

Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 3

P4575

[5669]-110

T.E. (Electronics) (Semester - I)

NETWORK SYNTHESIS

(2012 Pattern)

Time : 2½ Hours]

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.

[Max. Marks : 70

Q1) a) Define all the four transfer functions for a two port network and list properties of transfer function. **[6]**

b) Synthesize the following function using Foster-II and Cauer-II form. **[6]**

$$Z(s) = \frac{s(s^2 + 9)}{(s^2 + 1)(s^2 + 16)}$$

c) Define zeros of transmission with examples and synthesize the Transfer function. **[8]**

$$Z_{21}(s) = \frac{2}{s^3 + 3s^2 + 4s + 2}$$

as a 1 Ω terminated two port LC ladder network.

OR

Q2) a) List properties of positive real function and test whether the following

function is positive real function. $Z(s) = \frac{s^2 + 2s + 25}{s^2 + 5s + 16}$ **[6]**

b) An admittance function is given as: **[6]**

$$y(s) = \frac{8s^2 + 10s}{s + 1}$$

Realize the network using Cauer-I and Cauer-II form.

c) What is constant Resistance Network? Design a bridge T network terminated in 1 Ω to give a voltage transfer ratio. **[8]**

$$G_{12}(s) = \frac{s^2 + 1}{s^2 + 2s + 1}$$

P.T.O.

Q3) a) Elaborate the properties of Butterworth Approximation? **[4]**

b) Realize the third order low pass Butterworth filter with transfer function as transfer impedance function terminated by 1 Ω ? **[8]**

c) Convert the low pass filter of Fig. 1, into a low pass filter with 500 Ω impedance level, and cut off frequency at $\omega_0 = 10^4$ rad/sec. **[4]**

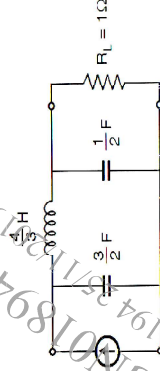


Figure 1

OR

Q4) a) Explain frequency and impedance scaling in filters? **[4]**

b) Synthesize the Chebyshev low pass filter to meet specifications: **[12]**

- i) Load resistance = 600 Ω
- ii) 0.5 dB ripple in pass band
- iii) Cut off frequency = 500 Krad/sec
- iv) At 1.5 Mrad/sec the magnitude must be 30dB down

Q5) a) Synthesize second order low pass filter to have a pole frequency of 2 kHz and a pole Q is 10. Also compute component sensitivities. Use Sallen and Key circuits based on positive feedback topology. **[10]**

b) What is cascade approach in active filter synthesis? Explain in brief and list the advantages of the approach? **[6]**

OR

Q6) a) Synthesize the following high pass filter using RC-CR transformation on Sallen and Key low pass filter: **[10]**

$$H_{HP}(s) = K \frac{s^2}{s^2 + s + 25}$$

b) Explain in detail coefficient matching technique to obtain element values in active filters. **[6]**

[5669]-110

- Q7) a) Find the transfer impedance function $\frac{V_o}{I_{in}}$ for the passive RLC circuit shown in Fig. 2? Compute the sensitivities of ω_p , Q_p and K with respect to the passive elements R, L and C? [6]

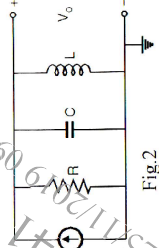


Fig.2

- b) Explain the concept of gain sensitivity? Also explain the various factors affecting the gain sensitivity? [6]
- c) Determine the common mode output voltage for the circuit in figure 3, if $R_2 = 100k\Omega$, $R_1 = 1k\Omega$, $CMRR = 80dB$ and $V_{in} = 2$ Volts. [6]

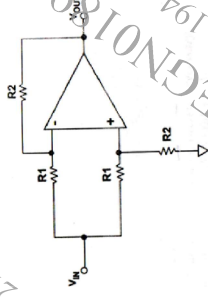


Figure 3

OR

- Q8) a) Draw frequency response of op amp and explain why frequency compensation is needed. [6]
- b) Prove the following sensitivity relationships? [4]
- $S_x^p = S_y^p S_x^y$
 - $S_x^{\frac{p}{1-2S_x^p}}$
- c) Discuss how the following parameters of op amp affect the filter performance? [8]
- Dynamic range
 - Slew rate
 - Input bias and offset currents
 - Common mode noise

