Code No: RR320201

Set No. 1

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
ANALYSIS OF LINEAR SYSTEMS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between static and dynamic systems with suitable examples
   (b) Develop the force. Voltage analogous network for the system shown in figure 1b and hence develop the loop equations.

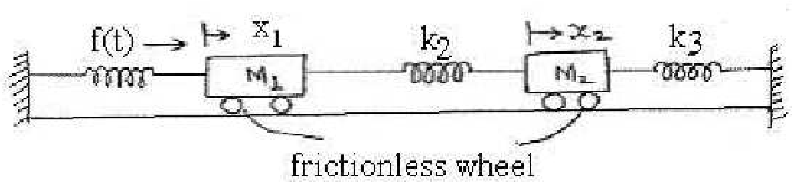

Figure 1b

   (c) Obtain the state equations of the mechanical system shown in figure 1c[4+6+6]

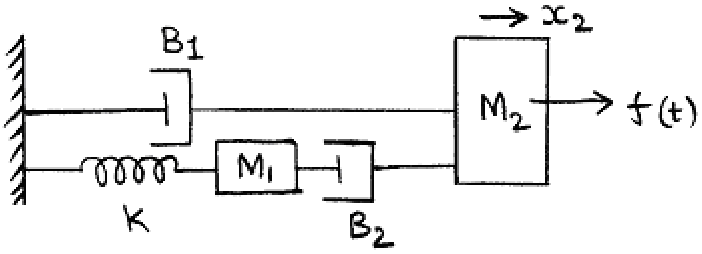

Figure 1c

2. (a) Explain what is meant by state variable and Mention the advantages of state space approach.
   (b) Develop the state variable model equations of the following network using equivalent source approach. figure 2
   (c) Obtain the state-space representation of the series R-L-C circuit excited by e(t) and the response is i(t). [4+6+6]

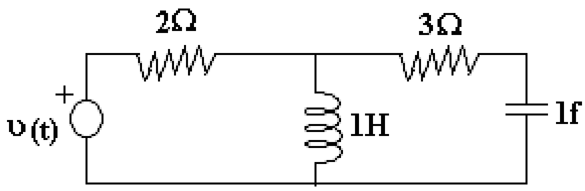

Figure 2

3. (a) Distinguish between unit impulse function and unit doublet function and hence develop the Laplace transform of these functions.
   (b) Find the expressions for the current i(t) in a series R-L-C circuit, with R=5Ω, L=1H, C=$\frac{1}{4}$ F, when it is fed by a ramp voltage of 12 r(t-2). [3+3+10]

4. (a) Find the Laplace transform of a periodic waveform. figure 4a

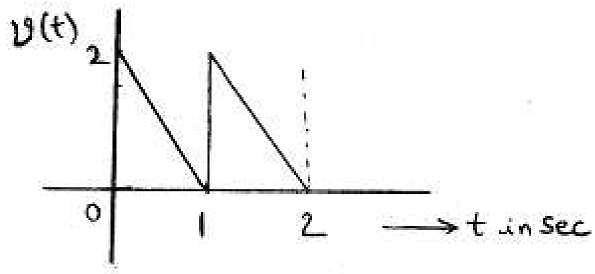

Figure 4a

(b) Find the inverse Laplace transforms f(t) using convolution integral for the following function $F(s) = \frac{3s}{(s^2+1)(s^2+4)}$ [8+8]

5. (a) Obtain the trigonometric fourier series expansion of the periodic triangular waveform shown in figure 5.

