Code: 15A02303 **R15**

B.Tech II Year I Semester (R15) Regular & Supplementary Examinations November/December 2017

CONTROL SYSTEMS ENGINEERING

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Classify of different control system.
(b) Mention the basic elements of closed loop system.
(c) What are the advantages of Block diagram Reduction technique?
(d) Define step signal.
(e) State various time domain specifications.
(f) List the disadvantages of static error coefficients.
(g) List the advantages of bode plots.
(h) List the frequency domain methods to find the stability of the system.
(i) Define state and state variable.
(j) Define controllability and observability

PART – B

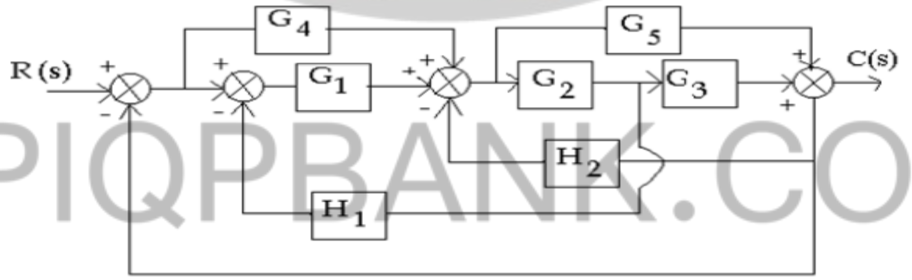
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Give the advantages of open loop control system and disadvantages of closed loop control system.
(b) Give the advantages and disadvantages of transfer function.

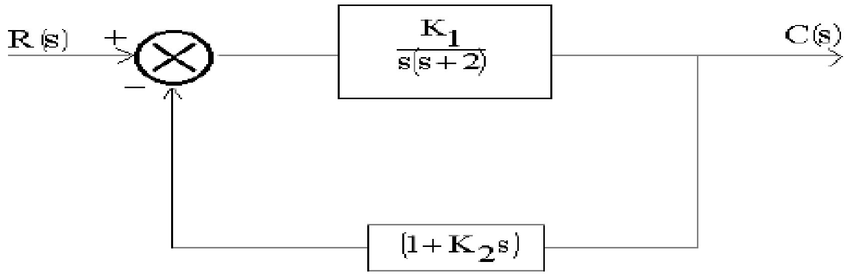
OR

3 Determine the transfer function C(s) /R(s) for the block diagram shown in Figure bellow by first drawing its signal flow graph and then using the Mason's gain formula.



UNIT – II

4 For the system shown in the block diagram of figure below determine the values of gain K_1 and velocity feedback constant K_2 so that the maximum overshoot with a unit step input is 0.25 and the time to reach the first peak is 0.8 sec. Thus obtain the rise time and settling time for 5% tolerance band.



OR

5 (a) Derive the expression for 2nd order system under damped system with unit step as input.
(b) Obtain unit impulse response of a unity feedback control system whose open loop transfer function is:

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

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UNIT – III

6 (a) Explain the Routh's criterion to determine the stability of a dynamical system and give its limitations.

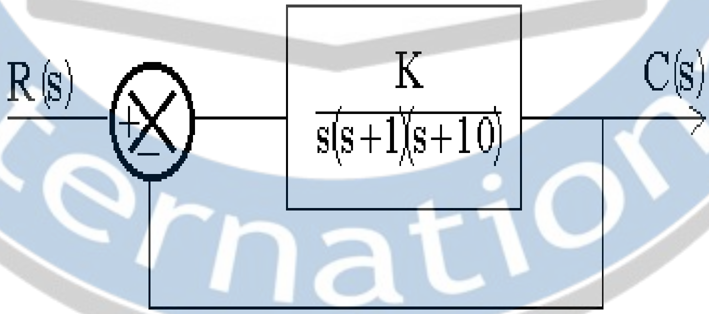
(b) Determine the range of K for stability of a unity-feedback control system whose open loop transfer function is: $G(s)=\frac{K}{s(s+1)(s+2)}$

OR

7 Sketch the root locus diagram for a unity feedback system with its open loop function as: $G(s)=\frac{K(s+3)}{s(s^2+2s+2)(s+5)(s+9)}$. Thus find the value of K at a point where the complex poles provide a damping factor of 0.5.

UNIT – IV

8 Consider the system shown in figure below for that Draw the Bode-diagram of the open loop transfer function G(s) with K = 1. Determine the phase margin and gain margin. Find the value of K to reduce the phase margin by 10^0.



OR

9 Draw the complete Nyquist plot for a unity feedback system having the open loop function: $G(s)=\frac{6}{s(1+0.5s)(6+s)}$. From this plot obtain all the information regarding absolute as well as relative stability.

UNIT – V

10 (a) What are the advantages and limitations of state space analysis over conventional methods?

(b) Write the properties of state transition matrix.

OR

11 Investigate the controllability of the system: $\dot{x}=\begin{bmatrix}0 & 1\\ -3 & -4\end{bmatrix}x+\begin{bmatrix}\alpha\\ \beta\end{bmatrix}u$

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