

Total No. of Questions : 8]

SEAT No. :

P1331

[Total No. of Pages : 4

[4858] - 1069

T.E. (Electrical) (Semester - II)

Control System - I

(2012 Pattern) (End Semester)

Time : $2\frac{1}{2}$ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer all questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) State and explain the terms:

[6]

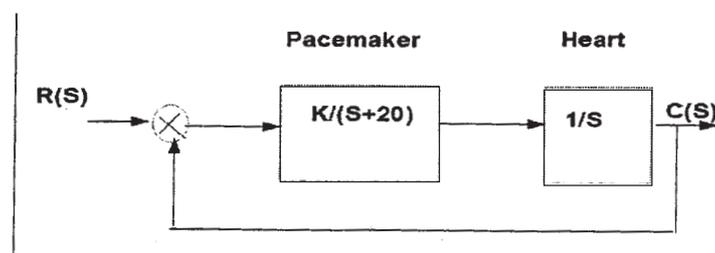
- i) Transfer function.
- ii) Feedback.
- iii) Feed forward system.
- iv) Regulatory system.

b) Derive transfer function of interacting two tank system.

[7]

c) The block diagram of an electronic pacemaker is given in fig. Determine the steady state error for unit ramp input when $K = 400$. Also, determine the value of K for which the steady state error to a unit ramp will be 0.02.

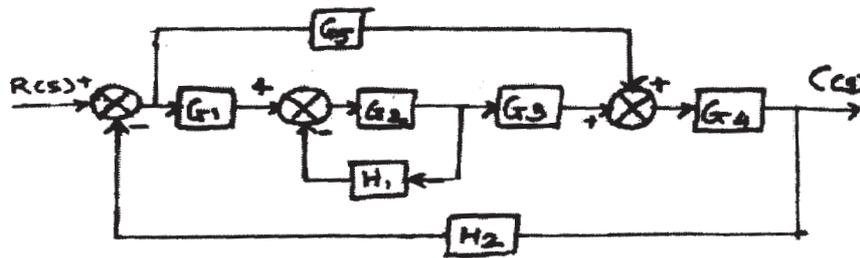
[7]



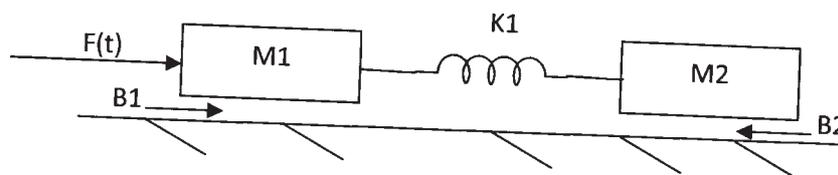
OR

P.T.O.

Q2) a) Derive transfer function using block diagram reduction. [7]



b) Explain force voltage analogy. Derive transfer function of following system using F-V analogy. [7]



c) A unity feedback system has open loop transfer function as $G(s) = \frac{K}{s(s+10)}$. Determine the gain K so that system will have damping ratio of 0.5. For this value determine settling time, peak overshoot. [6]

Q3) a) Explain stability analysis using Routh Hurwitz criterion and test the system stability whose characteristic equation is : $S^3 + 5S^2 + 6S + 30 = 0$. [8]

b) Explain rules for construction of root locus. [8]

OR

Q4) a) Sketch the root locus for open loop system [10]

$$G(s) = \frac{K}{s(s+1)(s^2+4s+5)} \quad H(s) = 1$$

- i) Find range of K for stability.
 - ii) Find the value of K for marginally stable and corresponding close loop poles.
- b) Explain Routh Hurwitz stability criterion. If a complete row becomes zero what is its significance. [6]

Q5) a) Draw bode plot for following system $G(s) = \frac{40}{s(s+2)(s+5)}$. Find gain margin and phase margin comment on stability. [12]

b) Explain Nyquist stability criterion. [6]

OR

Q6) a) Explain correlation between frequency domain and time domain. [9]

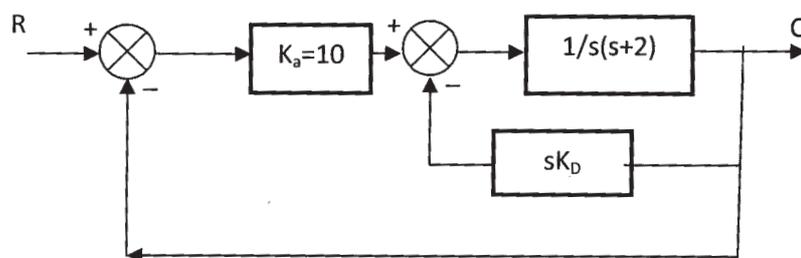
b) Draw the polar plot of the given system $G(s)H(s) = \frac{10}{s(s+2)}$. [9]

Q7) a) Draw block diagram and discuss [8]

i) PD controller.

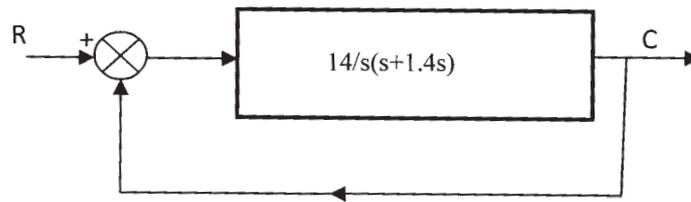
ii) PI controller.

b) A feedback system which employs output rate feedback is shown. Determine the derivative feedback constant K_D which will increase the damping factor of the system to 0.6. What is the steady state error to unit ramp input. [8]



OR

- Q8)** a) Define tuning and explain tuning method for controllers. [8]
- b) A closed loop control system with unity feedback is shown in figure by using derivative control, the damping ratio is to be made 0.7. Determine the value of T_d , also determine the rise time, peak time and maximum overshoot without derivative control and with derivative control. The input to the system is unit step. [8]



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