BTS(C) – VI– 09 –008-T

B. Tech Degree VI Semester Examination, April 2009

EE 603 CONTROL SYSTEM I

(2006 Scheme)

Time: 3 Hours Maximum Marks: 100

PART A

(Answer all questions)

(8x5=40)

I. (a) What are frequency domain specification? Define any three.
(b) Define gain margin and phase margin.
(c) What are the characteristic of servo motors?
(d) What is stepper motor? Define full step, half step and micro step?
(e) What is 'P' controller and what are its advantages and disadvantages?
(f) What are the characteristic of lag compensation and lead compensation?
(g) Define controllability and observability.
(h) What is state observer? Define full order and reduced order state observer.

PART B

(4 x 15=60)

II. Sketch the bode plot for the following transfer function and determine phase margin and gain margin.

$$G(s)=\frac{75(1+0.25)}{s(s^2+165+100)}$$

OR

III. By Nyquist stability criterion determine the stability of closed loop system, whose open loop transfer function is given by

$$G(s)H(s)=\frac{(s+2)}{(s+1)(s-1)}$$

Comment on the stability of open loop and closed loop system.

IV. A unity feedback control system has an open loop transfer function

$$G(s)=\frac{K}{s(s^2+4s+13)}$$

Sketch the root locus.

OR

V. Explain the construction and working of Synchro Transmitter.

VI. Consider the unity feed back system whose open loop transfer function is

$$G(s)=\frac{K}{s(s+3)(s+6)}$$

Design a lag lead compensator to meet the following specification.
(i) Velocity error constant, Kv=80 (ii) Phase margin, $\gamma \geq 35$.

OR

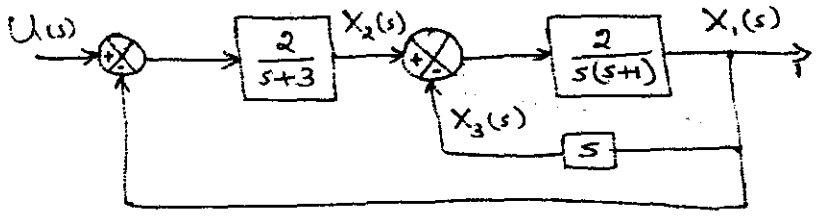
VII. Consider a unity feed back system with open loop transfer function,

$$G(s)=\frac{100}{(s+1)(s+2)(s+10)}$$

Design a PID controller, so that the phase margin of the system is 45^0 at a frequency of 4 rad/sec and the steady state error for unit ramp input is 0.1.

(Turn over)

VIII. Write the state equation for the system shown below, in which x_1, x_2 and x_3 constitute the state vector. Determine whether the system is completely controllable and observable.



OR

IX. Consider a linear system described by transfer function $\frac{Y(s)}{u(s)} = \frac{10}{s(s+1)(s+2)}$

Design a feed back controller with a state feed back so that the closed loop poles are placed at $-2, -1 \pm j1$.

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