Code No: RR320201 **Set No. 1**

III B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
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) For the figure 1 shown below , draw the mechanical system. And hence write the equilibrium equations
   (b) Draw the electrical analogous circuits for the mechanical system shown in figure1 [8+8]

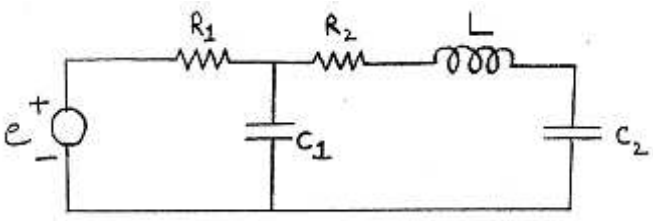

Figure 1

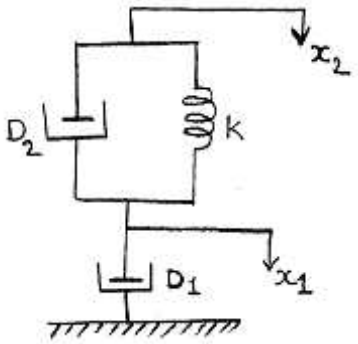

Figure 1

2. Consider a system described by $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = u(t)$ with initial conditions $y(0) = \frac{dy(0)}{dt} = 1$. Develop the state equations and hence obtains the complete state response of the system. [8+8]

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 [4x2=8]
   (b) Develop the Laplace transforms of the function to be expressed for the following waveforms. figure 3 [8]

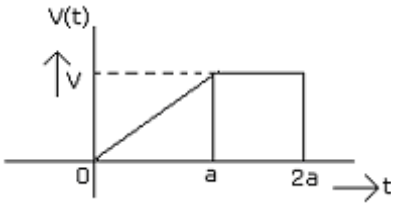

Figure 3

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]

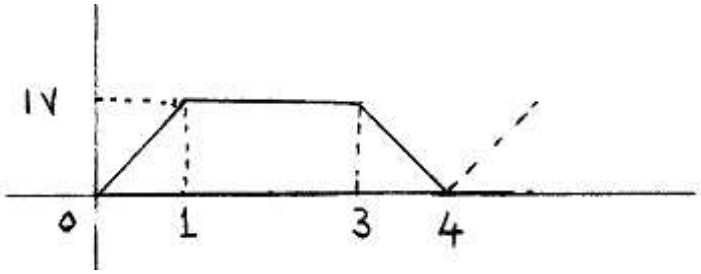

Figure 4

5. A 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 [4x4=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 waveform shown in figure6.
   (b) Find the Fourier transform of double sided exponential $f(t) = Ae^{-a|t|}$ for$-\alpha < t < \alpha$ [8+8]

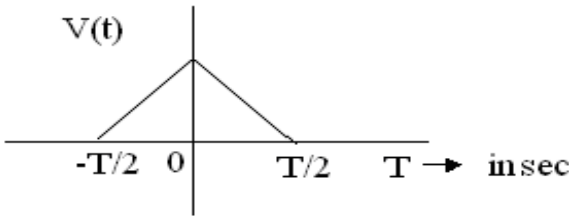

Figure 6

7. (a) Check whether the following polynomial is Hurwitz or not?
   $H(s) = s^4 + 2s^2 + 3s + 6$
   (b) Find the range of values of 'a' so that $H(s) = s^4 + s^3 + as^2 + s + 3$ is Hurwitz. [7+9]

8. (a) Synthesize L-C Admittance function into first Cauer form network
   $Z(s) = (2s^4 + 20s^2 + 18)/s(s^2 + 4)$

(b) Synthesize the admittance function into second Cauer form network $Z(s) = (s^2 + 2)(s^2 + 4)/s(s^2 + 3)(s^2 + 5)$ [8+8]

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

III B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
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 linear and non-linear systems with suitable examples.
   (b) Explain the D'Alembert's Principle with the help of a mechanical rotational system.
   (c) For the mechanical system shown in figure 1, draw the mechanical equivalent network. Hence develop the force-current analogous electric circuit and write the equations. [4+5+7]

