Total No. of Questions : 8]

SEAT No. :

P2397

[Total No. of Pages :4

[4758] - 558

T.E. (Electronics)

NETWORK SYNTHESIS

(2012 Pattern) (Semester - I) (End - Semester)

Time : 3 Hours] *[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) Determine the range of 'k' so that, polynomial $P(s) = s^3 + 14s^2 + 56s + k$ is Hurwitz. **[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) Realize the transfer function as an open circuited LC ladder network. **[8]**

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

OR

Q2) a) Explain the following basic removal operations? **[6]**

i) Removal of a pole at $s = \infty$ from the function.

ii) Removal of a pole at s = 0 from the function.

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.

P.T.O.

c) What is constant Resistance Network? Also Synthesize the following transfer function for a constant resistance lattice with 1 Ω termination. **[8]**

$$\frac{V_2}{V_1}=\frac{s^2-3s+2}{s^2+3s+2}$$

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

b) Find the transfer function of third order normalized low pass Butterworth filter and realize as a LC transfer impedance function terminated by 1 Ω? **[8]**

c) Convert the low pass filter of Fig 1, into a band stop filter with 500 Ω impedance level, bandwidth (B.W) = 20 Krad/sec. and pass band center at ω_0 = 50 Krad/sec. **[4]**

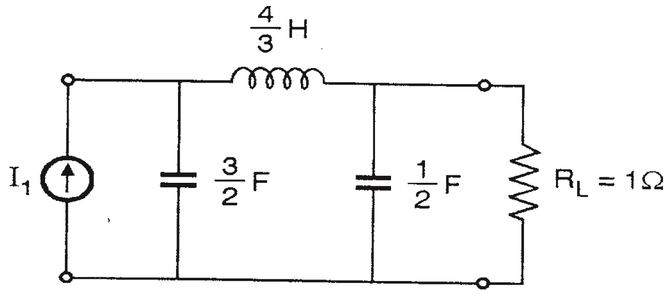

Figure 1

OR

Q4) a) Explain frequency and impedance normalization? **[5]**

b) Obtain a system function H(s) that exhibits the Chebyshev characteristics with not more than 1dB ripple in pass band and attenuation of 20dB at ω = 2rad/sec. **[6]**

c) Explain in detail the properties of Chebyshev polynomials used in filter approximation? **[5]**

Q5) a) Synthesize second order low pass filter to have a pole frequency of 25 kHz and a pole Q is 10? 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) Design third order low pass Butterworth filter with cut-off frequency $f_C = 2kHz$ (use positive feedback topology)? **[8]**

b) Design a second order Butterworth low pass filter having upper cut off frequency is 1.5kHz? Then using RC-CR transformation realize high pass filter with same frequency? **[8]**

Q7) a) Find the transfer impedance function $\frac{V_0}{I_{in}}$ 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]**

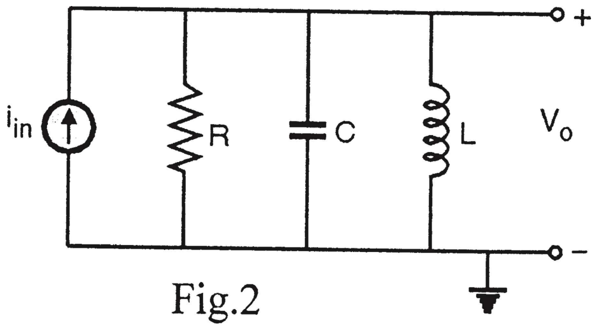

Fig.2

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

c) 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/sec, find the frequency at which the slew rate limiting occurs. **[6]**

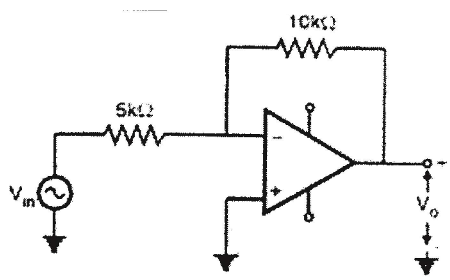

Figure 3

OR

Q8) a) Define sensitivity? Why it is needed? Find sensitivity of resonating frequency of series resonating circuit with respect to the components R, L and C? **[6]**

b) Prove the following sensitivity relationships? **[4]**

i) $S_{X}^{\sqrt{P}} = \frac{1}{2} S_{X}^{P}$

ii) $S_{\sqrt{x}}^{P} = 2 S_{X}^{P}$

c) Discuss how the following parameters of op amp affect the filter performance? **[8]**

i) Dynamic range

ii) Slew rate

iii) Input Offset voltage

iv) CMRR

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