

KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

Level : B. E.

Year : II

Exam Roll No. :

Time: 30 mins.

Course : EEG 213

Semester : I

F. M. : 10

Registration No.:

Date APR 6 2017

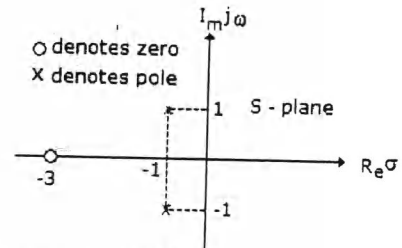
SECTION "A"

[20 Q. × 0.5 = 10 marks]

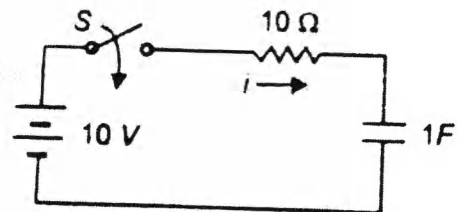
- A series RL circuit with $R=100$ ohm and $L=50$ H is excited by a DC source of 100 V. The time constant of the circuit is:
a) 2 s b) 0.2 s c) 0.5 s d) 5 s
- The transient current after 1 s in the circuit described in question number 1 is:
a) -0.135 A b) 0.135 A c) -7.38 A d) 7.38 A

- The driving point impedance of a network has pole zero locations as shown below. If $Z(0) = 3$, the impedance function is:

- a) $\frac{3(s+3)}{s^2+2s+3}$ b) $\frac{2(s+3)}{s^2+2s+3}$
c) $\frac{3(s-3)}{s^2-2s-3}$ d) $\frac{2(s-3)}{s^2-2s-3}$



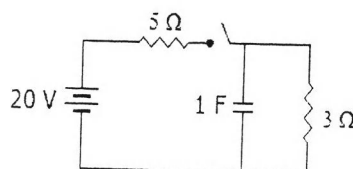
- In the circuit below, the switch is closed at $t=0$, the current at $t=0+$ is
a) can not be determined b) zero A
c) -1 A d) 1 A

