Total No. of Questions : 8]

SEAT No. :

P1720

[Total No. of Pages : 4

[5058]-353
T.E.(Electronics.)
NETWORK SYNTHESIS
(2012 Pattern)(Semester-I)

Time :2½Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) *Answer Q1 or Q2,Q3 or Q4,Q5 or Q6,Q7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks*
4) *Use of electronic pocket calculator is allowed.*
5) *Assume suitable data if necessary.*

Q1) a) Test whether the following functions are positive real, **[6]**

i) $F(s)=\dfrac{s^2+4}{2s^3+3s^2+6s+1}$

ii) $F(s)=\dfrac{(s+2)(s+4)}{(s+1)(s+3)}$

b) Synthesize the following function using cauer-I and cauer-II form, **[6]**

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

c) State the properties of Transfer function and synthesize the following Transfer function. **[8]**

$$Z_{21}(s)=\frac{s}{s^3+3s^2+3s+2}$$

as a 1Ω terminated two port LC ladder network.

OR

Q2) a) Define all the four transfer functions for a two port network and explain effect of location of poles and zeros on response of the network. **[7]**

b) State and explain the properties of LC impedance function and also indicate which of the following functions are LC, RC,RL, or RLC impedance functions. **[7]**

i) $Z(s)=\dfrac{s^3+2s}{s^4+3s^2+2}$

ii) $Z(s)=\dfrac{s^2+4s+3}{s^2+6s+8}$

iii) $Z(s)=\dfrac{s^4+4s^2+3}{s^3+2s}$

c) Define constant resistance network? Design a bridge T network terminated in 1Ω to give a voltage transfer ratio **[6]**

$$G_{12}(s)=\frac{s+2}{s+3}$$

Q3) a) Compare Butterworth and Chebyshev Approximation Techniques. **[4]**

b) Determine the transfer function and realize low pass Butterworth approximation filter whose requirements are characterized by,

Pass band edge frequency 0.2 Mrad/sec, maximum loss in pass band 2dB, stop band loss at least 60 dB at 6Mrad/sec **[8]**

c) Normalized third order Low pass filter is shown below in Fig.1 **[4]**

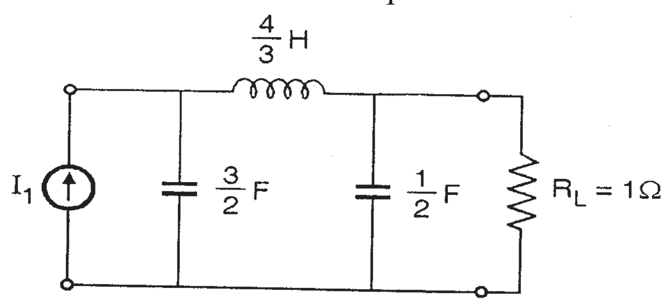

Figure 1

Design the corresponding high pass filter with its cutoff frequency $\omega_c = 10^4$ rad/sec and the impedance load of 500Ω

OR

Q4) a) Explain frequecncy and impedance Scaling. **[4]**

b) State the properties of Butterworth Approximation. **[4]**

c) Determine the transfer function of Chebyshev low pass filter to meet the following specification, **[8]**

i) 0.5 dB ripple in the pass band.

ii) Cut off frequency $w_c = 5x\ 10^5$ rad/sec.

iii) The Magnitude must be down to 30 dB at $w= 1.5\times10^6$ rad/sec.

iv) Load resistance=600Ω

Q5) a) Differentiate between Passive and Active filters. **[4]**

b) Synthesize 2nd order active low pass filter to have a pole frequency of 2 kHz and pole Q of 10. Then using RC-CR transformation, realize HPF with same cut off frequency. **[6]**

c) What are the advantages and disadvantages of biquad topologies of Active filter? **[6]**

OR

Q6) a) Design 2nd order Sallen and Key high pass Butterworth filter having cut off frequency of 600 Hz. **[4]**

b) Explain the different feedback topologies used in active filter designing. **[4]**

c) Synthesize the following high pass filter function using RC-CR transformation. **[8]**

$$H(s)=\frac{ks^2}{s^2+s+25}$$

Q7) a) Define Sesitivity? Give some of its important properties. **[4]**

b) Explain the concept of gain sensitivity? Also explain the various factors affecting the gain sensitivity. **[6]**

c) Explain effect of the following op-amp characteristics on the active filter. **[8]**

i) Dynamic range

ii) Input Bias Current.

iii) Slew rate.

iv) CMRR

OR

Q8) a) For the series RLC circuit shown in Fig.2, find transfer function V_2/V_1. Calculate the sensitivities of K, the pole frequency ωp, the factor(Q_p) with respect to R,L and C. Comment on the result obtained. **[6]**

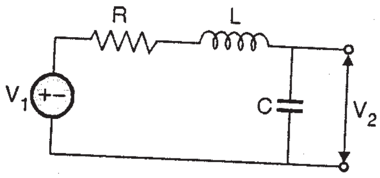

Figure 2

b) Prove the following sensitivity relationships. **[6]**

i) $S_x^{p^n} = nS_x^p$

ii) $S_{\sqrt{x}}^p = 2S_x^p$

iii) $S_x^{y+c} = \frac{y}{y+c} S_x^y$

c) Explain the effect of offset voltage on active filter performance. The input to the inverter shown in Fig.3 is a sine wave of amplitude 5 volt. If the slew rate of the op amp is 1V/µ sec, find the frequency at which the slew rate limiting occurs. **[6]**

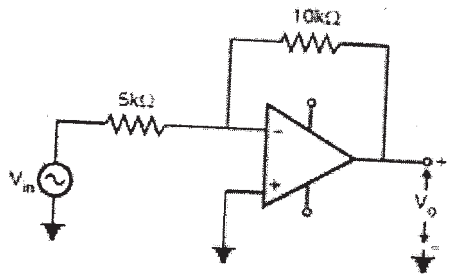

Figure 3

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