



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeeppiaar Naagar, Rajiv Gandhi Salai, Chennai - 600 119.
www.sathyabama.ac.in



DEPARTMENT OF BIOMEDICAL ENGINEERING

BOARD OF STUDIES – 2016 - 2017 (ODD Semester)

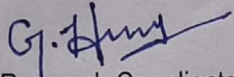
Minutes of the Meeting

03-06-2016

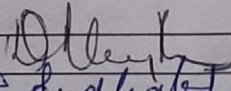
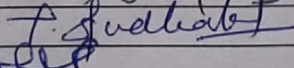
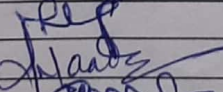
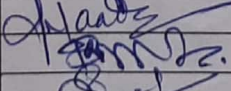
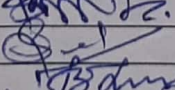
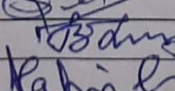
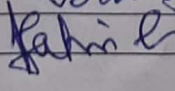
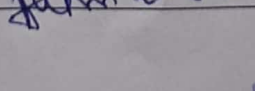
1. As per discussion with the BOS members the new syllabus was introduced for the Batch 2015 onwards, a few core subjects such as Basic Electronic Devices (SEC1217), Radioimaging & therapeutics (SBM1205), Linear Electronic Circuits (SEC1219)
2. The Courses SBM1201 (Bioinstrumentation & measurements) in Unit II Analog and instruments. Few new topics were included viz electrodyamometer and its types.
3. SBM1205 – Radioimaging & therapeutics has been shifted from 5th Semester to 4th semester in order to understand the continuity of core papers viz Diagnostic instrumentation.

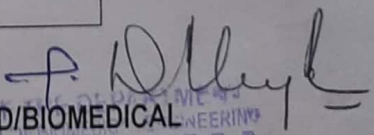
Members of Board of studies – Biomedical Engineering

EXTERNAL MEMBERS

1. Dr. G. Harikrishnan, 
Associate Professor & Research Coordinator,
Department of Electrical & Electronics Engg.,
Sree Vidyanikethan Engg. College, Tirupati

INTERNAL MEMBERS

S.No.	Name of the Internal Member	Signature
1	Dr. Daniel Alex Anand	
2	Dr. T. Sudhakar	
2	Dr. J. Premkumar	
3	Dr. Anima Nanda	
4	Dr. S. Krishnakumar	
5	Ms. Sindu Divakaran	
6	Ms. Bethanney Janney	
7	Ms. A. Sabarivani	


HOD/BIO MEDICAL
DEPARTMENT OF BIOMEDICAL ENGINEERING
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S.No.	Course Code	Course Name	Deleted Topics	Added Topics
1	SBM1201	Bioinstrumentation & Measurements	NIL	Electrodynamometer type instruments Basic Electrodynamometer type instrument Electrodynamometer type Ammeter and Electrodynamometer type voltmeter - Construction and working principle

SBMX1001	BIOINSTRUMENTATION AND MEASUREMENTS	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

UNIT- I INTRODUCTION 10

Function elements of measuring instrument-performance characteristics of instruments – static, dynamic - dynamic-errors in measurement-types of errors-sources of errors-statistical analysis. Calibration and standards-process of calibration. Bridge Circuits –Wheatstone bridge. Maxwell's Inductance capacitance bridge, Wein's bridge.

UNIT- II ANALOG INSTRUMENTS 10

Construction and working principle- D'arsonval galvanometer, moving coil instruments-permanent magnet moving coil instrument, dynamometer instrument, moving iron instruments –attraction type, repulsion type, DC Potentiometer ohmmeter.

UNIT-III DIGITAL INSTRUMENTS 10

Comparison between analog and digital instruments –basic building block of a digital instrument- ramp type digital voltmeter – digital frequency meter - digital phase meter –digital storage oscilloscope.

