Total number of printed pages – 7 **B. Tech**

CPES 5201

Fourth Semester Examination – 2008

NETWORK THEORY

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (i) Give at least three properties of parallel resonance circuit.

   (ii) What are half power frequency points ? Explain.

   (iii) What is the difference between an ideal filter and a practical filter ?

   (iv) Give the properties of a filter.

   (v) What are even and odd functions ? Give examples.

   (vi) What is the nature of the impulse response of an RL circuit ?

   (vii) For the band pass filter what is the normal characteristic impedance ?

   (viii) What is the value of ramp function at t=0 ?

   (ix) What is the reciprocal of a driving point function ?

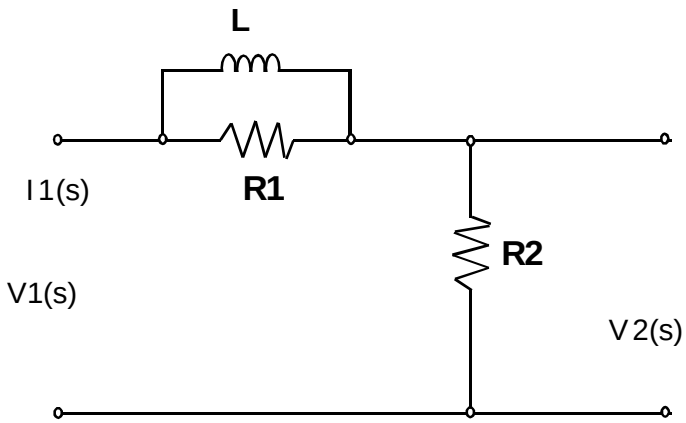
   (x) State final value theorem.

2. (a) Define the following network functions with reference to a 2-port network : 4

(i) driving point impedance

(ii) transfer impedance.

(b) For the given network, find the transfer functions $G_{21}(s)$, $Z_{21}(s)$ and driving point impedance $Z_{11}(s)$. 6



3. (a) What do you understand by : 4

(i) zeros of a function, and

(ii) zeros of transmission.

(b) What information do poles and zeros provide in respect of a network to which they relate ? Draw pole and zeros for : 6

$$\frac{s^2+3s+2}{s^2+7s+12}$$

And evaluate v(t) either analytically or by making use of pole-zero diagram.

4. (a) Derive the expression of Z-parameters in terms of other parameters. 5

(b) Calculate the Z-parameters, if the values of other parameters are given below : 5

(i) A = 2, B = –1, C = 3 and D = – 2

(ii) $h_{11} = 1,\ h_{12} = -2,\ h_{21} = -3,\ h_{22} = 2$

(iii) $Y_{11}=1/3,\ Y_{12} = 2/3, Y_{21} = -1/3, Y_{22} = 1/6$

5. (a) Draw and discuss the profile of circuit parameters with frequency in a parallel resonant circuit. 3

(b) Derive the relationship between Bandwitdth, Detuning Factor, Quality factor, Impedance and selectivity of a parallel resonant circuit. 3

(c) A current source, having an internal resistance of 10 KΩ feeds a tank circuit containing a coil (having L_C = 200 mH, $R_C = 10\,\Omega$) in parallel to a capacitor of 100 μF. Find the frequency of resonance and Q factor. 4

6. (a) Discuss the basic concept of working of low pass and high pass filters using reactive elements. 3

(b) Analyze a prototype High Pass Filter. 3

(c) Design the T and π section of a prototype High Pass Filterhaving cut-off frequency of 20 kHz and design impedance of 450 Ωs. Also find its characteristics impedance and phase constant at 25 kHz as well as determine the attenuation at 4 kHz. 4

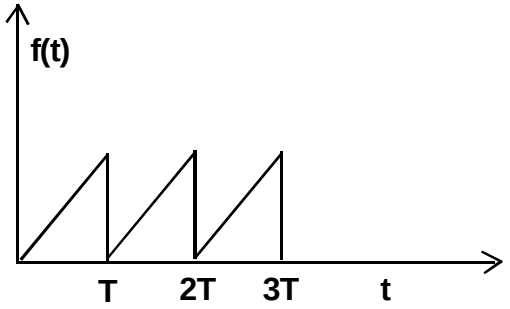
7. (a) Represents the given impedance function using Cauer-I form. 5

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

(b) Synthesize the Foster-II form of given admittance function 5

$$Y(s) = \frac{(s^2+1)(s^2+5)}{s(s^2+3)}$$

8. (a) Determine the effective value of f(t) of the waveform shown in the figure below. 5



(b) Obtain the Fourier coefficients for the function given by 5

$f(t) = (t + \pi)$ when $-\pi < t < \pi$; $f(x+2\pi) = f(x)$

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