LE. T. EXAM.

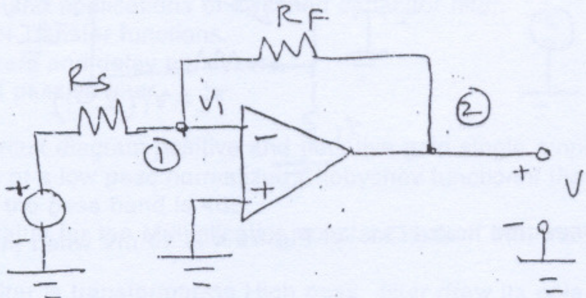
Con. 2071-06. TV-8349

(REVISED COURSE)

3 Hours) [Total Marks : 100

N.B. (1) Attempt any five questions.
(2) Assume suitable data if necessary.
(3) Figures to the right indicate full marks.

1. (a) Find the function V_0/V_{IN} for the operational amplifier circuit shown in Figure 1. 10



(b) Sketch the gain versus frequency for the voltage transfer function : 10

$$T(s) = 10\,\frac{s^2+16}{s^2+2s+100}.$$

2. (a) Find the Butterworth approximation for a Low-pass filter whose requirements are characterized by– 10
$A_{max} = 0{\cdot}5$ dB. $A_{min} = 12$ $w_p = 100$ $w_s = 400$

(b) An active RC network is known to have the following transfer function– 10

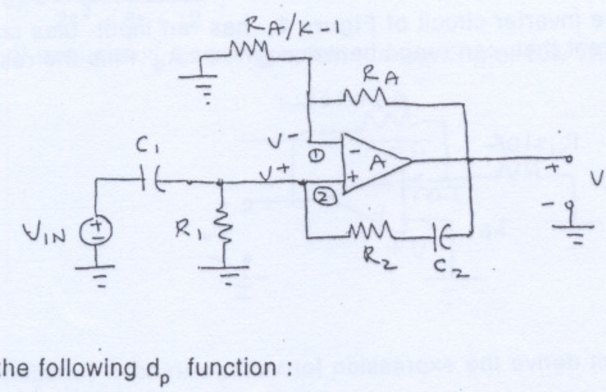
$$T(s) = \frac{s^2 + \frac{1}{R_1 C_1 R_2 C_2}}{s^2 + \frac{1}{R_3 C_3}\,s + \frac{1}{R_1 C_1 R_4 C_4}}.$$

The network is used to realize the band-reject filter function :

$$T'(s) = \frac{s^2+144}{s^2+0{\cdot}8s+16}$$

If every resistor and capacitor increases by one percent, find–
(i) The biquadratic parameter sensitivities at $\omega = 3{\cdot}6$ rad/sec.
(ii) The component sensitivities.
(iii) The gain deviation at $\omega = 3{\cdot}6$ rad/sec.

3. (a) The active RC circuit shown in Figure 2 realizes a second-order high-pass function. Find it transfer function V_0/V_{IN} and derive expressions for the sensitivity of W_p and Q_p to elements R_1, R_2, C_1, C_2 and the amplifier gain A. 10



(b) Synthesize the following d_p function : 10

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

4. (a) Realize the following voltage transfer function using an LC Ladder terminated in a 1 Ω resistor : 10

$$T(s) = \frac{s}{s^4+3s^3+3s^2+3s+1}.$$

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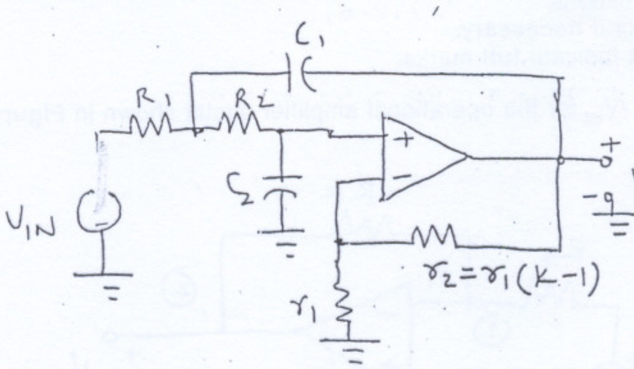
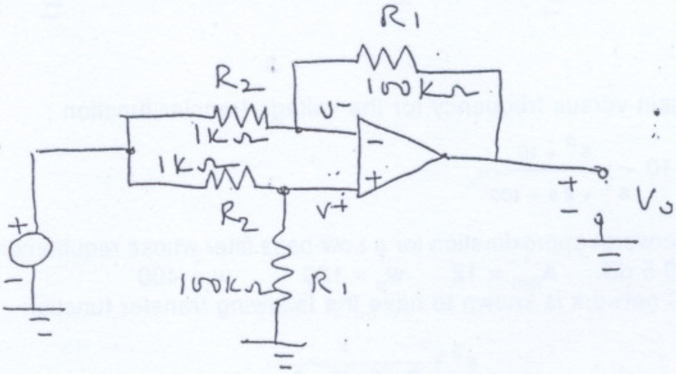
(b) Synthesize the following Low-pass function using the positive feedback circuit shown in **Figure 3** :

$$T(s) = \frac{2b}{s^2 + as + b}$$

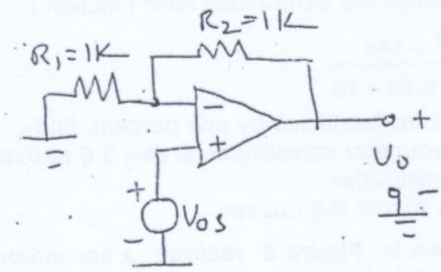
where a and b are positive constants.



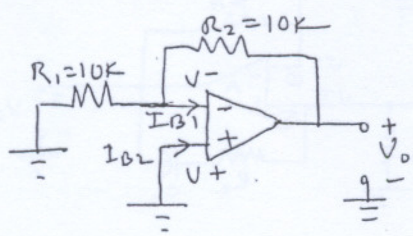
5. (a) The output voltage measured in the Ckt. of **Figure 4** is 10 mV when the input voltage is 1 volt. Find the CMRR. 10



(b) (i) The output offset voltage measured in the Ckt. of **Figure 5** is 10 mV. What is the input-offset voltage, V_{OS}, if $R_1 = R_2 = 10$ K. 5



(ii) The op amp used in the inverter circuit of **Figure 6**, has an input bias current of 500 nA and an input-offset current that can range between ± 100 nA. Find the resulting maximum output offset voltage. 5



6. (a) By using method of constraint derive the expression for voltage transfer function of a finite gain high pass Sallen-Key filter. 10

(b) Draw a neat circuit diagram of Akerberg-Mossberg filter and derive the expression for its voltage transfer function having low pass characteristics. 10

7. Write short notes on the following :– 20

(a) Gain equalizers and delay equalizers.

(b) Generalized Impedance Converter (GIC).

(c) Phase approximation and Ideal transmission

(d) Switched capacitor filters.