(b) Obtain the exponential form of fourier series of the unit impulse function shown in figure. 5. [8+8]

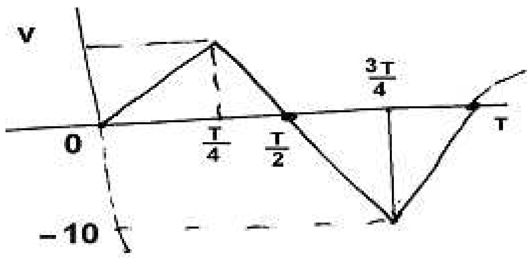

Figure 5

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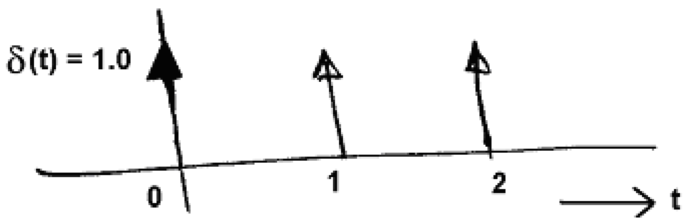

Figure 5

6. (a) State and explain the properties of Fourier Transform.

(b) Define Signum function and hence develop the expression for Fourier transform of it. [8+8]

7. (a) Test whether the following polynomial is Hurwitz or not? H(s)=$s^5 + s^4 + 6s^3 + 4s^2 + 8s + 3$

(b) Check whether the following functions are positive real or not?

i. $Z(s) = (s + 1)/(s^2 + 2)$

ii. Z(s) $= (2s^2 + s + 2)/(s^2 + s + 1)$ [6+5+5]

8. (a) Explain how the removal of pole at infinity of an impedance Z(s) can realize an element in the network.

(b) Realize the network with the following driving point impedance function using first Foster form.
$Z(s) = (s+2) / s(2s+5)$ [8+8]

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Code No: RR320201 **Set No. 2**

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
ANALYSIS OF LINEAR SYSTEMS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. For the following mechanical rotational system, shown in figure1.
   (a) Draw the mechanical network and write the equilibrium equations.
   (b) Develop electric analogous circuits and write the corresponding equations. [8+8]

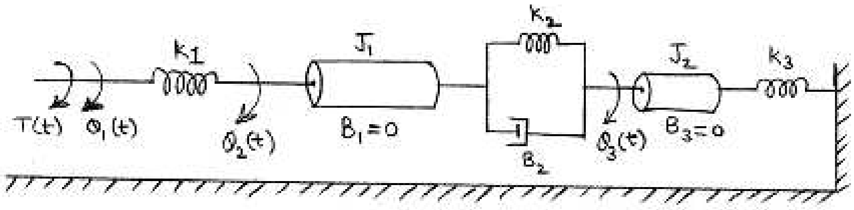

Figure 1

2. (a) Explain what is meant by state variable and Mention the advantages of state space approach.
   (b) Develop the state variable model equations of the following network using equivalent source approach. figure 2
   (c) Obtain the state-space representation of the series R-L-C circuit excited by e(t) and the response is i(t). [4+6+6]

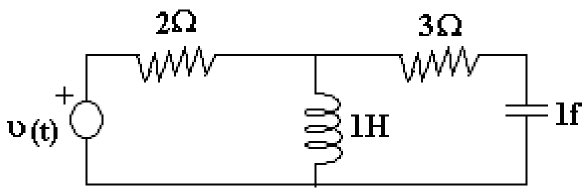

Figure 2

3. (a) Define the following functions and obtain the Laplace transform of these:
      i. Shifted step function
      ii. Pulse
      iii. Shifted ramp function
      iv. Impulse function [4×2=8]
   (b) Develop the Laplace transforms of the function to be expressed for the following waveforms. figure 3 [8]

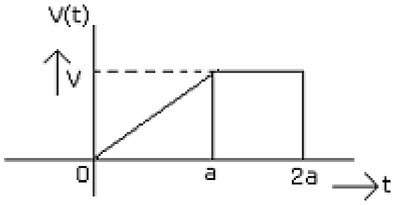

Figure 3

4. (a) Find the Laplace transform of a periodic waveform. figure 4a

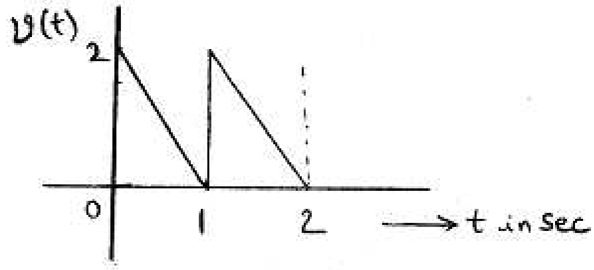

Figure 4a

(b) Find the inverse Laplace transforms f(t) using convolution integral for the following function $F(s) = \frac{3s}{(s^2+1)(s^2+4)}$ [8+8]

