KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING

EEE 307: NETWORK ANALYSIS AND SYNTHESIS

DATE: FRIDAY, 13TH APRIL 2012 **TIME: 8.00 A.M. – 10.00 A.M.**

INSTRUCTIONS

(i) This paper contains **FIVE (5)** questions.

(ii) Answer all question in Section **A** and any **TWO** questions from each Sections **B**.

SECTION A

1a) Define the following terms as used in graph theory

i. Branch

ii. Node

iii. Tieset

iv. Cutest

v. Incidence matrix

vi. **b) i)** Draw the oriented graph of networks shown in **figure 1**

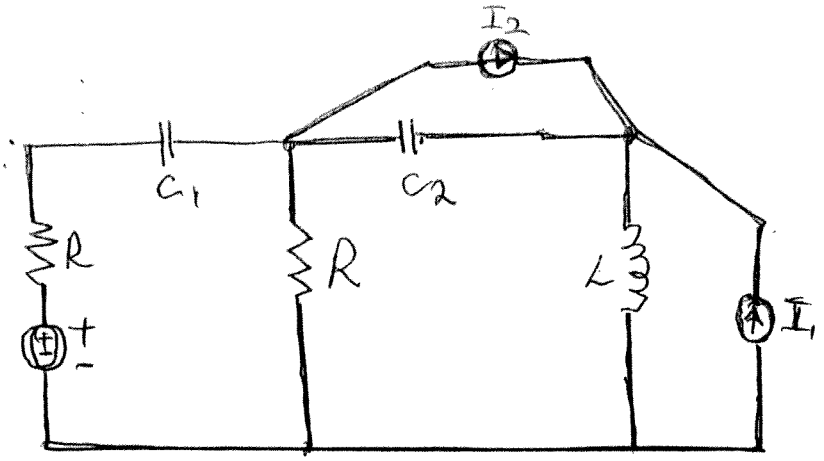

Figure 1.

ii) Draw all possible trees and co-trees of oriented graph above (bi) (4mks)

c)i) For the network shown in **figure 2**, determine the Z parameter (4mks)

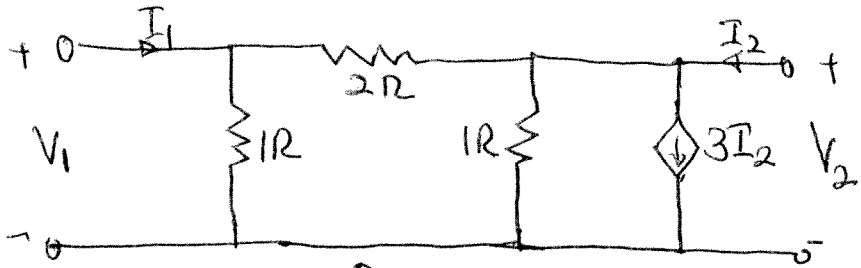

figure 2

ii) What is the necessity for an isolating transformer when two-port networks are connected in series or parallel (2mks).

d) i) Define Hurwitz Polynomial (2mks)

ii) An impedance function is given by

$$Z = \frac{(s+1)(s+4))}{5(s+2)(s+5))}$$

Find the RC representation of Foster –I (4mks)

e) Design a constant high pass filter (both π and T networks) having a cut-off frequency of 2KHZ with load resistance of 200Ω (6mks)

SECTION B

2a) Write the loop matrix equation for the network shown in **figure 3** above. Selected three to be represent by branch with C1 and L (15mks)

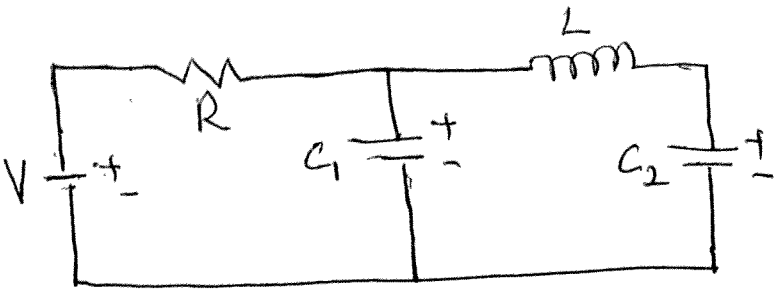

figure 3.

b)i) Explain the concept of duality (2mks)

ii) Draw the Dual of the network shown below in the **figure 4** (3mks)

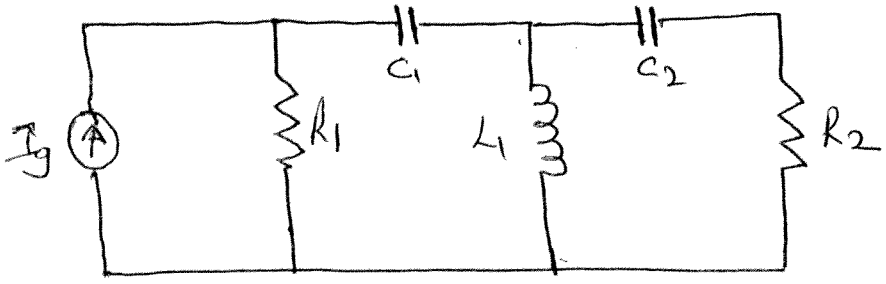

figure 4.