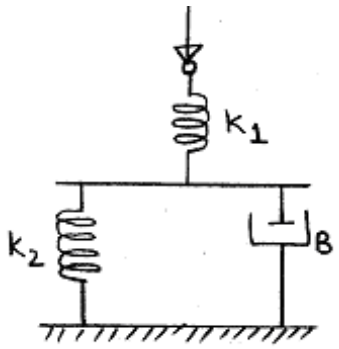

Figure 1

2. (a) Write the state equations for the network shown in figure 2a

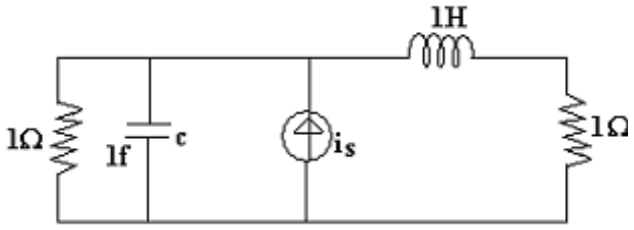

Figure 2a

   (b) Solve the state equations $\begin{bmatrix} \frac{di}{dt} \\ \frac{dv}{dt} \end{bmatrix} = \begin{bmatrix} -2 & 0 \\ 0 & -4 \end{bmatrix} \begin{bmatrix} i \\ v \end{bmatrix} + \begin{bmatrix} e^{-t} \\ e^{-2t} \end{bmatrix}$
   with initial conditions $\begin{bmatrix} io \\ vo \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ [8+8]

3. (a) In the circuit shown in figure 3, determine the voltage across AB using Lapalace transform approach.
   (b) Find the Laplace transform of the following waveforms figure 3 [8+8]

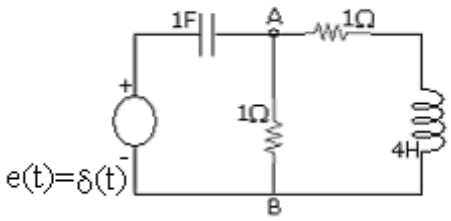

Figure 3

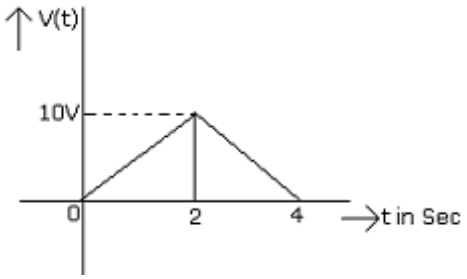

Figure 3

4. (a) State and Explain the graphical interpretation of convolution theorem.
   (b) Determine the convolution integral for the functions (e^{-2t}) (sin2t)
   (c) Given that impulse response of a systems is $\frac{s}{s+1}$, find the response for an input of e^{-2t}. [4+6+6]

5. (a) Obtain the fourier coefficients of the following waveform shown in the figure5a

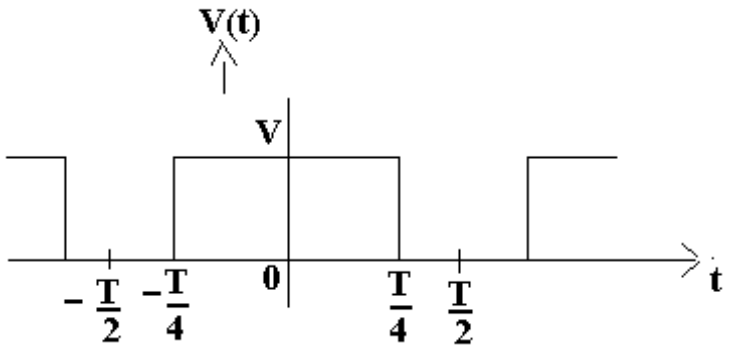

Figure 5a

   (b) Find the complex fourier coefficient f or the periodic half wave rectified sine wave shown in figure5b. [8+8]

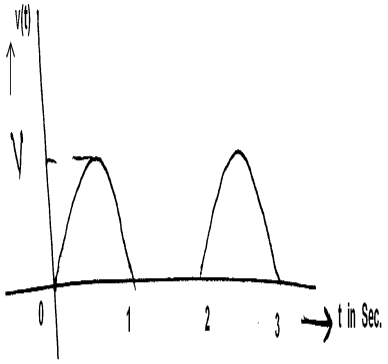

Figure 5b

6. (a) Find the Fourier transform of the function F(t)= u(t+1) ? 2u(t) + u(t-1)
   (b) Find the inverse Fourier transform of the following function $F(\omega) = F_1(\omega) - F_2(\omega) where F_1(\omega) = 2\Pi\delta(\omega)$ *and* $F_2(\omega) = (2Sin\omega)/\omega$ [8+8]