5. A full-wave rectified output voltage, with an input voltage of 230 V, 50Hz, is applied to a series R-L circuit with R=2Ω, L = 3.18mH. Find [4×4=16]

(a) Fourier coefficients

(b) RMS value of voltage

(c) RMS value of current.

(d) Average power consumed in the circuit and power factor of the load.

6. (a) Find the Fourier transform of the signal
F(t)=1.0 for $-T_1 < t < +T_1$
= 0 elsewhere

(b) If f(t) = Ke^{-at} u(t). Find the Fourier transform of the function F ($j\omega$). Compare this with Laplace transform of the given function.

(c) Find the function V(t) corresponding to the function V(f) shown in figure 6 using inverse Fourier transform. [6+6+4]

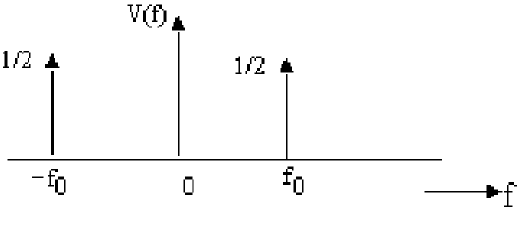

Figure 6

7. (a) Check whether the following polynomial is Hurwitz or not?
$P(s) = 2s^4 + 5s^3 + 6s^2 + 2s + 1$

(b) " All driving point immittances of passive networks are positive real functions". Substantiate the statement.

(c) State the analytical tests to be considered for a polynomial to check whether it is a positive real function or not? [7+5+4]

8. The driving point impedance of a one port L- C network is given by
$Z(s) = \frac{3(s^2+1)(s^2+16)}{s(s^2+9)}$ Obtain the first and second Foster form of equivalent networks. [8+8]

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Code No: RR320201

Set No. 3

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
ANALYSIS OF LINEAR SYSTEMS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between continuous and discrete time systems with suitable examples.
   (b) Explain the D'Alenbent's Principle with the help of a suitable mechanical translational systems.
   (c) For the mechanical system shown in figure 1c, draw the mechanical equivalent network. Hence develop the force-voltage analogous electric circuit and write the equations. [4+5+7]

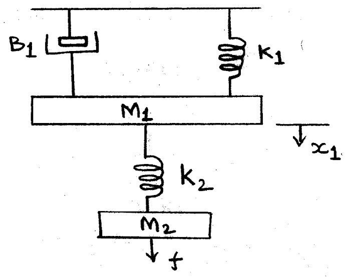

Figure 1c

2. (a) Write matrix state equation for the circuit shown in figure.2a

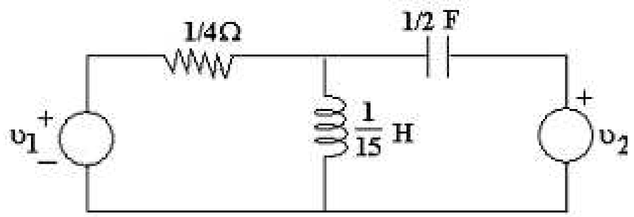

Figure 2a

   (b) Find the complete state response of the system
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t) \text{ and } \begin{bmatrix} x_1 & (0) \\ x_2 & (0) \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$ [8+8]

3. (a) Find the voltage $V_c(t)$ for the circuit shown in figure 3a with the input given in Figure. 3a

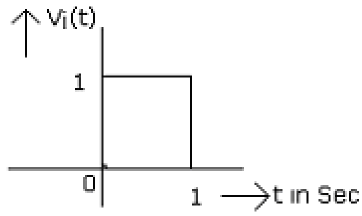

Figure 3a

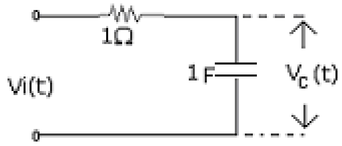

Figure 3a

(b) State and explain scaling theorem.

