UNIVERSITY OF PUNE

[4363]-183

T. E.(Electronics & Telecomm-Semester-I) Examination - 2013

NETWORK SYNTHESIS & FILTER DESIGN(304183)

(2008 Pattern)

[Total No. of Questions :] **[Total No. of Printed Pages :4]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **any three** from each Section.*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of electronic pocket calculator is allowed.

(6) Assume suitable data, if necessary.

SECTION –I

Q.1 a)Define the terms causality & realizability state and explain the condition for stability of a network [6]

b) What is positive real function? State the necessary and sufficient condition for a function to be positive real. [6]

c) Test whether following polynomial are Hurwitz [6]

i) $S^4 + S^3 + 4S^2 + 2S + 3$

ii) $S^4 + S^3 + 5S^2 + 3S + 4$

OR

Q.2 a) Explain the following removal operations [6]

i) Removal of pole at s= ∞ from given function

ii) Removal of pole at s= o from given function

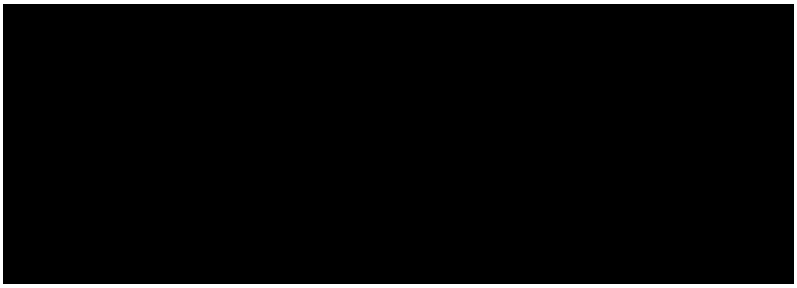
b) Test whether the following function are positive real [6]

i) $F(s) = \frac{S^2\ 2s+25}{s^2+5s+16}$

ii) $F(s) = \frac{3S^2+5}{s(s^2+1)}$

c) A network shown in **figure1** has driving point impedance Z(s) with the poles and zeros located at the following places. [6]

Poles at - $\frac{1}{2} \pm j \frac{\sqrt{3}}{2}$ and zero at -1. If Z(0) = 1 Ω Determine the values of component R, L and C.



Q. 3 a) State properties of L-C driving point impedance of admittance function[4]

b) Realize the following R-C driving point impedance function in [6]

i) Foster I form ii) Caner I from

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

c) Identify the following R-C network function and synthesize the same. [6]

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

OR

Q.4 a) Identify the following network function with proper justification [6]

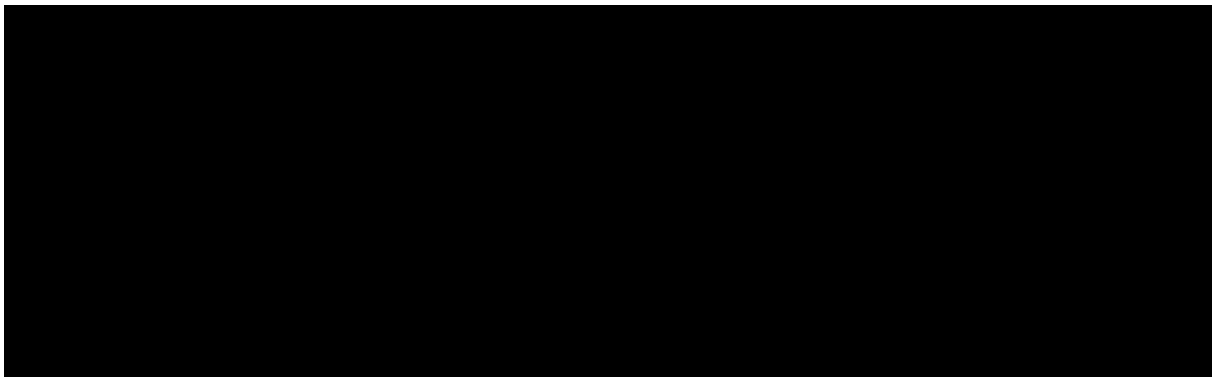
$F(s) = \frac{2(s+2)(s+4)}{(s+3)(s+6)}$ Synthesize the same using foster II form.