UNIT-IV SIGNAL GENERATION AND ANALYSIS 10

Standard signal generator-a.f.sine and square wave generator-function generator-function generator –RF generator. Basic Wave Analyzer –heterodyne wave analyzer-spectrum analyzer –spectrum analyzer-Harmonic distortion analyzer.

UNIT-V DISPLAY DEVICES AND RECORDERS 10

Digital Display System and Indicators-classification of display devices-CRT-DOT MATRIX display-light crystal display –strip chart recorders, galvanometer type recorders –self balancing type potentiometric recorders-magnetic tape & disk recorders.

TOTAL NUMBER OF PERIODS: 50

TEXT BOOKS:

1. A. K. Sawhney "A course in electronic Measurements and Instruments", Dhanpat Rai sons, 1991 (Unit: I, II & III)
2. H.S. Kalsi "Electronic Instrumentation & Measurement" Tata McGraw HILL, 1995 (Unit: IV & V).

REFERENCES:

1. W.D cooper and A. D. Helfrick, "Electronic Instruments and Measurements Techniques", Prentice Hall of India-1991
2. E. O. Doebelin, "Measurement System – Application & Design", Mc Graw Hill, 1990

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Part A: 10 questions of 2 marks each – No Choice -

Part B: 5 questions from each of the FIVE units of internal Choice, Each carries 12 marks. -

Exam Duration: 3 hrs

20 marks

60 marks

SBM1201	BIOINSTRUMENTATION AND MEASUREMENTS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the static and dynamic behavior of analog and digital instruments and basic construction and working of AC and DC instruments for measurement of Voltage and Current.
- To obtain basic knowledge of digital instruments for measurement of voltage and current.
- To study signal generator and signal analysis. Also to study the different output devices analog and digital recorders.

UNIT 1 INTRODUCTION

9 Hrs.

Function elements of measuring instrument, Error in Measurement, Sources of Error, Static Characteristics: Accuracy, Sensitivity, Reproducibility, Drift, Static error types and Dead zone, Dynamic Characteristics: Speed of Response, Fidelity, Lag and Dynamic Error, Dynamic response of different order systems, Statistical Analysis: Mean, Deviation, Average deviations and Standard deviations, Measurement Standards, Bridge Circuits: Wheatstone bridge, Maxwell's bridge and Wein's bridge.

UNIT 2 BASICS OF ANALOG INSTRUMENTS

9 Hrs.

D'arsonval Galvanometer, Moving coil Instruments: Permanent magnet moving coil instrument, PMMC ammeter and PMMC voltmeter, Ohmmeter: Shunt type and Series type. Moving iron instruments: Attraction type, Repulsion type, MI Ammeter and MI Voltmeter, Electrodynamometer type instruments: Basic Electrodynamometer type instrument, Electrodynamometer type Ammeter and Electrodynamometer type voltmeter - Construction and working principle.

UNIT 3 BASICS OF DIGITAL INSTRUMENTS

9 Hrs.

Comparison between analog and digital instruments, Basic building block of a digital instrument, Ramp type digital voltmeter, Digital frequency meter, Digital phase meter and Digital storage oscilloscope.

UNIT 4 SIGNAL GENERATION AND SIGNAL ANALYSIS

9 Hrs.

Standard signal generator, AF Sine and square wave generator, Function generator, RF generator, Basic Wave Analyzer, Heterodyne wave analyzer Spectrum analyzer and Harmonic distortion analyzer.

UNIT 5 DISPLAY DEVICES AND RECORDERS

9 Hrs.

Digital Display System and Indicators: Classification of display devices, DOT MATRIX display, LED Seven Segment display, LED matrix display, LCD seven segment display, Recorders: Graphic Recorders - Strip chart recorders, Galvanometer type recorders and Self balancing type potentiometric recorders, Magnetic tape recorders and Disc recorders

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. A. K. Sawhney, A course in electronic Measurements and Instruments, Dhanpat Rai sons, 1991.
2. H.S. Kalsi, Electronic Instrumentation & Measurement, Tata McGraw HILL, 1995
3. W.D cooper and A. D. Helfrick, Electronic Instruments and Measurements Techniques, Prentice Hall of India-1991
4. E. O. Doebelin, Measurement System - Application & Design, Mc Graw Hill, 1990

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

PART A: 10 questions of 2 marks each - No choice

PART B: 2 questions from each unit of internal choice; each carrying 12 marks

Exam Duration : 3 Hrs.