7. (a) Check whether the following polynomial is Hurwitz or not?
   $H(s) = s^4 + 2s^2 + 3s + 6$
   (b) Find the range of values of 'a' so that $H(s) = s^4 + s^3 + as^2 + s + 3$ is Hurwitz. [7+9]

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. 3**

III B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
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) For the givens mechanical system draw the mechanical network. Develop the electrical analogous circuits figure 1a [3+3+3]

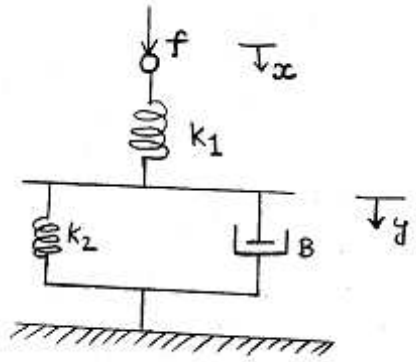

Figure 1a

(b) For the systems shown develop the force voltage analogues circuit. Hence develop the state equations. figure 1b [4+3]

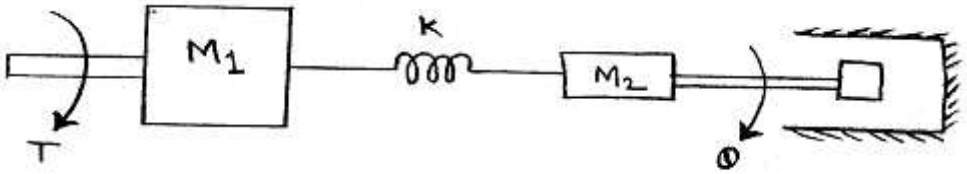

Figure 1b

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]

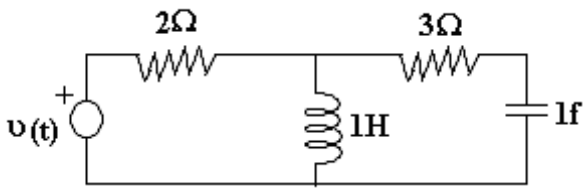

Figure 2

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 [4x2=8]

(b) Develop the Laplace transforms of the function to be expressed for the following waveforms. figure 3 [8]

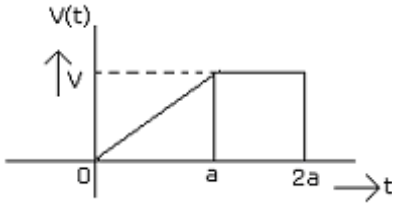

Figure 3

4. (a) Find the inverse Laplace transform by using convolution for the following functions

i. $h(t) = e^{-t}$, $f(t) = e^{-2t}$
ii. $F_1(s) = \frac{1}{(s+3)}, F_2(s) = \frac{1}{(s+2)}$

(b) The waveform gives below consists of a train of impulses of magnitude which decays exponentially. Find the Laplace transform of the function.figure 4 [4+4+8]

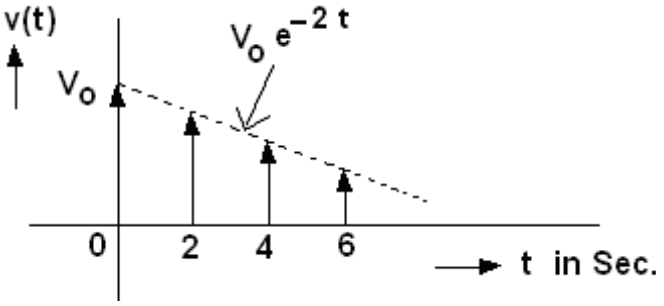

Figure 4

5. (a) Determine the Fourier series expansion for the triangular waveforms shown in figure 5a

