

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. **07**
- (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 **07**
- 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 order control system for a unit step input (for damping factor = $\zeta < 1$). **07**
- (b)** From a given signal flow graph (Fig. 2), using Masson's gain formula deduce overall transmittance. **07**
- OR**
- (b)** Reduce block diagram as shown in Fig. 3 and obtain overall transfer function. **07**
- Q.3 (a)** Using Routh-Hurwitz criterion, determine the stability for the system having characteristic equation **07**
- $$x^5 + 2x^4 + 6x^3 + 12x^2 + 6x + 10 = 0$$
- (b)** Consider the speed control system shown in Fig. 4, to control the angular speed, ω of the load. For a given data, draw a block diagram of the system and determine the transfer function $w(s)/E_r(s)$. **07**
- Given that: $K_A = 4$ amps/volts ; $K_T = 1.5$ N-m/amp ; $K_e = 50$ volts/amp ;
 $K_1 = 0.2$ volts/(rad/sec) ; $K_b = 0.75$ volts / (rad/sec) ;
 $R_a = 1\Omega$; $J = 6$ Kg-m²
- OR**
- Q.3 (a)** Draw Proportional-Derivative (PD) hydraulic controller, explain its working and determine its transfer function. **07**
- (b)** Derive the torque equation of gear-train system (Fig. 5) referred to motor shaft. **07**

Gtu Paper Solution 2010

Kumar K. S. Suresh



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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 Carathodory 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

Probability and Statistics for Engineering and the Sciences + Enhanced Webassign Access ,2017

Advanced Engineering Mathematics Michael D. Greenberg,1998-09

Electric Circuits And Networks (For Gtu) Kumar K. S. Suresh,2010-09

Chemical Engineering Design Gavin Towler, Ray Sinnott, 2012-01-25 Chemical Engineering Design Second Edition deals with the application of chemical engineering principles to the design of chemical processes and equipment Revised throughout this edition has been specifically developed for the U S market It provides the latest US codes and standards including API ASME and ISA design codes and ANSI standards It contains new discussions of conceptual plant design flowsheet development and revamp design extended coverage of capital cost estimation process costing and economics and new chapters on equipment selection reactor design and solids handling processes A rigorous pedagogy assists learning with detailed worked examples end of chapter exercises plus supporting data and Excel spreadsheet calculations plus over 150 Patent References for downloading from the companion website Extensive instructor resources including 1170 lecture slides and a fully worked solutions manual are available to adopting instructors This text is designed for chemical and biochemical engineering students senior undergraduate year plus appropriate for capstone design courses where taken plus graduates and lecturers tutors and professionals in industry chemical process biochemical pharmaceutical petrochemical sectors New to this edition Revised organization into Part I Process Design and Part II Plant Design The broad themes of Part I are flowsheet development economic analysis safety and environmental impact and optimization Part II contains chapters on equipment design and selection that can be used as supplements to a lecture course or as essential references for students or practicing engineers working on design projects New discussion of conceptual plant design flowsheet development and revamp design Significantly increased coverage of capital cost estimation process costing and economics New chapters on equipment selection reactor design and solids handling processes New sections on fermentation adsorption membrane separations ion exchange and chromatography Increased coverage of batch processing food pharmaceutical and biological processes All equipment chapters in Part II revised and updated with current information Updated throughout for latest US codes and standards including API ASME and ISA design codes and ANSI standards Additional worked examples and homework problems The most complete and up to date coverage of equipment selection 108 realistic commercial design projects from diverse industries A rigorous pedagogy assists learning with detailed worked examples end of chapter exercises plus supporting data and Excel spreadsheet calculations plus over 150 Patent References for downloading from the companion website Extensive instructor resources 1170 lecture slides plus fully worked solutions manual available to adopting instructors

Introduction to Embedded Systems, Second Edition Edward Ashford Lee, Sanjit Arunkumar Seshia, 2017-01-06 An introduction to the engineering principles of embedded systems with a focus on modeling design and analysis of cyber physical systems The most visible use of computers and software is processing information for human consumption The vast majority of computers in use however are much less visible They run the engine brakes seatbelts airbag and audio system in your car They digitally encode your voice and construct a radio signal to send it from your cell phone to a base station They command robots on a factory floor power generation in a power plant processes in a chemical plant and traffic lights in a city These less visible computers are called embedded systems and the software they run is called embedded software The principal challenges in designing and analyzing embedded systems stem from their interaction with physical processes This book takes a cyber physical approach to embedded systems introducing the engineering concepts underlying embedded systems as a technology and as a subject of study The focus is on modeling design and analysis of cyber physical systems which integrate computation networking and physical processes The second edition offers two new chapters several new exercises and other improvements The book can be used as a textbook at the advanced undergraduate or introductory graduate level and as a professional reference for practicing engineers and computer scientists Readers should have some familiarity with machine structures computer programming basic discrete mathematics and algorithms and signals and systems

Elements of Mechanical Engineering(GTU) Sadhu Singh,2010 The book strictly complies with the new syllabus of Gujrat Technological University Ahmedabad for B E First year of all braches of Engineering The subject matter is presented in a graded stepwise easytofollow style Each chapter includes MulplesChoice Questions Review Questions and Exercises for easy recapitulation

Qualitative Research Methods for the Social Sciences Bruce Lawrence Berg,Howard Lune,2014 Qualitative Research Methods collection organization and analysis strategies This text shows novice researchers how to design collect and analyze qualitative data and then present their results to the scientific community The book stresses the importance of ethics in research and taking the time to properly design and think through any research endeavor

