Seat No.:

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GUJARAT TECHNOLOGICAL UNIVERSITY

B E Sem-VI Examination May 2011

Subject code: 161905

Subject Name: Control Engineering

Date:23/05/2011

Time: 10.30 am - 01.00 pm Total Marks: 70

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) State whether the following statements are true or false.
 - (1) Sprinkler is an example of open loop control system.
 - (2) In stochastic control system the response is not predictable and repeatable.
 - (3) Servomechanism is an automatic control system.
 - (4) Human system is a single variable control system.
 - (5) Signal flow graphs are primarily useful for analyzing non-linear control system.
 - (6) Root locus is defined as the path of the roots of the transfer function traced out in the S-plane as a system parameter is changed.
 - (7) A system is unstable if all the poles of the characteristic equation are towards the left-hand side of the S-plane.
 - (b) For mechanical system shown in Fig. 1
 - Write the differential equations governing the system.
 - Obtain Laplace transform of these equations.
 - Draw the Force-Voltage analogous electrical network.
- Q.2 (a) Obtain the mathematical equation and sketch the time response of a second 07 order control system for a unit step input (for damping factor = $\mathcal{L} < 1$).
 - (b) From a given signal flow graph (Fig. 2), using Masson's gain formula deduce 0' overall transmittance.

OR

- (b) Reduce block diagram as shown in Fig. 3 and obtain overall transfer 07 function.
- Q.3 (a) Using Routh-Hurwitz criterion, determine the stability for the system having 67 characteristic equation

 $s^3 + 2s^4 + 6s^3 + 12s^2 + 6s + 10 = 0$

(b) Consider the speed control system shown in Fig. 4, to control the angular 97 speed, ω of the load. For a given data, draw a block diagram of the system and determine the transfer function w(s)/E_r(s).

Given that: $K_A = 4$ amps/volts; $K_T = 1.5$ N-m/amp; $K_a = 50$ volts/amp; $K_t = 0.2$ volts/(rad/sec); $K_b = 0.75$ volts / (rad/sec);

 $R_{*} = 1\Omega : J = 6 \text{ Kg-m}^{2}$

OR

- Q.3 (a) Draw Proportional-Derivative (PD) hydraulic controller, explain its working 07 and determine its transfer function.
 - (b) Derive the torque equation of gear-train system (Fig. 5) referred to motor 07 shaft.

0.7

0.7

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Engineering Mathematics Iii (For Gtu) Ram Babu, 2010-09 An Introduction to Measure Theory Terence Tao, 2021-09-03 This is a graduate text introducing the fundamentals of measure theory and integration theory which is the foundation of modern real analysis The text focuses first on the concrete setting of Lebesgue measure and the Lebesgue integral which in turn is motivated by the more classical concepts of Jordan measure and the Riemann integral before moving on to abstract measure and integration theory including the standard convergence theorems Fubini s theorem and the Carath odory extension theorem Classical differentiation theorems such as the Lebesgue and Rademacher differentiation theorems are also covered as are connections with probability theory The material is intended to cover a quarter or semester s worth of material for a first graduate course in real analysis There is an emphasis in the text on tying together the abstract and the concrete sides of the subject using the latter to illustrate and motivate the former The central role of key principles such as Littlewood s three principles as providing guiding intuition to the subject is also emphasized There are a large number of exercises throughout that develop key aspects of the theory and are thus an integral component of the text As a supplementary section a discussion of general problem solving strategies in analysis is also given The last three sections discuss optional topics related to the main matter of the book Introduction to Information Retrieval Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, 2008-07-07 Class tested and coherent this textbook teaches classical and web information retrieval including web search and the related areas of text classification and text clustering from basic concepts It gives an up to date treatment of all aspects of the design and implementation of systems for gathering indexing and searching documents methods for evaluating systems and an introduction to the use of machine learning methods on text collections All the important ideas are explained using examples and figures making it perfect for introductory courses in information retrieval for advanced undergraduates and graduate students in computer science Based on feedback from extensive classroom experience the book has been carefully structured in order to make teaching more natural and effective Slides and additional exercises with solutions for lecturers are also available through the book s supporting website to help Advanced Engineering Mathematics Michael D. Greenberg, 1998-09 course instructors prepare their lectures

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