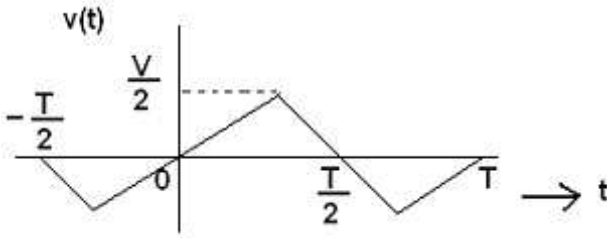

Figure 5a

(b) Determine the exponential form of fourier series for the following function: figure 5 [8+8]

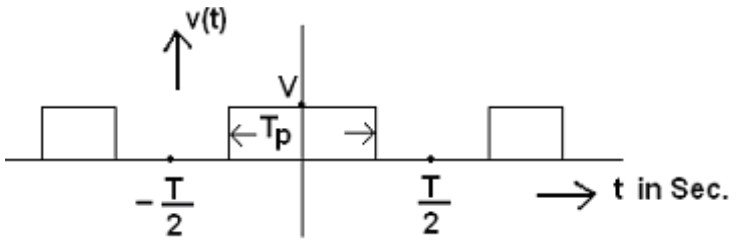

Figure 5

6. (a) State and explain Parseval's theorem.
   (b) Derive the expression for Fourier transform of unit step function. [7+9]

7. (a) Check whether the following polynomial is Hurwitz or not?
   $H(s) = s^4 + 2s^2 + 3s + 6$
   (b) Find the range of values of 'a' so that $H(s) = s^4 + s^3 + as^2 + s + 3$ is Hurwitz. [7+9]

8. (a) Explain the realization of first Foster form of R-C equivalent network deriving necessary expressions.
   (b) Develop the model for synthesizing an R-C impedance function in second Cauer form deriving the necessary expressions. [8+8]

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Code No: RR320201 **Set No. 4**

III B.Tech II Semester Supplimentary Examinations, Aug/Sep 2007
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 mechanical system shown in figure 1.
   (a) Draw the mechanical network and write the corresponding equilibriums equations. [4+4]
   (b) Develop electric analogous networks and write the corresponding equations. [4+4]

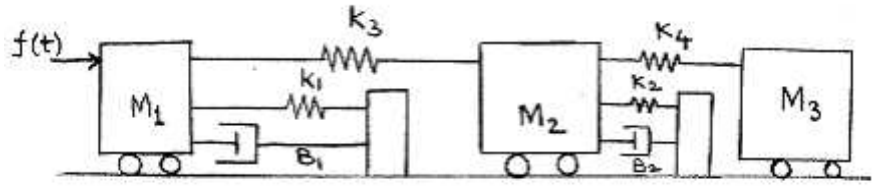

Figure 1

2. (a) The transfer function of a system is $G(s) = \frac{2}{(s+1)(s+2)}$ obtain the state variable representation of the systems. [8+8]
   (b) Determine the state transition matrix for the system represented by the characteristic matrix $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & -2 & 1 \\ 1 & 4 & 1 \end{bmatrix}$

3. (a) The transfer function of an armature controlled d.c. motor relating the output speed to the input armature voltage is given by. $H(s) = \frac{0.03}{(s+0.06)}$
   Determine the output speed as a functions of time when the armature is to a step voltage of 240V.
   (b) State and explain what is meant by Gate functions and hence develop the Laplace transforms of it. [8+8]

4. (a) State and Explain the graphical interpretation of convolution theorem.
   (b) Determine the convolution integral for the functions (e^{-2t}) (sin2t)
   (c) Given that impulse response of a systems is $\frac{s}{s+1}$, find the response for an input of e^{-2t}. [4+6+6]

5. A voltage $\begin{matrix} v(t) = 1 & 0 \le t \le 1.0 \\ = 0 & 1.0 < t \le 5.0 \end{matrix}$ and total period T is 5 seconds. Find the Fourier series expansions of the voltage waveform. If this voltage is applied to the series R-L circuit with R = 1Ω, L = 2.5H, find the current, average power, power factor of the circuit. [16]

6. (a) State and explain Parseval's theorem.
   (b) Derive the expression for Fourier transform of unit step function. [7+9]

7. (a) Test whether the following polynomial is Hurwitz or not
   $H(s) = s^6 + 5s^5 + 15s^4 + 28s^3 + 44s^2 + 36s + 36$
   (b) Test whether the following function is positive real or not
   F(s)= (3s) / (s+1) (s+3) [9+7]

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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