

III B.Tech II Semester(R05) Supplementary Examinations, May 2010
LINEAR AND DISCRETE SYSTEMS ANALYSIS
(Electrical & Electronic Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. (a) Consider the system. $\ddot{y} + 6\dot{y} + 11y + 6y = 6u$ where y is the output and u is the i/p to the system. Obtain the state space representation.
 (b) Obtain the state transition matrix for the following system

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} X. \quad [8+8]$$
2. (a) Calculate the Impedance consisting of R and L and the PF of a circuit whose expression for voltage and current are
 $e(t) = 254 \sin(314t) + 50 \sin(942t + 30)$
 $i(t) = 17.7 \sin(314t - 45^\circ) + 1.583 \sin(942t - 41.6^\circ)$
 (b) Explain clearly the significance of the term "Mirror image symmetry" used in determining Fourier series of a given waveform. [12+4]
3. (a) Find the FT of a sequence of equidistant impulses of unit strength and separated by T seconds.
 (b) State and prove the relationship between FT and Laplace transform. [8+8]
4. (a) Determine the LT expression for the following.
 i. A voltage defined by $v(t) = 10u(t) - 10u(t - 2)$
 ii. Current defined by $i(t) = \frac{-e^{-(t-2)}}{e}$
 If the above quantities refer to a circuit, determine its components.
 (b) Find the initial and final values of the following functions.
 i. $\frac{s-1}{(s+1)(s+2)}$
 ii. $\frac{1}{s^2+4s+5}$. [8+8]
5. (a) Determine whether the polynomial: $3s^6 + s^5 + 19s^4 + 6s^3 + 81s^2 + 25s + 25 = 0$ is Hurwitz or not.
 (b) An impedance function has simple poles at $s=-2$ and $s=-5$ and simple zeros at $s=-3$ and $s=-8$. $Z(0)=50\text{ohms}$. Find the four canonical networks with elements values. [8+8]
6. An LC driving point impedance function has infinite impedance at 1000Hz and 4000Hz, and the impedance is zero at 2500Hz. The impedance at 500Hz is $1k\Omega$. Find the driving point impedance function which satisfies the above criteria.. [16]
7. Determine and plot the autocorrelation sequence of each of the following sequences. From the completed auto-correlation sequences, find the sequences that are periodic and also their periods.
 (a) $x_1[n] = \sin(2\pi n/M)$, where M is a positive integer
 (b) $x_2[n] = n \text{ modulo } 7$. [16]
8. Consider a system described by the Differential Equation $y(n) = y(n-1) - y(n-2) + 0.5x(n) + 0.5x(n-1)$
 Find the response of this system to the input $x(n) = (0.5)^n u(n)$ with initial conditions $y(-1) = 0.75$
 & $y(-2) = 0.25$. [16]