20 Marks

60 Marks



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DEPARTMENT OF BIOMEDICAL ENGINEERING

BOARD OF STUDIES – 2016 - 2017 (EVEN Semester)

Minutes of the Meeting

02-11-2016

1. As per discussion with the BOS members, the practical oriented course like Medical Pathology (SBM1206) in Unit V Pathological techniques has been included to learn the staining techniques to enhance the hand skills.
2. The Courses SBM1207 (Biosignals & systems) shifted from Sem III to Sem IV to know the basics of transform, Laplace and Fourier. In the subject sampling theorem has been included to know the reconstruction of signal from its sample and effect of sampling.
3. SEC1218 –Fundamental of digital systems in Unit II Basic of Logic Gates & minimization techniques have been added.
4. SEC1219 – Linear Electronic Circuits – A new subject has been introduced which gains the knowledge to implement in professional training.

Members of Board of studies – Biomedical Engineering

EXTERNAL MEMBERS

Dr. G. Harikrishnan, Associate Professor & Research Coordinator,
Department of Electrical & Electronics Engg.,
Sree Vidyanikethan Engg. College, Tirupati

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HEAD OF THE DEPARTMENT
DEPARTMENT OF BIOMEDICAL ENGINEERING
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Chennai - 600 119

S.No.	Course Code	Course Name	Deleted Topics	Added Topics
1	SBM1206	Medical Pathology	Unit IV & V - Autosomal & sex linked disorders, hypersensitive reactions, autoimmune diseases Unit III - chlamydiae, mycoplasma, rickettsial	Unit V - Pathological techniques Unit III - Infectious diseases - bacteria, fungi, protozoan Unit IV - Skin disorder, renal disorder
2	SEC1218	Fundamentals of Digital systems	Unit III - ALU model & comparator model Unit IV - Implication chart method Unit V - PAL, HCT/HC series IC's	Unit II - introduction to logic gates Unit IV - state assignment
3	SBM1205	Radioimaging & therapeutics	NIL -	Unit I - V. Based on industrial demands majority of topics was revised like element of radiation, radiotherapy, radioimaging techniques, radiation generator, radio diagnosis, radio safety measures
4	SBM1207	Biosignals & Systems	NIL	Sampling theorem - Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling Aliasing, Introduction to Band Pass sampling- Examples related to physiological signals

SBMX1004	MEDICAL PATHOLOGY	L	T	P	CREDITS	TOTAL MARKS
		3	0	0		

UNIT- I NORMAL CELL STRUCTURE

10

Cell Degeneration and regeneration-Inflammations, Pathologic Processes that occur in human body, Inflammation-full process. Apoptosis, Degeneration, Enlargement and Atrophy of organs. Hypertrophy Neoplasia. Basic classification, Difference between benign and malignant tumors - Etiology of tumors - Spread of Tumors.

UNIT-II FLUID AND HEAMODYNAMIC DERANGEMENT

10

Edema, Shock, Hemorrhage – Thrombus –Embolism - Disseminated intra vascular Coagulation-Hematological disorders. Bleeding Disorders - Leukemia-lymphoma.

UNIT- III INFECTION AND PATHOLOGICAL PROCESSES

10

Bacteria, fungi and virus as potential pathogens, mechanism of pathogenecity, mechanism of development of resistance. Bacterial- Chlamydial, Mycoplasma, Rickettsial disease - Fungal, protozonal - Helminthic disease.

