Code: R7310206

R07

B.Tech III Year I Semester (R07) Supplementary Examinations December 2015

LINEAR SYSTEMS ANALYSIS

(Electrical and Electronics Engineering)

(For 2008 regular admitted batch only)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

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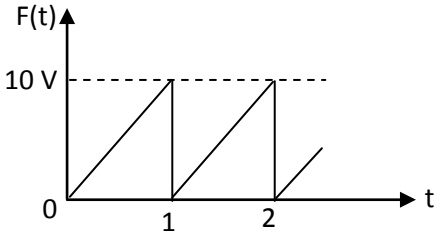
1 (a) Explain the network topological method for developing the state equations.
(b) Obtain the state space representation of RLC series circuit.

2 (a) Explain the exponential form of Fourier series.
(b) Find the trigonometric Fourier series for the waveform shown in below figure.



3 (a) Derive average power factor of non-sinusoidal voltages and currents.
(b) Find the expression for current in an impedance of R = 10 Ω, L = 0.03H with applied voltage $V_{(t)} = \{100\,Sin\,314t + 20\,Sin\,(942t + 30°) + 5\}$ volts. Also determine the rms voltage and current as well as P.F of the network.

4 (a) State and prove convolution theorem.
(b) A step voltage V_i (t) = 150u(t) volts is applied to series RLC circuit with R = 5 Ω, L = 1H and C = 2F. The initial current in the circuit is zero, but there is an initial voltage of 25 volts on the capacitor in direction which opposes the applied source. Find the expression for the current.

5 (a) "The odd part of a Hurwitz polynomial has roots on the jw-axis only". Justify the statement with appropriate explanation.
(b) Test whether the following function is a positive real function :
$F(s) = (2s^4 + 7s^3 + 11s^2 + 12s + 4) / (s^4 + 5s^3 + 9s^2 + 11s + 6)$.

6 (a) What is 'First Foster form'? Explain.
(b) Synthesize the network in the first Foster form for the L-C impedance function:
$Z(s) = 2(s^2 + 1)(s^2 + 9)/[s(s^2 + 4)]$.

7 (a) State sampling theorem. What do you understand by 'Nyquist rate' and 'Nyquist interval'?
(b) A flat top sampling system samples a signal of maximum 1 Hz with 2.5 Hz sampling frequency. The duration of the pulse is 0.2 second. Calculate the amplitude distortion due to aperture effect at highest signal frequency. Also find out the equalization characteristic.

8 (a) Describe briefly the need for z-transform. Explain how the z-transform maps infinite number of poles in s-plane into a single point in z-plane.
(b) Find the inverse z-transform of $X(z) = \frac{z(z-3/2)}{(z-1/3)(z-1/2)}$ ROC $|z| > 1/2$.

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