Con. 5304-07. (REVISED COURSE) CD-6082

(3 Hours) [Total Marks : 100

N.B. (1) Attempt any **five** questions.
(2) Assume **suitable** data if **necessary** and state it.
(3) Draw **neat** diagrams wherever **required**.

1. (a) Prove that for Chebeshev function the cut-off frequency, ω_{3dB} is given by the equation, 10

$$\omega_{3dB} = \cosh\left(\frac{1}{n}\cosh^{-1}\frac{1}{\varepsilon}\right) \quad \text{for } \varepsilon < \text{or} = 1$$

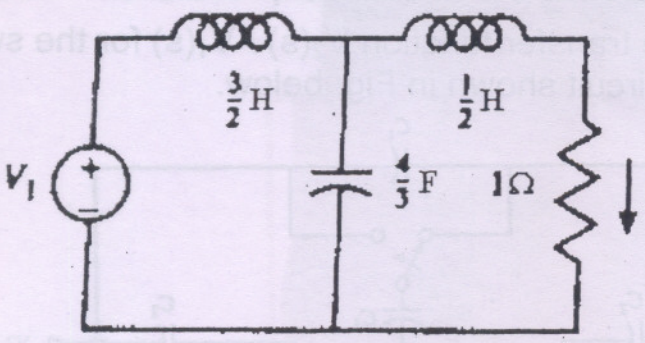
(b) The specifications for a Chebyshev filter are : 10

Passband ripple — 0.5 dB
Pass-band — 0 – 2.5MHz
Stop-band attenuation — 40 dB at 5 MHz

(i) Determine the order of the filter.
(ii) Find Cn (w) for this filter.
(iii) Draw its pole locations in s—plane.

2. (a) (i) List 5 properties of Butterworth function 10
(ii) List 5 properties of Chebeshev function

(b) Find the transfer function of the following circuit and draw its magnitude response 10



3. (a) Synthesize a third order Butterworth low pass filter. Then transform it to a band pass filter. 10

(b) Design equal-resistance-equal-capacitance Band-Pass filter to realize the voltage transfer function given by, 10

$$\frac{V_2(s)}{V_1(s)} = \frac{5000\,s}{s^2 + 3000\,s + 6\times10^6}$$

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4. (a) Find one Foster form and one Cauer form L-C realizations for the following driving point admittance. 10

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

(b) Derive the transfer function for second order infinite gain single amplifier high pass filter. 10
Hence realize an infinite gain single amplifier filter for following specifications

fo=1KHz, Q=$\frac{1}{\sqrt{2}}$, Ho = 5, choose C=0·01μF.

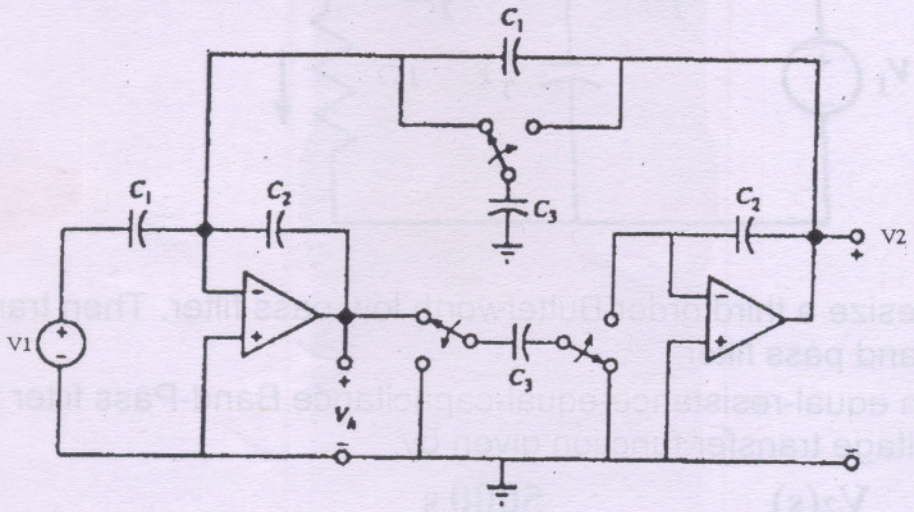
5. (a) Draw a neat circuit diagram of a Akerberg-Mossberg filter and derive the expression for its voltage transfer function having low pass characteristics. 10

(b) Design an equal resistance and equal_capacitance Sallen-key high pass filter for Q = 0·707 and ωn = 6283 r/s. 10

6. (a) Derive the expression for a state variable filter using three amplifier configuration . Specify the expressions for LP, HP and BP output. 10

(b) (i) Explain how a resistor is realized by a switched capacitor using MOS switches. Derive the relevant expressions. 10

(ii) Find the voltage transfer function $V_2(s) / V_1(s)$ for the switched capacitor filter circuit shown in Fig. below.



7. (a) Draw the neat circuit diagram of generalized impedance converter **(GIC)** and derive the expression for the input impedance. How to obtain synthetic inductor using GIC? 10

(b) Explain the principle of developing the block diagram and the circuit diagram of Leap-Frog filter for third order low pass characteristics. 10