Total No. of Questions : 12]

SEAT No. :

P879

[Total No. of Pages : 3

[4659]-337
B.E. (Instrumentation and Control Engineering)
c-ADVANCED CONTROL SYSTEMS
(2008 Pattern) (Semester-I) (Elective-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***

SECTION-I

Q1) a) Explain with neat diagrams of different types of Singular points. **[6]**

b) Define describing function. Obtain the describing function for saturation nonlinearity. **[12]**

OR

Q2) a) What is phase plane method and what are the characteristics of phase plane method? **[6]**

b) Obtain the stability of a system shown in figure by using describing function method. **[12]**

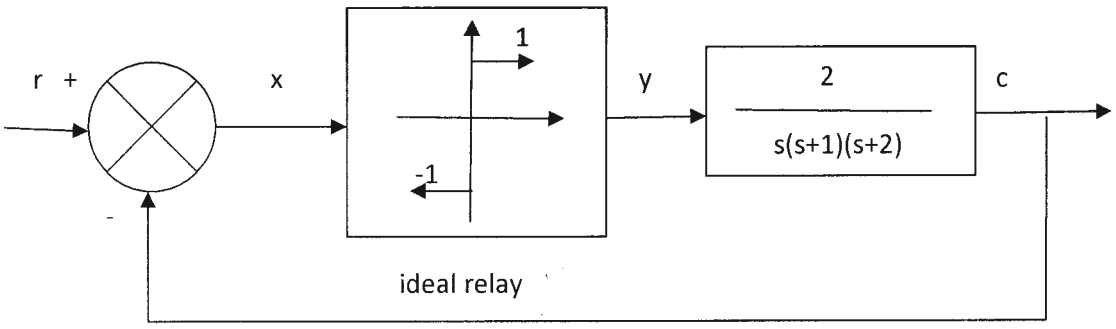

Figure: Q.2b.

Q3) a) Explain with neat diagram of Jump resonance. **[8]**

b) Determine whether following quadratic form is positive definite or not

$$Q(x) = 10x_1^2 + 4x_2^2 + x_3^2 + 2x_1x_2 - 2x_2x_3 - 4x_1x_3$$ **[8]**

OR

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Q4) A Two Phase Servomotor is driven by an amplifier as shown in figure. The transfer function of the motor is, $G(S) = K\, e^{-0.1S} / S(0.1S+1)$.

Investigate the stability of the system for K = 0.1. What is the largest value of K for no limit cycle to exist. **[16]**

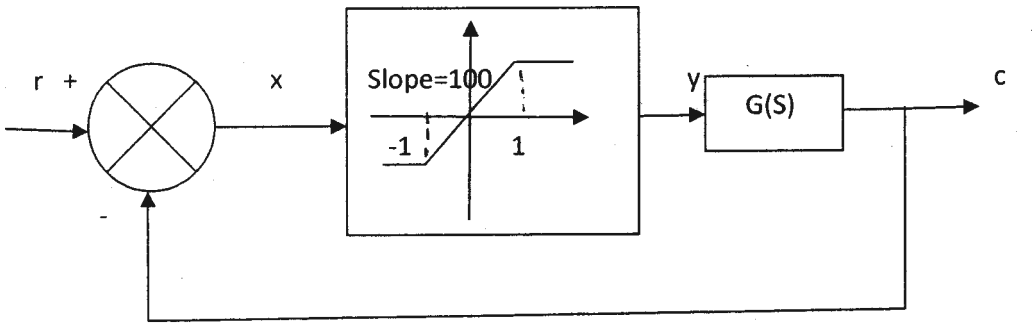

figure :Q 4

Q5) a) Explain in detail Discrete time MRAC systems. **[8]**

b) Explain with neat diagram of MIT rule for continues time MRAC system. **[8]**

OR

Q6) Explain with neat diagram of Direct and indirect model reference adaptive controller. **[16]**

SECTION-II

Q7) a) Explain in detail Linear Quadratic self tuning regulator. **[8]**

b) Explain with neat diagram of Implicit and explicit self tuning regulator. **[8]**

OR

Q8) a) Explain with neat diagram of Recursive parameter estimation of STR. **[8]**

b) Explain design of STR using Minimum variance method. **[8]**

Q9) a) Explain in detail robustness studies of multivariable system. **[9]**

b) Explain adaptive control technique for control of pulp and dryer control. **[9]**

OR

Q10)a) Explain the recent trends in adaptive control system. **[9]**

b) Explain in detail the general purpose adaptive regulator. **[9]**

Q11)Obtain the control law that minimize the performance index $J = \int_0^\infty \left(x_1^2 + u^2\right) dt$.

For the system given below: $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$. Explain in brief State Regulator Problems. **[16]**

OR

Q12)a) Explain the performance measures for the optimal control problems. **[8]**

b) Explain in detail of Matrix Riccati equations. **[8]**

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