Exam. Code: 0934
Sub. Code: 33754

2015

B.E. (Electrical and Electronics Engineering)-4th Semester

PC-EE-403: Control Engineering - I

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of normal graph paper and semi-log graph paper is allowed. Assume any missing data.*

x-x-x

I. Attempt the following:-

(a) Write torque-voltage analogy.

(b) What are absolute and relative stabilities?

(c) How is sensitivity of control system affected by feedback?

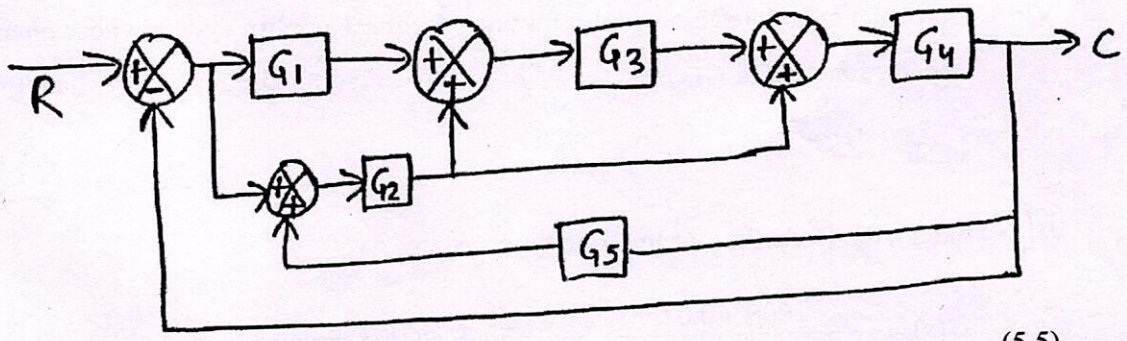
(d) Explain servomechanism.

(e) What is regenerative control systems? (5x2)

UNIT - I

II. (a) Differentiate between time variant and time invariant control systems, and between continuous and discrete control systems. Also derive formula for transfer function of degenerative feedback system.

(b) Find transfer function using block diagram reduction method:



(5,5)

P.T.O.

III. (a) A servomechanism is represented by equation

$$\frac{d^2y}{dt^2}+4.8\frac{dy}{dt}=144E$$

Where E = (C-0.5y). Find the value of damping ratio, undamped and damped frequency of oscillations.

(b) A unity feedback system is characterized by upon loop transfer function $G(s)=\frac{K}{s(s+10)}$. Determine gain K so that system will have damping ratio of 0.5. For the value of K, determine settling time for 5% tolerance band, peak overshoot, and time to peak overshoot for unit step input. (5,5)

IV. (a) The open loop transfer function of a unity feedback control system is given by $G(s)H(s)=\frac{K}{s(s+Ts)}$. It is desired that all roots of characteristics equation must lie in the region to the left of line $s=-a$. Determine values of K and P required so that there are no roots to right of the line $s=-a$.

(b) Draw and explain neat and clean diagram to show all time response specifications for unit step input. (7,3)

UNIT - II

V. Draw a root locus for unity feedback system whose forward path transfer function is given by $G(s)=\frac{K(s+1)}{s^2(s+5)(s+3)}$. (10)

VI. Construct complete Nyquist plot for unity feedback control system whose open loop transfer function is $G(s)H(s)=\frac{K}{s(s^2+2s+2)}$. Find maximum K. for which the system *is* stable. (10)

VII. Sketch the Bode Plot for the following system:

$G(s)=\frac{100(1+0.02s)}{(1+s)(1+0.1s)(1+0.01s)^2}$. Find all the frequency domain specifications and stability. (10)

x-x-x