Code No: NR220206 **NR**

II B.Tech II Semester Supplementary Examinations, April/May 2005
CONTROL SYSTEMS
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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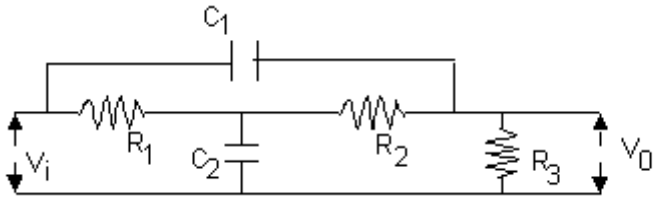
1. Define transfer function and what are its limitations.

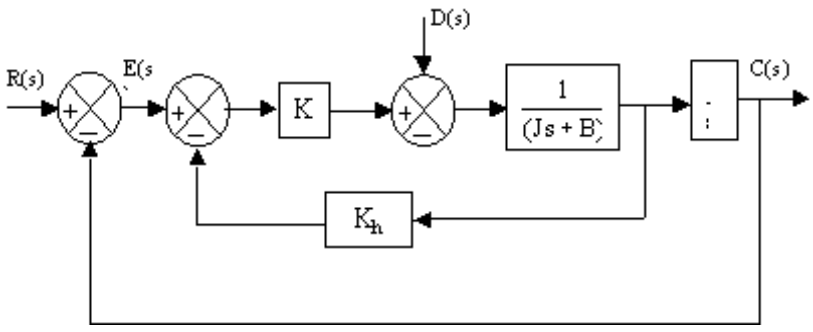
   Obtain the transfer function for the following electrical network.



2. (a) Explain the effect of feedback on noise to signal ratio.
   (b) With the help of sketches, explain the construction and working principle of a Synchro transmitter.

3. For a unity feedback system $G(s) = \frac{36}{s(s+0.72)}$. Determine the characteristic equation of the system. Hence calculate the undamped frequency of oscillations, damped frequency of oscillations, damping ratio, peak overshoot, time required to reach the peak output, settling time. A unit step input is applied to the system.

4. (a) Show that the Routh's stability criterion and Hurwitz stability criterion are equivalent.
   (b) Consider the servo system with tachometer feedback shown in *Fig. P4*. Obtain the error signal E(s) when both the reference input R(s) and disturbance input D(s) are present. Obtain also the steady-state error when the system is subjected to a reference input (unit-ramp input) and disturbance input (step input of magnitude).



5. Show that s1 $= -1 \pm j\sqrt{2}$, s2 $= \pm j\sqrt{11}$ are the points on the root locus for $G(s)H(s) = \frac{K}{(s+1)(s+2)(s+3)}$ and hence find the values of K at these points.

6. (a) Explain the correlation between time and frequency response of a system.
   (b) Sketch the Bode Plot for G(s) $= \frac{(1+100s)(1+s)}{(1+10s)(1+0.1s)}$. Assume unity feed back. Obtain gain margin and phase margin using semi log sheet.

7. Make a rough sketch of the Nyquist plot for system whose open loop transfer function is G(s)H(s) $= \frac{5}{s(1+0.2s)(1+s)}$.
   (a) Is the above system stable? Explain.
   (b) Define gain margin of a system and determine the GM of the system specified in (a).
   (c) Define the PM of a system and indicate how this can be determined from the Nyquist plot.

8. (a) Obtain the state variable model in phase variable form for the following system: $\dddot{Y} + 2\ddot{Y} + 3\dot{Y} + 4Y = u(t)$
   (b) The closed loop transfer function is given by $\frac{Y(s)}{U(s)} = \frac{160(s+4)}{s^3+8s^2+192s+640}$ Obtain the state variable model using signal flow graph.

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