Code :EE3221

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III B.Tech II Semester(R05) Supplementary Examinations, April/May 2011
ANALYSIS OF LINEAR SYSTEMS
(Electrical & Electronics Engineering)
(For students of RR regulation readmitted to III B.Tech II Semester R05)

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

Answer any FIVE questions
All questions carry equal marks

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1. (a) Distinguish between translational and rotational mechanical system with suitable examples and develop the analogous relationships between various quantities of these systems.
   (b) Develop the force-current analogous circuit for the system shown in figure 1 and hence develop the nodal equations.

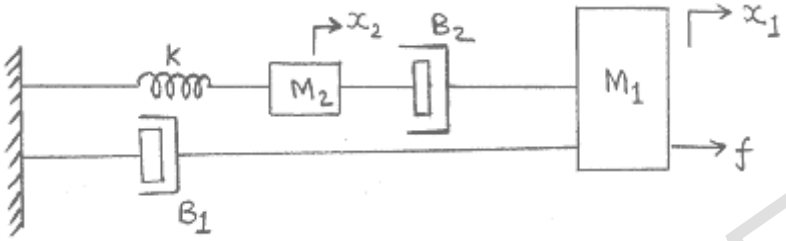

Figure 1:

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.
   (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) Find the current i(t) in a series R-L-C circuit comprising of resistor R = 5Ω, L=1H, C= $\frac{1}{4}$ F when the step voltage 3 u(t-3) is applied to it
   (b) Find the response of a series R-C circuit with R=1Ω, C=2F with an impulse voltage of 2δ (t-3) applied across it.

4. (a) State and Explain the graphical interpretation of convolution theorem.
   (b) Determine the convolution integral for the functions (e^{-2t}) (sin2t)
   (c) Given that impulse response of a systems is $\frac{s}{s+1}$, find the response for an input of e^{-2t}.

5. A full-wave rectified output voltage, with an input voltage of 230 V, 50Hz, is applied to a series R-L circuit with R=2Ω, L = 3.18mH. Find:
   (a) Fourier coefficients
   (b) RMS value of voltage
   (c) RMS value of current
   (d) Average power consumed in the circuit and power factor of the load.

6. (a) Find the signal f(t) whose Fourier transform is $F(j\omega) = 5/(6 + j5\omega - \omega^2)$
   (b) Find the Fourier transform of the following functions:
      i. f(t) = te^{-at} for t ≥ 0
      ii. V(t) = $V_m cost - \Pi/2 \leq t \leq \Pi/2$
      = 0 elsewhere

7. (a) Check whether the following polynomial is Hurwitz or not?
   $H(s) = s^4 + 2s^2 + 3s + 6$
   (b) Find the range of values of 'a' so that $H(s) = s^4 + s^3 + as^2 + s + 3$ is Hurwitz.

8. (a) For the following driving point input impedance, synthesize the realizable impedance with R-L elements using Fosters first form:
   Z(s) = (s+2)(s+4)/ (s+3)(s+5)
   (b) Synthesis the given function
   Z(s) = 2(s+1)(s+5)/ s(s+3)
   into two R-C parallel branches and hence determine the values of branches $R_1 - C_1$ and $R_2 - C_2$ and assume $R_1 = R_2$.

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