(c) The Laplace transform equation for the current is $I(s) = \frac{2}{(s)(s+2)}$

i. Find the current I(t).

ii. Using scaling theorem, find the current i_1(t) if $I_1(s) = \frac{2}{(3s)(3s+2)}$ [7+4+2+3]

4. A train of voltage pulses, with a, magnitude of 8v, with a periodic time of 4 seconds, with the first pulse starting from 2 seconds and duration of 2 seconds, is applied to a series R-L-C circuit consisting of R=4Ω, L-1H. C= $\frac{1}{5}$F Determine

   (a) Laplace transform of the periodic voltage waveform

   (b) Expression for i(t) using Laplace transform approach [8+8]

5. A full-wave rectified output voltage, with an input voltage of 230 V, 50Hz, is applied to a series R-L circuit with R=2Ω, L = 3.18mH. Find [4×4=16]

   (a) Fourier coefficients

   (b) RMS value of voltage

   (c) RMS value of current.

   (d) Average power consumed in the circuit and power factor of the load.

6. (a) State and explain the properties of Fourier Transform.

   (b) Define Signum function and hence develop the expression for Fourier transform of it. [8+8]

7. (a) Test whether the following polynomial is Hurwitz or not?
   H(s)=$s^5 + s^4 + 6s^3 + 4s^2 + 8s + 3$

   (b) Check whether the following functions are positive real or not?

   i. $Z(s) = (s + 1)/(s^2 + 2)$

   ii. Z(s) = $(2s^2 + s + 2)/(s^2 + s + 1)$ [6+5+5]

8. The driving point impedance of a one port L- C network is given by
   Z(s) =$\frac{3(s^2+1)(s^2+16)}{s(s^2+9)}$ Obtain the first and second Foster form of equivalent networks. [8+8]

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Code No: RR320201

Set No. 4

III B.Tech II Semester Supplimentary Examinations, Apr/May 2008
ANALYSIS OF LINEAR SYSTEMS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. For the mechanical system shown in figure 1.
   (a) Draw the mechanical network
   (b) Develop the electric analogous circuits and the corresponding state-variable models. [4+6+6]

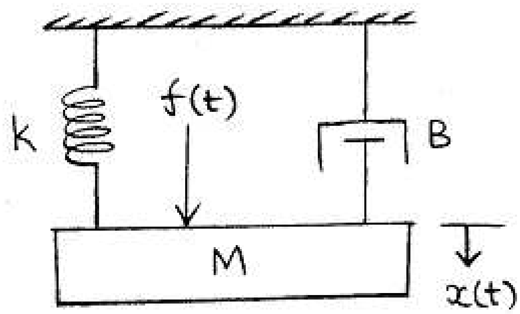

Figure 1

2. (a) Develop the state equations of the following network: figure 2
   (b) Derive the expression to find the solution of the state equations $\dot{X}(t) = A\, x(t) + B\, u(t)$ with $x(0) = x_0$ using state Transition Matrix approach. [8+8]

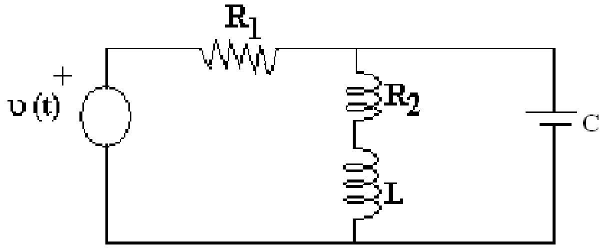

Figure 2

3. (a) Define the following functions and obtain the Laplace transform of these:
      i. Shifted step function
      ii. Pulse
      iii. Shifted ramp function
      iv. Impulse function [4×2=8]
   (b) Develop the Laplace transforms of the function to be expressed for the following waveforms. figure 3 [8]