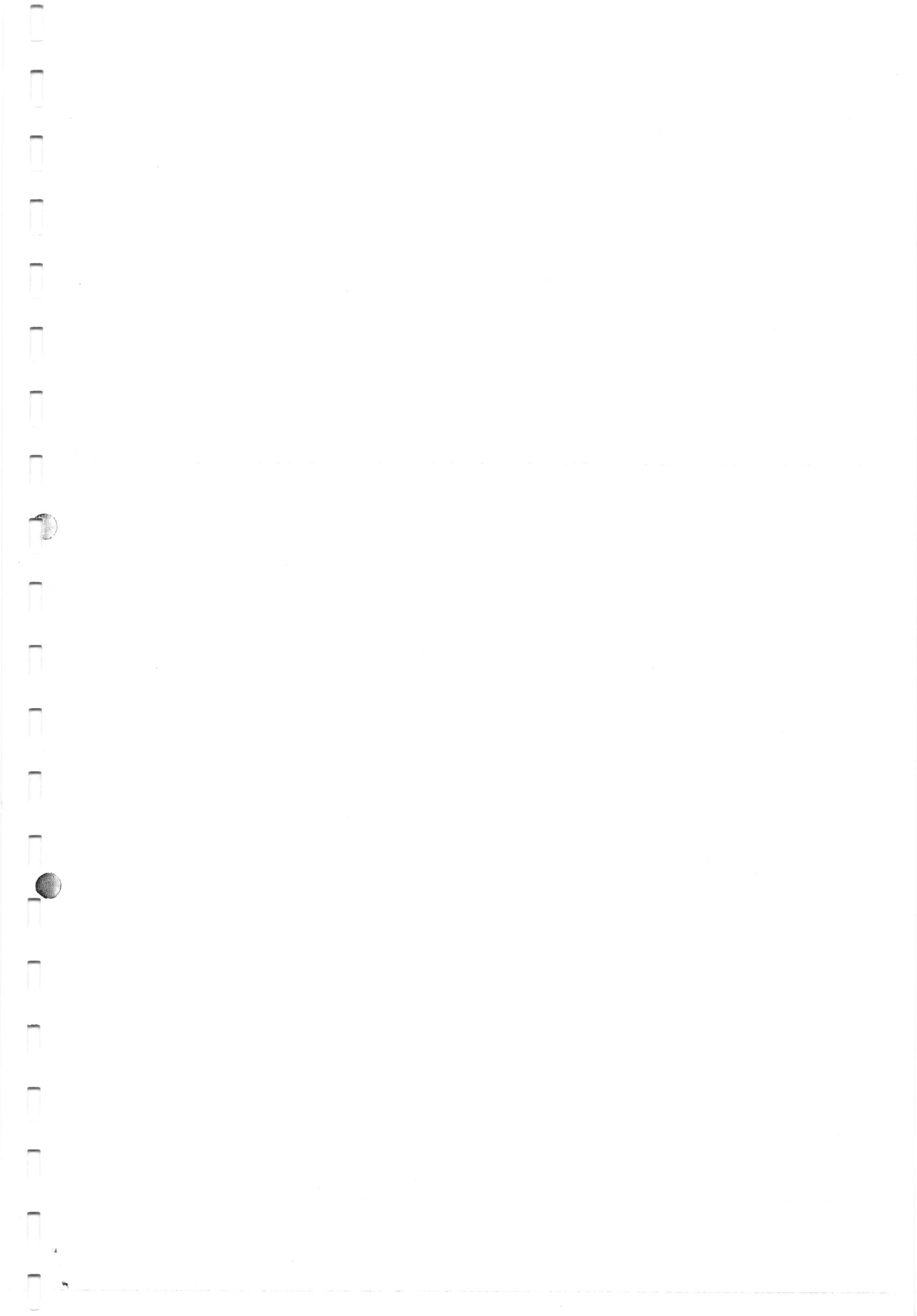


- A RC series circuit is applied a step voltage of value E at $t=0$, if the system is initially relaxed, the steady state value of the current will be...
a) Zero b) E/R c) $\frac{E}{R} e^{-\frac{t}{RC}}$ d) $\frac{E}{RC} e^{-\frac{t}{RC}}$

- A $0.5 \mu\text{F}$ capacitor is connected to a 10 V battery. After a long time, the voltage and current across the capacitor will be.....
a) 0.5 V 10 A b) 0 V, 10 A. c) 10 V, 0 A d) 0V, 0 A

- For the circuit shown below, switch is closed at $t=0$. The current across capacitor at $t=0+$ is.....
a) 0 A b) 4 A c) 2.5 A d) 3.1A





SECTION "B"
[5Q × 11 = 55 marks]

Attempt ANY FIVE questions. Assume suitable values for missing data.

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

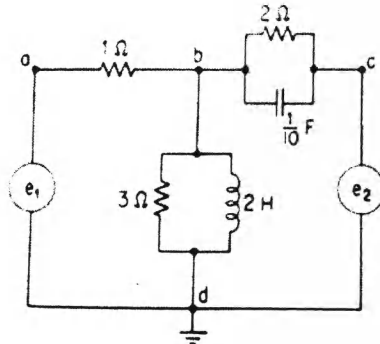


Figure 1

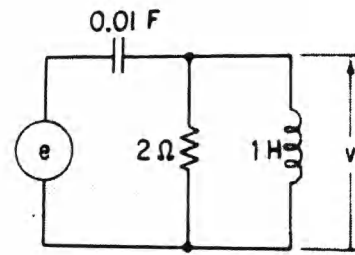


Figure 2

- b. For the circuit shown in **figure 2**, find the differential equation that relates inductor voltage v to the source voltage e . Consider that the source voltage may be time varying. Also, find the differential equation that relates capacitor current to the resistor current. [4]

- c. What do you understand by initial conditions? Why are they needed? [4]
For the circuit shown in **figure 3**, the switch has stayed at position a for a long time enough to reach a steady state. At time $t=0$, the switch is changed to position b . Write the differential equation for the current i , for all times $t > 0$. Find the initial conditions for the current, $i(0+)$, $\frac{di(0+)}{dt}$ and $\frac{d^2i(0+)}{dt^2}$. Consider $C = 0.1 \mu F$, $R = 1000 \Omega$, $L = 1 H$ and $V = 100 V$.

