Code No: EE3221 **RA**

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

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Verify the systems, whose input x(t) and y(t) are related by y(t)= x^2(t) is linear or not?
   (b) Consider the following system described by the input-output relations, are static or dynamic?
      i. $y(t) = \frac{1}{m} \int_{-\infty}^{\infty} x(t)dt$
      ii. $y(t) = e^{xt}$
   (c) Determine whether the following systems are causal or not?
      i. y(t) = x(-t)
      ii. y(t) = x(t) sin(t+1) [4+3+3+3+3]

2. (a) The transfer function of a system is $G(s) = \frac{2}{(s+1)(s+2)}$ obtain the state variable representation of the systems. [8+8]
   (b) Determine the state transition matrix for the system represented by the characteristic matrix $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & -2 & 1 \\ 1 & 4 & 1 \end{bmatrix}$

3. (a) A pulse voltage of 3V between 1 to 2 sec. is applied to a series R-L circuit with R=3 Ω, L=1H, Find the current i(t).
   (b) Find the current is i(t) in a series R-L-C circuit with R=3 Ω, L=1H, C=$\frac{1}{2}$F when it is driven by an impulse voltage of δ (t-2). [6+10]

4. (a) Find the convolution of two identical rectangular pulses. Each rectangular pulse has unit magnitude and duration equal to T seconds starting from t=0 seconds.
   (b) Find the convolution of h(t)=t and f(t)= e^{-at} for t> 0 [8+8]

5. (a) Derive the expression for RMS value of a complex (or voltage) wave which is expressed in terms of fourier series.
   (b) A complex voltage e(t) = 100 sin w t + 30 sin 3wt + 20 sin 5 wt where w = 100t. If this voltage is applied to a load of 10 ohms in series with 0.01H, find the current, average power and power factor of the circuit. [6+10]

6. (a) Find the Fourier transform of
   F(t) = u(t+T) - u(t-T)
   (b) Find the Fourier transform of
   $F(t) = 1 - |t/a| \; for - a < t < a$
   = 0 for $|t| > a$ [8+8]

7. (a) Check whether the following polynomial is Hurwitz or not?
   $P(s) = 2s^4 + 5s^3 + 6s^2 + 2s + 1$
   (b) " All driving point immittances of passive networks are positive real functions". Substantiate the statement.
   (c) State the analytical tests to be considered for a polynomial to check whether it is a positive real function or not? [7+5+4]

8. (a) Explain how the removal of pole at infinity of an impedance Z(s) can realize an element in the network.
   (b) Realize the network with the following driving point impedance function using first Foster form.
   Z(s) = (s+2) / s(2s+5) [8+8]

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