Con-2478-07. ND-7925

(REVISED COURSE)

(3 Hours) [Total Marks : 100

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

1. (a) Determine the Order of Butterworth response for the following specifications and realize the filter circuit. 10

W_p = 1 rad/sec, K_p = 3 dB
W_s = 2 rd/sec, K_s = 15 dB.

(b) Explain the steps to construct a leap-frog filter; and using the same procedure construct third order leap-frog filter. 10

2. (a) Determine the order of Chebyshev magnitude function with the following specifications 10

(i) Pass Band : 0 — 1 MHz.
(ii) Pass Band ripple 0·5 dB
(iii) Stop Band : 2 MHz
(iv) Stop Band attenuation = 40 dB.

Also develop the filter circuit.

(b) Draw the neat circuit diagram and derive the transfer function of Sallen and Key low-pass filter. 10

3. (a) Draw the neat circuit diagram of Tow-Thomas filter and derive the transfer functions for low-pass and band-pass filter realizations. 10

(b) Design a Tow-Thomas filter for low-pass and band-pass realizations for frequency = 2 KHz, Q = 20 and $|H_0| = 1$. Choose $C_1 = C_2 = C = 0{\cdot}01\ \mu F$. 10

4. (a) From the basic principles develop the state variable filter and derive the transfer functions for low-pass, band-pass and high-pass filter-realizations. 10

(b) Draw the neat circuit diagram of 4 Op-amp state variable band reject filter, and derive its transfer function using the expressions derived in Question No. 4(a). 10

5. (a) Draw the neat circuit diagram of infinite gain band-pass filter, with single Op-amp and design the filter circuit with following specifications. 10

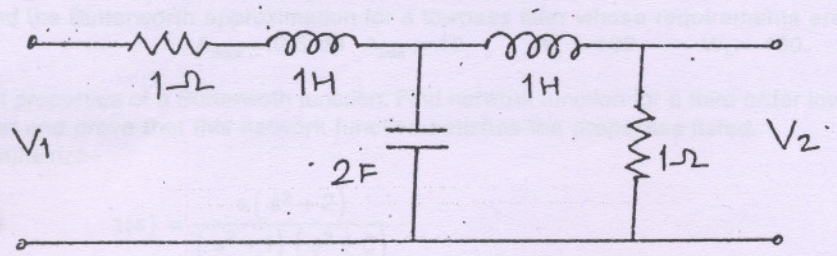
(i) $|H_0| = 2$
(ii) Q = 2
(iii) W_0 = 12 K rad/sec.

Choose $C_2 = C_3 = C = 0{\cdot}01\ \mu F$.

(b) Draw the neat circuit diagram of switched-capacitor Akerberg-Mossberg filter. 10

6. (a) Design an equal-resistance-equal-capacitance Sallen and Key band-pass filter for Q = 10, $W_0 = 2 \times 10^4$ rad/sec. Choose C = 0·1 μF. Find the value of R, and H_0. 10

(b) Determine the transfer function of the following circuit. 10



7. (a) Synthesize a passive network to realize the transfer function given below, with 1 Ω termination resistor: 10

$$Y_{T(s)} = \frac{s(s^2+9)}{2s^3+s^2+8s+1}$$

(b) Draw the neat circuit diagram of the Generalized impedance converter (GIC) and derive its transfer function. 10