

Code No: 136CJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, May - 2019

LINEAR SYSTEMS ANALYSIS

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A**(25 Marks)**

- 1.a) Define state variables. [2]
- b) Briefly explain the concept of state space. [3]
- c) State time shift property of continuous time Fourier series. [2]
- d) State and prove frequency shift of Fourier transform. [3]
- e) Find Laplace transform of the ramp function. [2]
- f) Write properties of positive real function. [3]
- g) Define Flat Top Sampling. [2]
- h) What are the effects of under sampling? [3]
- i) What is the significance of region of convergence (ROC) in Z-transform? [2]
- j) Determine Z- transform of $x(t) = u(t-2)$. [3]

PART - B**(50 Marks)**

2. Find the state equations for the network shown in the figure.1 Choose i_{L1} , i_{L2} and V_c as state variables. [10]

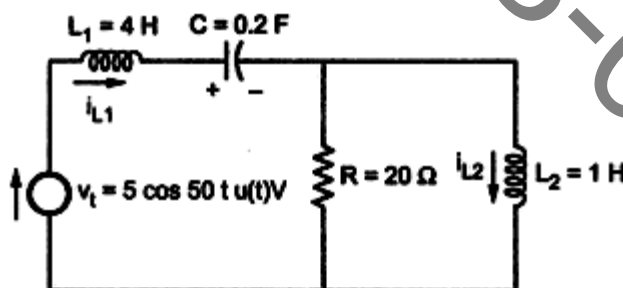


Figure 1

OR

3. For the network shown in figure.2 obtain the state equations in matrix form using equivalent source method. [10]

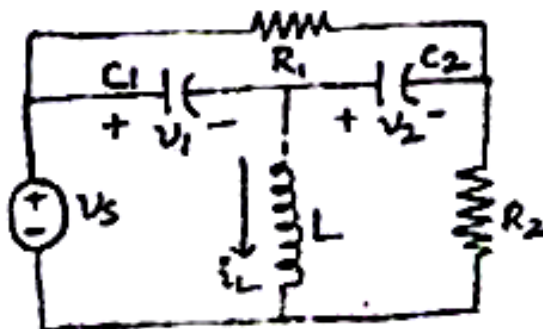


Figure 2

4. Find the exponential Fourier series and plot the magnitude and phase spectrum for the sawtooth wave form of figure 3. [10]

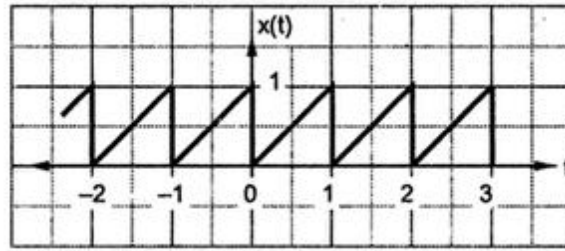


Figure 3

OR

5. The voltage $v(t) = 10 + 20 \sin 314t + 40 \sin(942t + 30^\circ)$ is applied to an RL circuit with $R = 10\Omega$ and $L = 0.0318$ H. Obtain
- Expression for current in the RL circuit.
 - Effective values of voltage and currents.
 - Power factor of the circuit.
- [10]

- 6.a) Obtain the Laplace transform of the square wave train shown in the figure.4

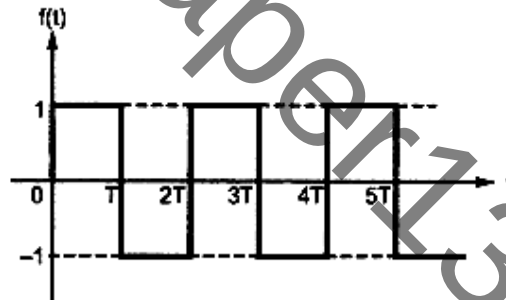


Figure 4

- b) Test whether the given polynomial $P(s) = s^3 + 2s^2 + 4s + 2$ is Hurwitz. [5+5]

OR

7. Synthesize the Foster-I and Foster-II forms of LC driving point impedance. [10]

$$Z(s) = \frac{(s^2 + 1)(s^2 + 9)}{s(s^2 + 4)}$$

- 8.a) Determine and sketch the auto correlation function of given exponential pulse $f(t) = e^{-at} u(t)$.
- b) Give physical interpretation of power density spectrum. [5+5]

OR

- 9.a) State and prove sampling theorem.
- b) Write comparisons between energy spectral density and power spectral density. [5+5]

- 10.a) State and explain four properties of Z-transform.

- b) Determine inverse Z-transform of $X(z) = \frac{2Z(Z^2 - 1)}{(Z^2 + 1)^2}$ [5+5]

OR

- 11.a) State and prove initial value theorem of Z-transform.

- b) Determine inverse Z-transform of $X(Z) = \frac{Z(Z + 1)}{(Z - 1)^2}$. [5+5]