MODEL QUESTION PAPER

MFE3

I Semester M.TECH Examination, August 2011
CONTROL THEORY

Time: 3 Hours   Max. Marks: 75

GROUP A : Answer any three questions.

Q.1   Distinguish between open loop and closed loop system.

Q.2   Explain following terms -(a) Sensitivity (b) stability (c) Steady state error.

Q.3   Show with the help of examples that introduction of derivative mode of control in a feedback system with proportional control makes the system response less oscillatory. What is its effect on steady state accuracy?

Q.4   What is PI controller? Write its input output transfer function.

Q.5   What is transfer function of a system? Deduce the expression for transfer function a typical closed system.

GROUP B : Answer any three questions.

Q.6   What is the advantage of Bode plot over Nyquist plot?

Q.7   For the following characteristic equation of linear control system, construct the root loci for K >= 0. Determine the marginal value of K for stability. $Z^2 + (0.15K - 1)Z + 0.5 = 0$

Q.8   Discuss various components of Control System. What is PID control? Explain the principles of working of an electronic PID controller with a suitable diagram.

Q.9   State the stability by applying Routh-Hertwitz criteria.
$$4s^4 + s^3 + 6s^2 + 3s^2 + 11s + 6 = 0$$

Q.10   A unity feedback control system having O.L.T.F. is given below. Draw the Bode Plot. Determine the values of G.M., P.M., ω_{gc} & ω_{pc}. Comment on Stability.

GROUP C: All Questions are Compulsory.

Q.11 Fill in the blanks

(i)   A unity feedback system has an open loop transfer function G(s) = 25/s (s+8), then damping ratio is _____.

(ii)   The transfer function is the ratio of _____.

(iii)   The multiplying factor $\frac{1}{|OA|}$ is the _____ margin.

(iv)   Lead   network   _____the   bandwidth   of   the   system.

(v)   For every bounded input the output is bounded is referred as _____

system.

Q.12 Multiple choice question.

(i)   In force current analogy mass is analogous to _____
        (a) Inductance   (b) Current
        (c) Voltage   (d) Capacitance
(ii)   In a second order system ,if the damping ratio ξ is less than unity , th
        system will be _____.
        (a) Under damped system   (b) over damped system
        (c) Critically damped system   (d) freely oscillation
(iii)   The initial slop of Bode Plot for a transfer function having simple pole at
        origin is _____.
        (a) 20dB/decade   (b) -40 dB/decade
        (c) 40 dB/decade   (d) -20dB/decade
(iv)   Phase cross over point is one at which Nyquist Plot intersect the ___.
        (a) Positive real axis   (b) negative real axis
        (c) Positive imaginary axis   (d) negative imaginary axis
(v)   From the Nichol's chart, one can determine the following quantities pertaining
        to a closed loop system _____.
        (a) Magnitude and phase   (b) Bandwidth
        (c) Magnitude only   (d) Phase only

Q.13 True or false

(i)   In mechanical system, the spring force is proportional to acceleration.
(ii)   The output of system is given by $C(s) = 1/s *2/(s-3)$
        The output will Increase with respect to time
(iii)   Laplace transform of impulse function is one.
(iv)   The lag compensator Decrease the band width
(v)   The characteristic equation of an armature controlled d.c motor is of second
        order quation.

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