3a) For the circuit network shown in **figures 5** ,obtain the Y parameters (8mks)

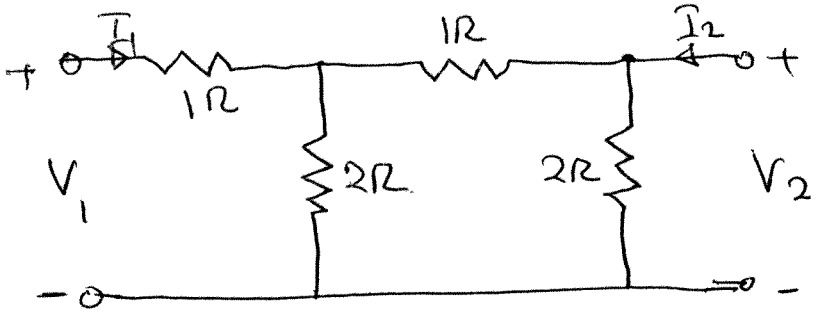

figure 5.

ii) The >- parameters of two-port network are

$Z_{11} = 0.5S, Z_{22} = 0.2S, Z1_2 = Z_{21} = 0.25S$

Computes transmission parameter (6mks)

b)i) For the network shown in **figure 6**, calculate the h- parameters. (6mks)

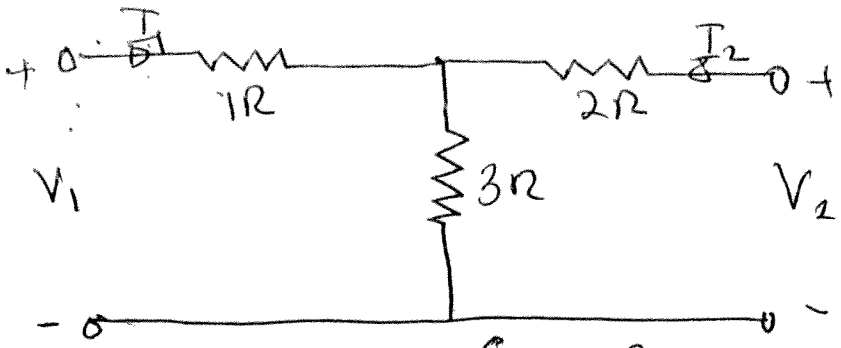

figure 6.

4a) An admittance function is give as

$$Y(s)=\frac{4s^2+6s}{s+1}$$

Realize the network using Cauer's first and second form (10mks)

b) i) An impedance function has the pole-zero pattern as shown in **figure 7**. If Z(-2) = 3, synthesize the impedance in Foster second form (6mks).

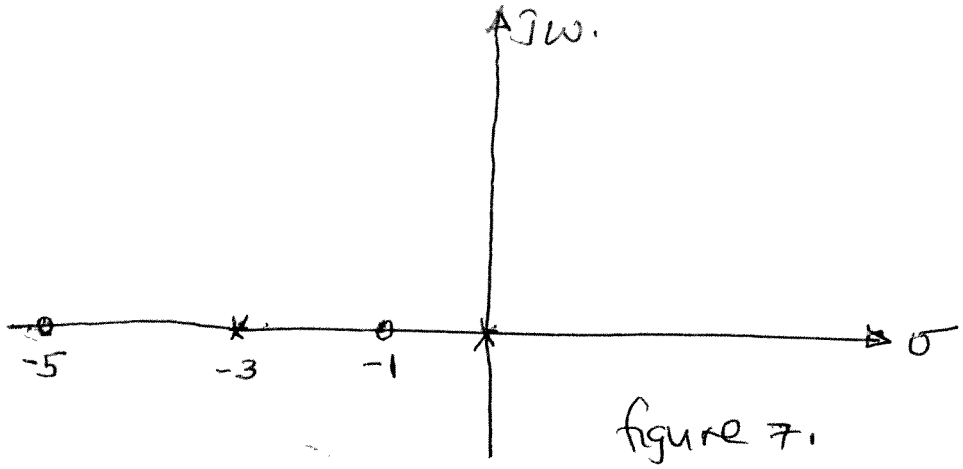

figure 7.

ii) Find the range of values of a so that

$P(s)=s^4+s^3+9s^2+2s+3)$ is Hurwitz

5a) i) State any four advantages of active filters over passive filter (2mks)

ii) Design m-derived T and π networks low pass filter with nominal characteristic impedance Ro= 900Ω, cut off frequency f_c= 0.9 KHZ and infinite attenuation (or resultant) frequency $f\infty = 1KHZ38g.$ (8mks)

bi) State and prove the Maximum Power Transfer Theorem of an AC circuit (10mks).