Graph Theory with Applications to Engineering and Computer Science Narsingh Deo,1974 Because of its inherent simplicity graph theory has a wide range of applications in engineering and in physical sciences It has of course uses in social sciences in linguistics and in numerous other areas In fact a graph can be used to represent almost any physical situation involving discrete objects and the relationship among them Now with the solutions to engineering and other problems becoming so complex leading to larger graphs it is virtually difficult to analyze without the use of computers This book is recommended in IIT Kharagpur West Bengal for B Tech Computer Science NIT Arunachal Pradesh NIT Nagaland NIT Agartala NIT Silchar Gauhati University Dibrugarh University North Eastern Regional Institute of Management Assam Engineering College West Bengal Univerity of Technology WBUT for B Tech M Tech Computer Science University of Burdwan West Bengal for B Tech Computer Science Jadavpur University West Bengal for M Sc Computer Science Kalyani College of Engineering West Bengal for B Tech Computer Science Key Features This book provides a rigorous yet informal treatment of graph theory with an emphasis on computational aspects of graph theory and graph theoretic algorithms Numerous applications to actual engineering problems are incorpo rated with software design and optimization topics

Introduction to Languages and the Theory of Computation John C. Martin,2003 Provides an introduction to the theory of computation that emphasizes formal languages automata and abstract models of computation and computability This book also includes an introduction to computational complexity and NP completeness

Principles of Management David S. Bright,Anastasia H. Cortes,Eva Hartmann,2023-05-16 Black white print Principles of Management is designed to meet the scope and sequence requirements of the introductory course on management This is a traditional approach to management using the leading planning organizing and controlling approach Management is a broad business discipline and the Principles of Management course covers many management areas such as human resource management and strategic management as well as behavioral areas such as motivation No one individual can be an expert in all areas of management so an additional benefit of this text is that specialists in a variety of areas have authored individual chapters

Basic Civil Engineering S. S. Bhavikatti,2019

Basic Electrical Engineering Mehta V.K. & Mehta Rohit,2008 For close to 30 years Basic Electrical Engineering has been the go to text for students of Electrical Engineering Emphasis on concepts and clear mathematical derivations simple language coupled with systematic development of the subject aided by illustrations makes this text a fundamental read on the subject Divided into 17 chapters the book covers all the major topics such as DC Circuits Units of Work Power and Energy Magnetic Circuits fundamentals of AC Circuits and Electrical Instruments and Electrical Measurements in a straightforward manner for students to understand

Engineering Mathematics-II A. Ganeshi, 2009 About the Book This book Engineering Mathematics II is designed as a self contained comprehensive classroom text for the second semester B E Classes of Visveswaraiah Technological University as per the Revised new Syllabus The topics included are Differential Calculus Integral Calculus and Vector Integration Differential Equations and Laplace Transforms The book is written in a simple way and is accompanied with explanatory figures All this make the students enjoy the subject while they learn Inclusion of selected exercises and problems make the book educational in nature It shou

Discrete Mathematical Structures for Computer Science Bernard Kolman, Robert C. Busby, 1987 This text has been designed as a complete introduction to discrete mathematics primarily for computer science majors in either a one or two semester course The topics addressed are of genuine use in computer science and are presented in a logically coherent fashion The material has been organized and interrelated to minimize the mass of definitions and the abstraction of some of the theory For example relations and directed graphs are treated as two aspects of the same mathematical idea Whenever possible each new idea uses previously encountered material and then developed in such a way that it simplifies the more complex ideas that follow

Digital Electronics Anil K. Maini, 2007-09-27 The fundamentals and implementation of digital electronics are essential to understanding the design and working of consumer industrial electronics communications embedded systems computers security and military equipment Devices used in applications such as these are constantly decreasing in size and employing more complex technology It is therefore essential for engineers and students to understand the fundamentals implementation and application principles of digital electronics devices and integrated circuits This is so that they can use the most appropriate and effective technique to suit their technical need This book provides practical and comprehensive coverage of digital electronics bringing together information on fundamental theory operational aspects and potential applications With worked problems examples and review questions for each chapter Digital Electronics includes information on number systems binary codes digital arithmetic logic gates and families and Boolean algebra an in depth look at multiplexers de multiplexers devices for arithmetic operations flip flops and related devices counters and registers and data conversion circuits up to date coverage of recent application fields such as programmable logic devices microprocessors microcontrollers digital troubleshooting and digital instrumentation A comprehensive must read book on digital electronics for senior undergraduate and graduate students of electrical electronics and computer engineering and a valuable reference book for professionals and researchers

Engineering Electromagnetics William H. Hayt, Jr,

Matrix Analysis of Structures SI Version Aslam Kassimali, 2012-08-08 This book takes a fresh student oriented approach to teaching the material covered in the senior and first year graduate level matrix structural analysis course Unlike traditional texts for this course that are difficult to read Kassimali takes special care to provide understandable and exceptionally clear explanations of concepts step by step procedures for analysis flowcharts and interesting and modern examples producing a technically and mathematically accurate presentation of the subject Important Notice Media content referenced within the product description or the product text may not be available in the ebook version

Category Theory in Context Emily Riehl, 2017-03-09 Introduction to concepts of category theory categories functors natural transformations the Yoneda lemma limits and colimits adjunctions monads revisits a broad range of mathematical examples from the categorical perspective 2016 edition

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