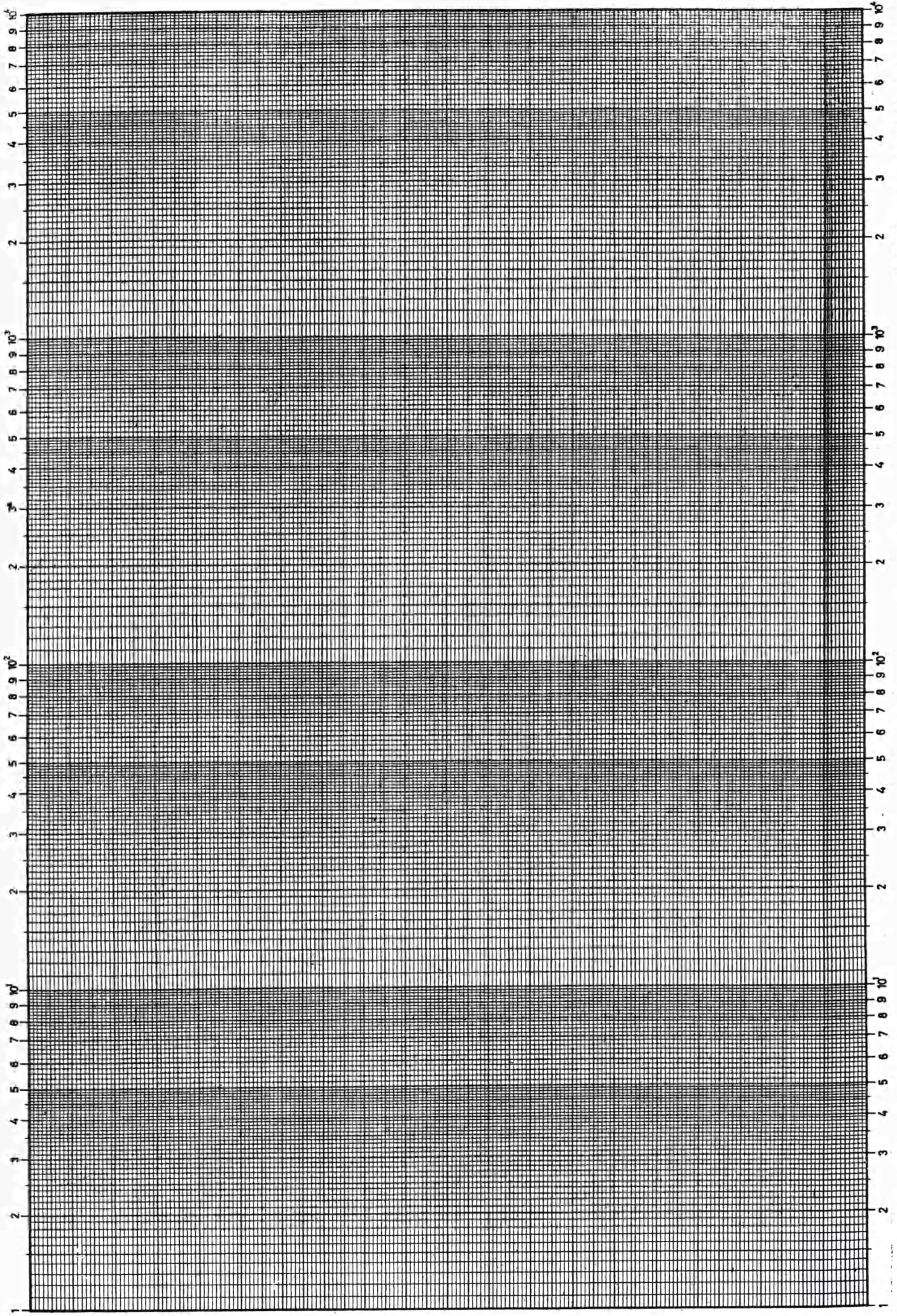


- c. What are the uses of filters? Explain different types of filters. [3]



ECEG-213, Table

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Jain Brothers Piplani

101 - Simple Log, 4 Scale Log x mm