UNIT- IV GENETIC DISORDERS AND IMMUNITY

10

Autosomal and sex linked disorders- Storage disorders -Types of hypersensitivity reactions - Immune deficiency syndrome - Primary-HIV- Autoimmune diseases - SCID, SLE, Rheumatoid arthritis

UNIT- V DISORDERS

10

Genetic basic of disease - three major classes of genetic disease - chromosomal, monogenic, multifactorial. Molecular basic of Diabetes. Respiratory disorder - Cystic Fibrosis. Tuberculosis and Bronchitis. Cancer - genetic and molecular basis. Neuropsychiatric disorders - Parkinson's disease, Alzheimer's disease.

TOTAL NUMBER OF PERIODS: 50**TEXT BOOK:**

1. Robbins S.L. &Ramzi S.C, "Pathologic Basic of Diseases", W.B. Saunders Co. 7 th Edition 1999 (Unit I – V)

REFERENCES:

1. Anatha Narayanan.R & Jayaram Panicker C.R, "Text Book of Microbiology", Orient Laongman 4thEdition1998. (UnitIII)
2. Janis Kuby, "Immunology", W.H. Freeman and Company, New York, 5thEdition, 2003 (Unit IV)

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Part A: 10 questions of 2 marks each –No Choice-

Part B: 5 questions from each of the FIVE units of internal Choice, Each carries 12 marks. -

Exam Duration: 3 hrs

20 marks

60 marks

SBM1206	MEDICAL PATHOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This paper has a basic science curriculum and is a bridge between basic sciences and clinical medicine. It is the field that studies the cause and diagnosis of disease.
- The science of pathology involves the exploration of the mechanisms of disease and how events at the level of the cell affect the patient as a whole.
- In addition to attending lectures, students regularly meet with instructors in laboratories and participate in clinical-pathological correlation and participate in conferences.

UNIT 1 INFLAMMATION AND NEOPLASIA

9 Hrs

Introduction to Pathology, Classification, Cell injury - Necrosis - etiology, pathogenesis, reversible and irreversible cell injury, Inflammations - acute and chronic, Pathologic Processes, Apoptosis, atrophy of organs. Hypertrophy, Neoplasia - Basic classification, Difference between benign and malignant tumors - Etiology and Spread of tumors.

UNIT 2 FLUID AND HEMODYNAMIC DERANGEMENT

9 Hrs.

Edema, Shock, Hemorrhage - Thrombus - Embolism - Disseminated intra vascular Coagulation - Hematological disorders. Bleeding Disorders - Leukemia - lymphoma.

UNIT 3 INFECTIOUS DISEASES

9 Hrs

Bacteria, fungi and virus as potential pathogens, mechanism of pathogenicity, mechanism of development of bacterial resistance. Bacterial - Plague, syphilis, Staphylococcus, Streptococcus, Clostridial diseases, Fungal - Dermatophytosis, Mycetoma, Candidiasis, Aspergillosis, Protozoan - Amoebiasis, Helminthes - Filariasis disease. Viruses - Influenza

UNIT 4 IMMUNE DISORDERS

9 Hrs

Immune deficiency syndrome - Primary HIV - Molecular basis of Diabetes. Respiratory disorder - Cystic Fibrosis. Tuberculosis, Neuropsychiatric disorders - Parkinson's disease, Alzheimer's disease, **skin disorders**, Eczema, Psoriasis, **Renal disorders**.

UNIT 5 PATHOLOGICAL TECHNIQUES

9 Hrs

Autopsy and Surgical Pathology - Special stains - Histochemistry - H&E, Toluidine Blue, Silver, Trichrome, PTAH, Giemsa, **Enzyme Histochemistry**, Cryostat, Immunohistochemistry, FISH, PAP - Molecular pathology - In situ hybridization

Max. 45 Hours

TEXT / REFERENCE BOOKS:

1. Robbins S.L. & Ramzi S.C, Pathologic Basis of Diseases, W.B. Saunders Co. 7th Edition, 1999.
2. Harsh Mohan, A Text book of Pathology, Jaypee Brothers, Medical Publishers (P) Ltd, 6th Edition. 2006.
3. Anatha Narayanan.R & Jayaram Panicker C.R, Text Book of Microbiology, Orient Longman 4th edition 1998.
4. Janis Kuby, Immunology, W.H. Freeman and Company, New York, 5th Edition, 2003

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 80

Exam Duration : 3 Hrs.