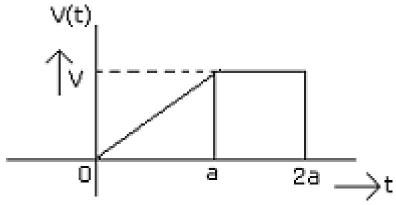

Figure 3

4. (a) Find the Laplace Transform of the Periodic function shown in figure 4
   (b) If h(t)= 2e^{-3t} u(t) and x(t)= u(t)-δ(t). Find y(t)=h(t)*x(t) using convolution in the time domain. [8+8]

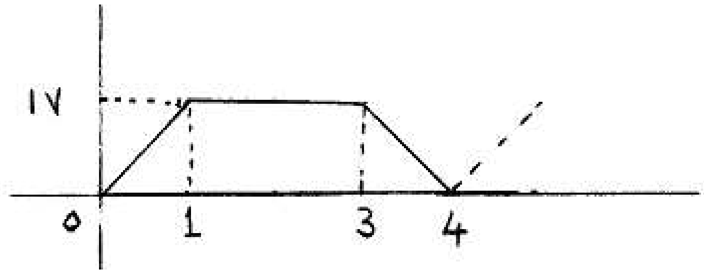

Figure 4

5. (a) Derive the expression for Average power of a complex wave which is expressed in terms of fourier series.
   (b) The current waveform shown in figure 5 is applied to a circuit containing 0.01 micro-farads in parallel with 1 kilo ohm with a range of frequency 13 to 14 kHz. Find the average power delivered to the resistor. [6+10]

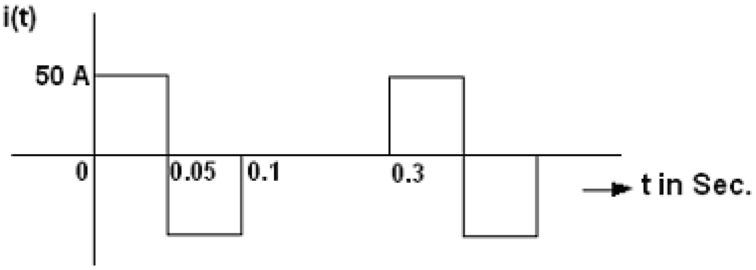

Figure 5

6. (a) Find the Fourier transform of the signal
   F(t)=1.0 for $-T_1 < t < +T_1$
   = 0 elsewhere
   (b) If f(t) = Ke^{-at} u(t). Find the Fourier transform of the function F ($j\omega$). Compare this with Laplace transform of the given function.
   (c) Find the function V(t) corresponding to the function V(f) shown in figure 6 using inverse Fourier transform. [6+6+4]

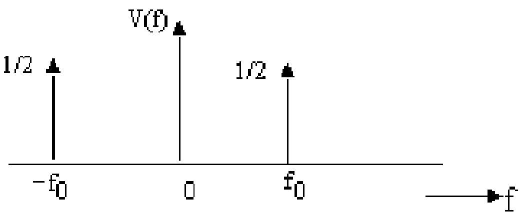

Figure 6

7. (a) State and explain the properties of Hurwitz polynomial.

   (b) Check whether the following polynomial is Hurwitz or not?
   $H(s) = s^4 + s^3 + 5s^2 + 3s + 4$ [8+8]

8. (a) Explain how the removal of pole at infinity of an impedance Z(s) can realize an element in the network.

   (b) Realize the network with the following driving point impedance function using first Foster form.
   Z(s) = (s+2) / s(2s+5) [8+8]

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