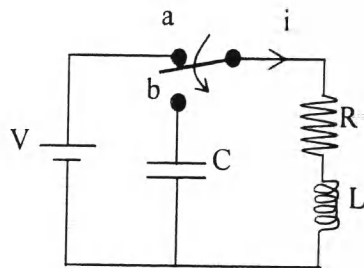


Figure 3

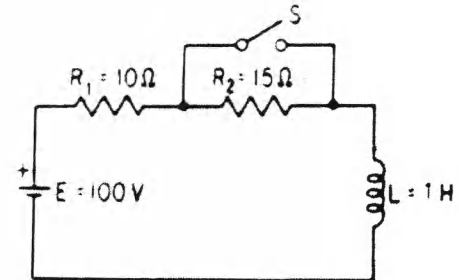


Figure 4

2. a. Consider the circuit in **figure 4**. Assuming that the circuit has been in steady state for a long time with the switch open, determine the differential equation and the complete time expression for the current after the switch is closed 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 shown below in **figure 5**, the switch K is open and the network reaches steady state. At $t = 0$, the switch is closed. Find the current in the inductor for all times $t > 0$. Sketch the current and identify the time constant. [5]

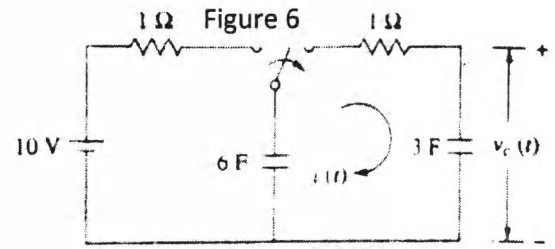
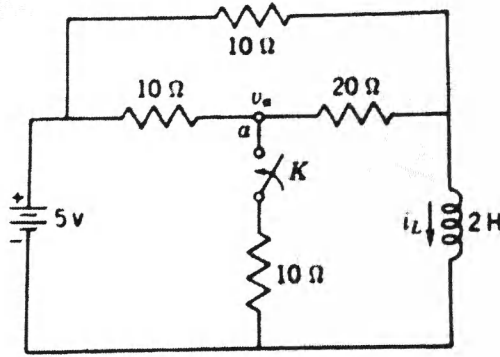


Figure 5

- c. Using linearity property, find the Laplace transform of: [2]
 $x(t) = 5e^{-6t} + 10t^2$
3. a. In the network of **figure 6**, switch is moved from a to b at time $t = 0$. Using the Laplace transform method, obtain the transformed network, and solve for $i(t)$ and $v_c(t)$. [5]

- b. The driving point impedance of a LC network is given as below. Realize the network as Cauer-I form. [4]

$$Z(s) = \frac{s^5 + 5s^3 + 4s}{s^4 + 3s^2 + 1}$$

- c. What do you understand by PRF? Discuss its properties. [4]
4. a. For the network function provided below, obtain the Bode magnitude plot. Use provided semi-log graph paper for the purpose. [5]

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

- b. Check whether the following network function of a one port network is PRF or not. [5]

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

- c. Realize following network function in Foster-II form: [2]
 $Z(s) = \frac{s+2}{(s+1)(s+3)}$. What type of network do you obtain?

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

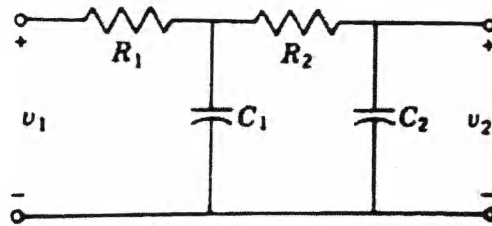
$$G(s) = \frac{50}{s(1+0.25s)(1+0.1s)}$$

Can you determine the gain margin from the plot?

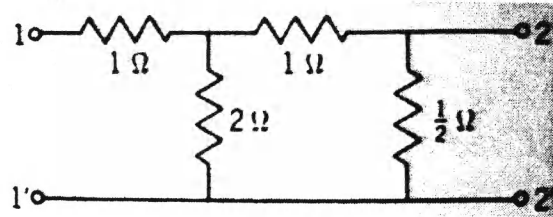
- b. A series RLC circuit is connected to a DC voltage source of 10 V with a switch that closes at time $t=0$. Find the complete expression for the current response $i(t)$ through the circuit, if $R=4.8\Omega$, $L=4$ H, and $C=0.25$ F [4]