PART A: 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice; each carrying 12 marks

60 Marks

SEC1218	FUNDAMENTALS OF DIGITAL SYSTEMS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- Apply Boolean algebra and other techniques to express and simplify logic expressions
- Analyze and design combinational and sequential digital systems
- Use different techniques, among them a hardware description language and a functional programming language, to design digital systems

UNIT 1 NUMBER SYSTEM AND BOOLEAN ALGEBRA

9 Hrs.

Introduction to number systems- Types and Conversions, Binary Arithmetic, Signed Binary Numbers, Binary Codes - BCD, ASCII, Excess-3 codes, Gray codes, Code conversion, Boolean Algebra - De-Morgans Theorem, Reduction of Switching Equations Using Boolean Algebra.

UNIT 2 LOGIC GATES AND MINIMIZATION TECHNIQUES

9 Hrs.

Introduction to logic gates: Design of two level gate network-Two level NAND-NAND and NOR-NOR networks, Universal property of NAND and NOR gates, Standard forms of Boolean equation- Minimization of SOP and POS- Karnaugh maps - Advantages and Limitations- Quine-Mcclusky Methods.

UNIT 3 COMBINATIONAL CIRCUITS

9 Hrs.

Binary Adder- Subtractor, Parallel Binary Adder, Parallel Binary Subtractor, Parallel Adder/ Subtractor, Decoders, Encoders, Priority Encoders, Multiplexers and De Multiplexer, Magnitude Comparators- one bit and two bit.

UNIT 4 SEQUENTIAL CIRCUITS

9 Hrs.

Flip flops - SR, JK, T, D, Master slave FF, Characteristic and Excitation table, Shift Registers, Counters- two bit and three bit Asynchronous and Synchronous Counters- UP/DOWN Counter, State Diagram representation of flip flops, State Minimization Techniques

State Assignment

UNIT 5 LOGIC FAMILIES AND MEMORIES

9 Hrs.

Classification and Characteristics of Logic Families - Operation of RTL, DTL, HTL, ECL, MOS and CMOS- Comparison of Logic Families Memories-Random Access Memory - Static RAM, Dynamic RAM, Read Only Memory, Programmable memory- EPROM, EEPROM, Charge Coupled Devices.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Morris Mano, Digital Design , Prentice Hall of India, 2001.
2. Ronald J. Tocci, Digital System Principles and Applications, PHI, 6th Edition, 1997.
3. Charles H. Roth, Fundamentals Logic Design , Jaico Publishing, IV Edition, 2002
4. Floyd, Digital Fundamentals , Universal Book stall, New Delhi, 1986.
5. R. P. Jain, Modern Digital Electronics , Tata McGraw Hill, 3rd edition, 1997.
6. Malvino A.P. and Donald P. Leach, Digital Principles and Applications, 4th Edition, Tata McGraw Hill, 2007

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

PART A: 10 questions of 2 marks each - No choice

PART B: 2 questions from each unit of internal choice; each carrying 12 marks

Exam Duration : 3 Hrs.

20 Marks

60 Marks

SBMX1007	RADIOLOGY	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

UNIT- I 10

Radioactive elements, Radioactive decay, alpha decay, beta decay, positron decay, decay energy and half-life. Heisenberg uncertainty principle-Radiation units-Roentgen, Rad - rem - sievert-X ray film processing, Intensifying screens.

UNIT- II 10

Fluoroscopy, Angiography, Image intensifier, PET, SPECT, collimators, grids - bucky grids.

UNIT- III 10

Radioisotopes in medicine – COBALT-60, linac, gammacamera, Nuclear scintigraphy, ISODOSE Chart.

