R09

Code No: 58010

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, May - 2016
LINEAR SYSTEMS ANALYSIS
(Electrical and Electronics Engineering)

Time: 3 Hours Max. Marks: 75

Answer any Five Questions
All Questions Carry Equal Marks

1.a) Write the normal form state equation in vector matrix form for the network shown in figure-1 using equivalent source method.

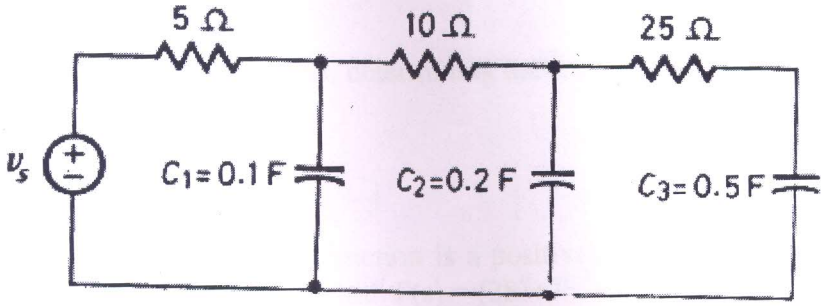

Figure 1

b) A system matrix is given by $A = \begin{bmatrix} -1/2 & 5/2 \\ 1/2 & -7/5 \end{bmatrix}$, obtain the state transition matrix. [8+7]

2.a) State and explain Parseval's theorem?
b) Find the Fourier series of the square wave in Figure 2. Plot the amplitude and phase spectra. [7+8]

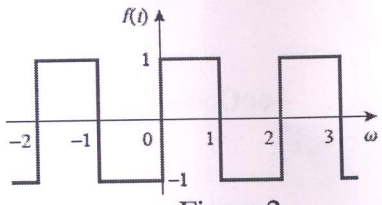

Figure 2

3.a) Calculate the average power dissipated by the 10 Ω resistor in the circuit of Figure 3. if $i_s(t) = 3 + 2\cos(50t - 60^0) + 0.5\cos(100t - 120^0)$ A

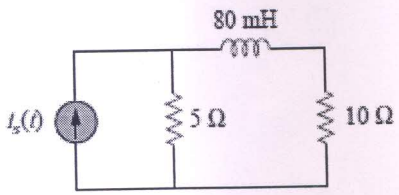

Figure 3

b) The full-wave rectified sinusoidal voltage in Figure 4(i) is applied to the low-pass filter in Figure 4(ii). Obtain the output voltage $v_o(t)$ of the filter. [7+8]

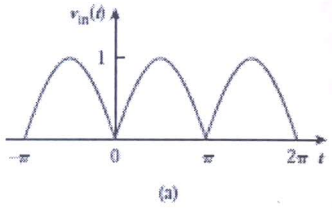

Figure 4(i)

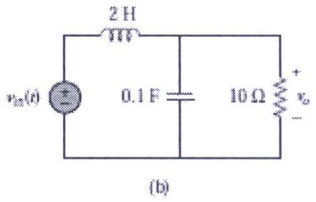

Figure 4(ii)

4.a) State and explain the properties of laplace transforms?

b) The impulse response of a certain linear system is given by

$h(t) = e^{-2t}\, u(t)$ $t \geq 0$

$= 0$ $t < 0$

using the convolution integral, determining the response y(t) due to the ramp input

$x(t) = 0$ $t < 0$

$= t$ $t \geq 0$ [8+7]

5.a) Explain Sturm's theorem.

b) Test whether the following function is a positive real function and the polynomials are Hurwitz or not using Sturm's test. $F(s) = (2S^4+7S^3+11S^2+12S+4) / (S^4+5S^3+9S^2+11S+6)$. [8+7]

6. Realize $Z(s) = S(S^2+2)(S^2+4)/(S^2+1)(S^2+3)(S^2+5)$ in all four forms. [15]

7.a) A power signal f(t) has a power Sf(w). Find the power density spectrum of the signal df/dt.

b) Give physical interpretation of power density spectrum. [8+7]

8. Use the derivative property, to find the Z-transform of the following sequences:

a) $x_1(n) = n\,(1/2)^n u(n-2)$

b) $x_2(n) = (1/n)(-2)^{-n} u(-n-1)$. [7+8]

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