- c. What do you understand by Bode plot? Why is it very useful? [2]

6. a. Find the transfer function $\frac{V_2(s)}{V_1(s)}$ for the network shown below: Consider $R_1 = 20\text{ K}\Omega$, $R_2 = 20\text{ K}\Omega$, $C_1 = 100\text{ }\mu\text{F}$, $C_2 = 200\text{ }\mu\text{F}$. [4]

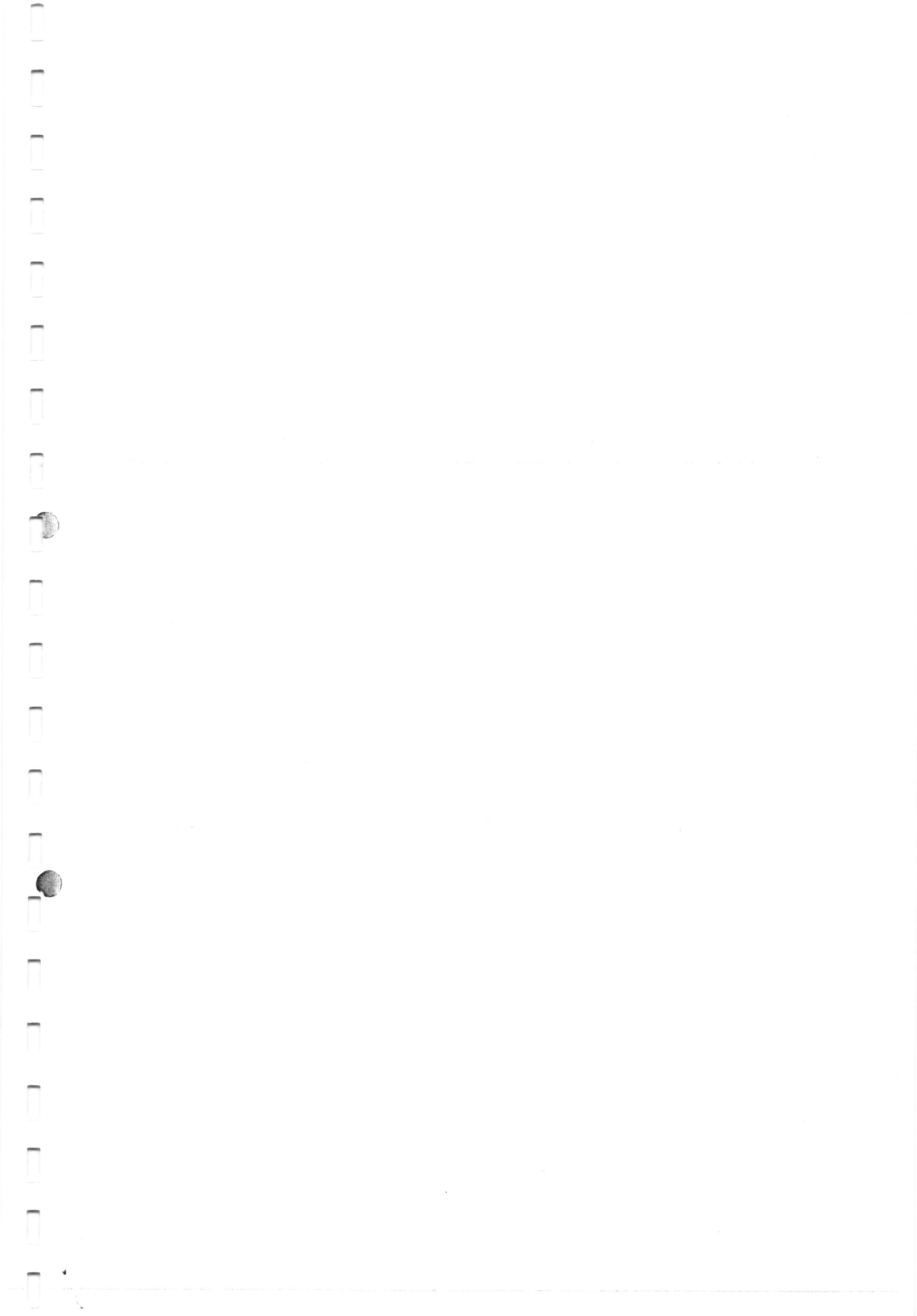