UNIT- IV 10

Laser chart - Einstein's coefficient's – its significance-population inversion - Nd.YAG – He - Ne Co2 laser – Holography – Recording & Reconstruction.

UNIT- V 10

Protective barrier-primary & secondary somatic & genetic effects of radiation-LD 50/30 effect of radiation on skin, blood forming organs, Radiation carcinogenic, permissible, occupation doses, dosimetry.

TOTAL NUMBER OF PERIODS: 50

TEXT BOOKS:

1. Thomas S. Curry, III, James E. Dowdey, Robert C. Murry J R., Christensen "The Physics of Diagnostic Radiology" Lea & Febiger 4th edition 1990 (Unit – I & V)
2. W.T Meridith & J.B Massey, "Fundamental Physics of Radiology", Wright; 2nd edition (March 15, 1972) (Unit – III)

REFERENCES:

1. Gopal, B. Saha, "Physics & Radiology of nuclear medicine", Springer 2nd Edition, 2006
2. R.S Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill Publishing company Ltd, New Delhi, 1997. (Unit – II & IV)

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Part A: 10 questions of 2 marks each - No Choice

Part B: 5 questions from each of the FIVE units of internal Choice, Each carries 12 marks

Exam Duration: 3 hrs
20 marks
60 marks

B. Tech (Biomedical Engineering)

30

2010 SYLLABUS

SBM1205	RADIO IMAGING AND THERAPEUTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- ☑ To obtain the knowledge about the specialty of medicine those deals with the study and application of imaging technology and enable the students to understand about radiation therapy and effects of radiation.

UNIT 1 ELEMENTS OF RADIATION 9 Hrs
 Radioactive elements and Radioisotopes in medicine, Radioactivity, General properties of alpha, beta and gamma rays - Laws of radioactivity, Radioactive decay - alpha decay, beta decay, positron decay, decay energy and half-life. Radiation units-Roentgen, Rad - rem - sievert. Radiation sources - Natural and artificial radioactive sources.

UNIT 2 RADIATION GENERATORS 9 Hrs
 Particle Accelerators- Cyclotron, Klystron, Magnetron, Cascade generator, Van De Graff generator. X ray films, X ray film processing, X Ray cassettes, Intensifying screens-New phosphor technology, Photostimulable phosphor imaging.

UNIT 3 RADIO DIAGNOSIS 9 Hrs
 Fluoroscopy, Digital radiography, Angiography, Image intensifier, PET, SPECT, collimators, grids - bucky grids, Body section radiography, Xeroradiography.

UNIT 4 RADIOTHERAPY 9 Hrs
 COBALT-60, Linac, Gamma camera, Nuclear scintigraphy, Brachytherapy, Cyber Knife, Gamma knife, Intraoperative radiotherapy.

UNIT 5 RADIATION SAFETY MEASURES 9 Hrs
 Radiation Protection, Protective barrier-primary & secondary, Equivalent Dose, Biological effects of radiation. Somatic & genetic effects of radiation-LD 50/30, Effect of radiation on skin, blood forming organs, Personnel and area monitoring systems. Radiation measuring devices -dosimeter, survey meter.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Thomas S. Curry, III, James E. Dowdey, Robert C. Murry JR., Christensen The Physics of Diagnostic Radiology Lea & Febiger 4th edition 1990.
2. Faiz M. Khan, The Physics of Radiation Therapy, 4th edition, 2009.
3. Gopal, B. Saha, Physics & Radiology of nuclear medicine, Springer 2nd Edition, 2006.
4. R. S. Khandpur, Handbook of Biomedical Instrumentation, Tata McGraw-Hill Publishing company Ltd, New Delhi, 1997.
5. K. Thayalan, Basic Radiological Physics, Jaypee Brothers Medical Publishers (P) Ltd., 2001

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 80

PART A: 10 questions of 2 marks each - No choice

PART B: 2 questions from each unit of internal choice; each carrying 12 mark

Exam Duration : 3 Hrs.

20 Marks

60 Marks