Total No. of Questions : 8]

SEAT No. :

P2864

[Total No. of Pages : 4

[4958]-1053

T.E.(Electronics)

NETWORK SYNTHESIS

(2012 Course) (Semester-I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*
2) *Figures to the right indicate full marks.*
3) *Use of electronic pocket calculator is allowed.*
4) *Assume suitable data, if necessary.*

Q1) a) State the properties of positive real function and check the following function for positive real function. $Z(s)=\frac{(s+2)}{s^2+3s+2}$. **[6]**

b) Synthesize the following function into Foster- I and Cauer-I form.

$$Z(s)=\frac{s(s^2+9)}{(s^2+1)(s^2+16)}.$$ **[6]**

c) Define zeros of transmission and synthesize the following transfer function into a ladder network with 1ohm termination.

$$Z_{21}(s)=\frac{s^3}{s^3+3s^2+4s+2}$$ **[8]**

OR

Q2) a) When is the network said to be causal and stable. State and explain conditions for stability and causality of a network function. **[6]**

b) State the properties of RC driving point admittance function and realize the following function into Cauer- I form

$$Y(s)=\frac{8s^2+10s}{s+1}$$ **[6]**

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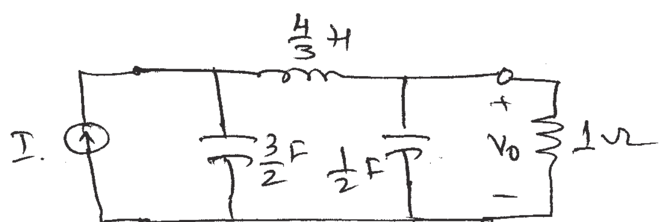
c) State the poperties of transfer function and realize the following voltage transfer function.

$$\frac{V_2}{V_1} = \frac{(s-1)(s^2-2s+2)}{(s+1)(s^2+2s+2)}$$ **[8]**

Q3) a) State the properties of Butterworth approximated filter. **[4]**

b) Realize the transfer function of a third order low pass Butterworth filter as a transfer impedance function. **[6]**

c) Consider the low pass filter of Figure① and convert it into a band pass filter with 1 Ω termination and bandwidth 6 ×10^4 rad/sec with band pass center frequency 4 ×10^4 rad/sec. **[6]**



Figure①

OR

Q4) a) Explain the need and concept of impedance and frequency scaling as used in filter designing. **[6]**

b) State the properties of Chebyshev approximation technique. **[4]**

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

Q5) a) Compare active and passive filters. **[4]**

b) Synthesize the second order low pass fiter to have a pole frequency of 10 kHz and a pole Q of 5 using saraga design of salten-key circuit. **[6]**

c) What is cascade approach in active filter synthesis. List the advantages of the cascade approach. **[6]**

OR

Q6) a) Explain the different biquad feedback topologies used in active filter designing and important considerations. **[6]**

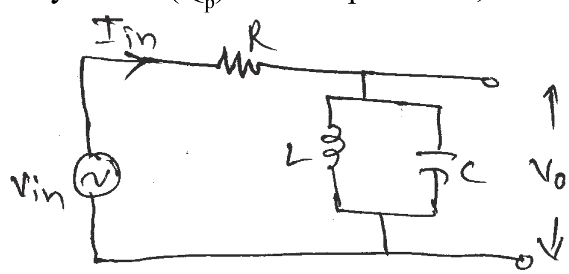
b) Design a first order active RC low pass Butterworth filter with cut off frequency 20kHz and pass band gain of 3.6. (use positive feedback topology) **[4]**

c) Synthesize the following high pass filter function using RC - CR transformation.

$$T_{HP}(s) = k.\frac{s^2}{s^2 + s + 16}$$ **[6]**

Q7) a) What is sensitivity. Write the properties of sensitivity function. **[4]**

b) For R-L-C circuit shown in Figure② find the transfer function $\frac{V_o}{I_{in}}$ and compute the sensitivities of gain constant K, resonant frequency (ω_p) and quality factor (Q_p) with respect to R,L and C. **[6]**



Figure②

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

i) Input offset voltage

ii) Slew rate

iii) Input offset current

iv) Dynamic range

OR

Q8) a) Prove the following sensitivity relationships. **[6]**

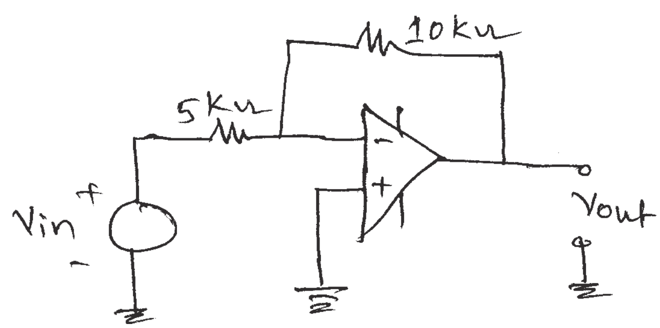
i) $S_x^{p_1+p_2} = \dfrac{p_1 S_x^{p_1} + p_2 S_x^{p_2}}{p_1 + p_2}$

ii) $S_x^{p^n} = n S_x^{p}$

iii) $S_{x^2}^{p} = \dfrac{1}{2} S_x^{p}$

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

c) The input to the inverting amplifier shown in Figure③ is a sine wave of amplitude 5 volts. If slew rate of op-amp is 1 V/μsec,find the frequency at which slew rate limiting occurs. **[6]**



Figure③

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