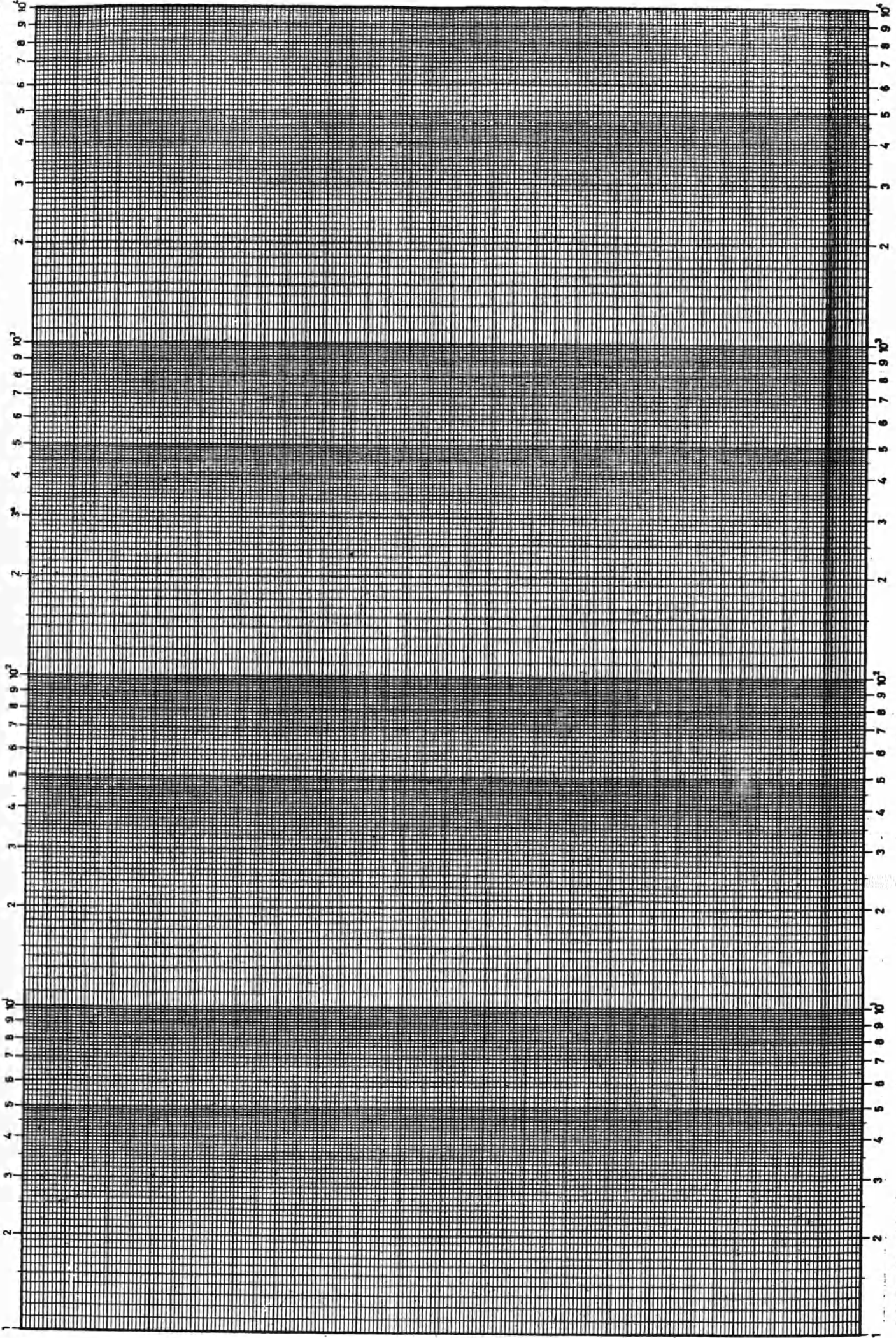
- b. Find the Y and resistive Z parameters of the network shown below: [4]



- c. Design an inverting active filter to meet the following transfer function: [3]

$$T(s) = 4 \frac{s + 0.5}{s + 4}$$





Jain Brothers Piplani

101 - Simple Log, 4 Scale Log x mm

Dear Log - simple paper
 APR 2017
 II-I