b) State properties of RL driving point impedance function. Draw and explain reactance curves for R-L network [4]

c) Synthesize the following L-C function using Cauer –I form [6]

$$Z(s) = \frac{S^2 + 10s^3 + 12s}{s^4 + 4S^2 + 3}$$

Q.5 a) What is meant by zeros of transmission? Determine ZOTs of the network shown in **figure 2** [4]

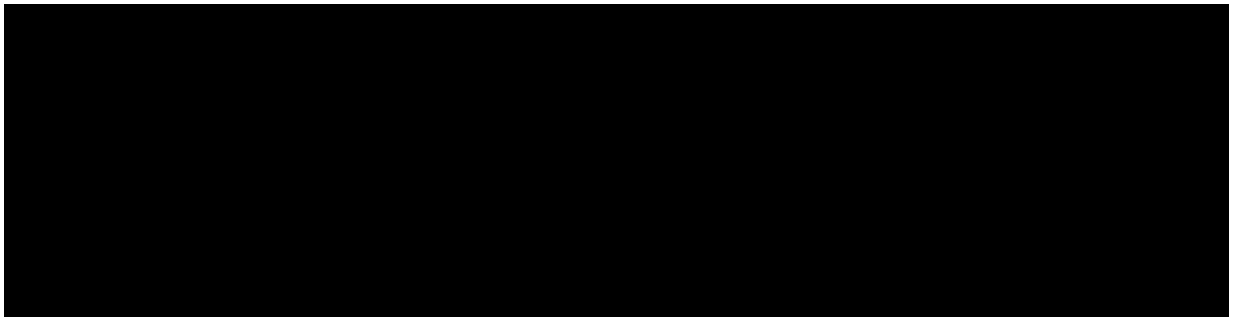


b) Synthesize the voltage ratio $\frac{V_2}{V_1} = \frac{S^2+1}{S^2+2S+1}$ as a constant resistance bridged T network terminated in a 1 Ω resistor [6]

c) State properties of transfer function. Obtain transfer function of two part network in terms of z parameters [6]

OR

Q.6 a) State reside condition. Determine whether the reside condition holds for following network shown in **figure 3** [4]



b) Synthesize $Z_{21}(s) = \frac{2}{S^3+3S^2+4s+2}$ into L-C ladder network with 1 Ω termination. [6]

c) Realize the following voltage ratio transfer function using a constant resistance lattice network with 1 Ω termination. [6]

$$\frac{V_2}{V_1} = \frac{4}{s+6}$$

SECTION – II

Q.7 a) State properties of a Buffer worth filter obtain transfer function and realize third order normalized LPF Butterworth filter convert if into LPF with out-off frequency $W_c = 10^4$ rad/see and load impedance of 500 Ω [12]

b) Write short note on frequency Transformation [6]

OR

Q.8 a) Synthesize a chebysher LPF to meet following specifications [18]

i) Load resistance 600 Ω

ii) $\frac{1}{2}$ db ripple with pass bond

iii) Cut-off frequently 5 x 10^5 rad/see

iv)At 1.5 x 10^6 rad/ see magnitude must be down 30 db.

Q.9 a) Explain with suitable example the coefficient matching technique for obtaining element values. [8]

b) Explain the position feedback topology used in active filter design and obtain it's transfer function. [8]

OR

Q.10 a) Synthesize the following HPF function using RC-CR transformation on sullen key LPR [8]

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

b) Write short note on [8]

i) FDNR ii) Gyrator

Q.11 a) What is multi element deviation ? Define variability and device expression for per unit change in parameter p due to simultaneous variation in all element [8]

b) For the network shown in **figure 4** determine the transfer function Vo/I_{in} and compute sensitivity of Qp, Wp and k with respect to the passive element R, L, C. (8) [8]

OR

Q.12 a) Discuss the effect of parameter of OP-AMP on the performance of active filters. [8]

b) Explain the concept of gain sensitivity. Explain the various factors affecting gain sensitivity [8]