SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY :: PUTTUR
(AUTONOMOUS)
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : ROBUST CONTROL (16EE7513) **Course & Branch**: CS - EEE
Year & Sem: I-M.Tech & II-Sem **Regulation:** R16

UNIT-I

1. What is meant by controller design? Distinguish between three main approaches for controller design. L1[12M]
2. Explain in detail the concept of "Robustness" with a distillation column model. L1[12M]
3. What is closed loop stability? What are the ways available for evaluating closed loop performance? Explain L1[12M]
4. Derive the expression for maximum additional delay for which closed loop stability is maintained. L1[12M]
5. What are the necessary design objectives of feedback control? L1[12M]
6. Explain the loop shaping approach to design a controller. L1[12M]
7. Explain steps required for deriving physical model of a room heating process. L1[12M]
8. Discuss about shaping closed loop transfer functions for feedback control L1[12M]
9. Write a short notes on the following
   (a) Frequency Response L2[6M]
   (b) Feedback control L2[6M]
10. Write a short notes on the following
    (a) Closed loop stability L2[6M]
    (b) Evaluating closed loop performance L2[6M]

UNIT-II

1. Derive the transfer function of MIMO Systems. L1[12M]
2. Explain Multivariable frequency response analysis. L1 [12M]
3. Explain the robustness of MIMO Systems with suitable example. L1[12M]
4. Explain stabilizing controllers used in both stable and unstable plants for internal stability of closed loop systems. L1[12M]
5. Discuss the rules for evaluating transfer function of MIMO L1[12M]
6. Explain two-step procedure for the control of multivariable plants. L1[12M]
7. Write short notes on:
   (a) System Norms L2[6M]
   (b) Constrains on S and T. L2[6M]
8. Find the generalized plant P the conventional one degree-of-freedom control configuration. L1[12M]
9. What is meant by internal stability of feedback systems? Explain with an example. L1[12M]
10. What are the implications of the internal stability requirements? Explain. L1[12M]

UNIT-III

1. What are the limitations imposed by uncertainty on SISO systems performance? L1[12M]
2. What are the performance requirements imposed by disturbances in MIMO systems? L1[12M]
3. What are the limitations imposed by RHP zeros in both time and frequency domains? Explain them. L1[12M]

4. Explain the limitations imposed by RHP-zeros on SISO systems. L1[12M]
5. What are the limitations forced by inputs on SISO control system. L1[12M]
6. What is meant by disturbance rejection? Give the limitations imposed by disturbances on SISO control system L1[12M]
7. What is the limitations enforced by uncertainty? Classify them. L1[12M]
8. Explain the limitations imposed by input constraints. L1[12M]
9. Explain the limitations imposed by uncertainty. L1[12M]
10. Explain about performance requirements imposed by disturbances. L1[12M]

UNIT-IV

1. (a) What is meant by "Uncertainty"? Explain the various sources of model uncertainty. L2[6M]
   (b) How parametric uncertainty translates into frequency domain uncertainty? Explain. L2[6M]
2. Explain the following parametric uncertainties with examples.
   (a) Parametric gain uncertainty. L2[6M]
   (b) Parametric pole uncertainty. L2[6M]
3. (a) What is functional controllability? Explain L2[6M]
   (b) Design uncertainty & sensitivity peak is MIMO systems. L2[6M]
4. Consider a true plant $G'(s)=3e^{-0.1s}/(2s+1)(0.1s+1)^2$
   (a) Determine and sketch the additive certainty weight when the nominal model is $G(s)=3/(2s+1)$ L2[6M]
   (b) Derive the corresponding robust stability condition. L2[6M]
5. Explain parameters uncertainty with a neat block diagram of an example L1[12M]
6. Discuss SISO robust performance with multiplicative uncertainty. L1[12M]
7. Explain how the uncertainty regions can be represented of uncertainty? L1[12M]
8. Define robust stability condition for SISO systems L1[12M]
9. (a) What are the different sources of model uncertainty? Classify them. L2[6M]
   (b) Explain gain uncertainty and time constant uncertainty. L2[6M]
10. Explain about parametric uncertainty with example.

UNIT-V

1. (a) What is meant by "μ-synthesis" and "DK – iteration"? Explain L2[6M]
   (b) What are the remarks on 'μ'? Explain. L2[6M]
2. Explain in detail the designing procedure of H_∞ loop shaping L1[12M]
3. What are the properties of 'μ' for real and complex perturbation? Explain. L1[12M]
4. Explain the robust stability for complex unstructured undertrained uncertainty.
5. (a) Discuss RS with structured uncertainty. L2[6M]
   (b) Explain Observer-based structure for H_∞ loop-shaping controllers. L2[6M]
6. Define structured singular value and RS. Explain its properties. L1[12M]
7. Explain the Applications RP with input uncertainty, μ-synthesis and DK iteration. L1[12M]
8. Explain robust stability and performance, robust stability of the MΔ structure. L1[12M]
9. Explain about RS for complex unstructured uncertainty and structured RS uncertainty. L1[12M]
10. Explain about general control formulation with uncertainty and obtain P, N and M. L1[12M]