

R07

Code: R7310206

III B. Tech I Semester (R07) Supplementary Examinations, May 2012

LINEAR SYSTEMS ANALYSIS
(Electrical & Electronics Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Explain the network topological method for developing the state equations.
(b) Obtain the state space representation of RLC series circuit.
- 2 (a) Derive the Fourier transform of a periodic function.
(b) Determine the trigonometric Fourier series for the half wave rectified sine wave form of magnitude ' V_m ' and sketch the line spectrum.
- 3 A $5\ \Omega$ resistive load is supplied from a full wave rectifier connected to 220 V, 60 Hz single phase supply. Determine the average and rms values of load current. Also find out the proportional of DC power and AC power to the total power in the load. Investigate the effect of adding an inductance in series with the load.
- 4 (a) Using convolution theorem, prove the shifting theorem.
(b) A rectangular voltage pulse of unit height and duration T is applied to a series RC circuit at $t=0$. Determine the voltage across the capacitor 'C' as a function of time.
- 5 (a) What are the 'necessary but not sufficient' conditions for positive realness of a rational function?
(b) Test the polynomial $s^4 + 4s^3 + 8s^2 + 16s + 32$ to find out if all its roots have negative real parts.
- 6 (a) Suppose $Z(s)$ represents an impedance function. Show that the removal of a pole at infinity corresponds to the removal of an inductor from the network.
(b) Synthesize the network for the positive real impedance function $Z(s) = (s^2 + 5s + 10) / [s(s + 10)]$.
- 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) State any five important properties of the ROC for the z-transform.
(b) Determine the z-transform of the following finite duration signals:
(i) $x(n) = \{3, 1, 2, 5, 7, 0, 1\}$.
(ii) $x(n) = \{2, 4, 5, 7, 0, 1, 2\}$.
(iii) $x(n) = \{0, 0, 1, 2, 5, 4, 0, 1\}$.
