M.E. (ETC) 1st Semester Examination, 2011

Active Network Analysis and Synthesis (ETC-919)

Time: 3 hours | Full Marks: 70

Answer question number 6 and any three questions from the rest.

(1) (a) Write down the properties of Network Functions. Check whether the function $H(s) = s/(s^2 - 3s + 4)$ is stable or not?

(b) Write down the special properties of passive RC driving point impedance function. How such functions can be written in partial fraction expansion form? Synthesis the DP function $Z(s) = (s+2)/(s^2 + 4s + 3)$

(c) Sketch the approximate magnitude and phase plot of a transfer function: $H(s) = s^2 + as + b$. Derive the expression of pole frequency and pole-Q in term of a and b. How do the magnitude and phase vary with frequency?

(5+6+6)

(2) (a) Write down the characteristics of Butterworth approximation function. Derive the expression of loss function in term of normalized frequency.

(b) Find the loss at stopband edge frequency 45 rad/sec for a 3th order Butterworth filter that has a maximum loss 0.5 dB at the pass band edge frequency of 9 rad/sec Draw the delay characteristics of the function.

(c) For Butterworth approximation function, prove that its 2n numbers of roots are located on the unit circle and are equally spaced at π/n radian intervals. Hence find out the approximate function for the 3rd order normalized Butterworth lowpass filter.

(6+5+6)

(3) (a) Draw the positive feedback biquad topology. Analyzing the feedback and feedforward transfer functions, find out the overall transfer function. Explain the special properties for such topology.

(b) Find out the transfer function of the active circuit given in Figure-1. Obtain the expressions for filter parameters using coefficient-matching technique.

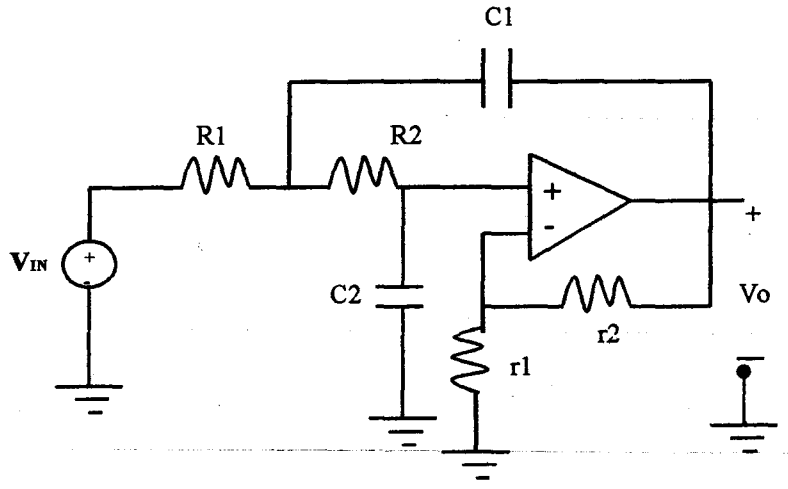

Figure-1

(c) Find out the sensitivity terms of the different parameters of the filter function.

(6+6+5)

(4) (a) How do you realized a lowpass filter function $T(s) = -d/ (s^2 + as + b)$ using three amplifier?

(b) How do you realize a general biquadratic function using an addition amplifier to the earlier circuit?

(9+8)

(5) (a) What do you understand by low sensitivity of passive network?

(b) Write down the different steps for synthesis the network function of a singly terminated ladder network

(c) Explain Zero shifting technique in this context.

(3+8+6)

(6) Write short notes (any two) (9.5 x 2)

(a) Delay Equalizer
(b) GYRATOR
(c) Switched capacitor network
(d) FDNR