Preface (Latest Revised Edition)

Electronics is such type of branch of science in which new inventions and development of new devices and equipments is a continuous process. Importance of Electronics and Computer systems has been well established. In current era, in almost every sphere of life electronic and computer devices are being used extensively. This book presents related basic principles of electronics and computer with a simple and easy approach in a systematic manner so that readers can understand and grasp the subject matter.

I hope that this effort of mine will prove to be fulfilling to the aspirations of teachers and students.

Salient features of the book:

- Presentation of subject matter in lucid and simple way.
- Presentation of related formulae in standard signs.
- Clear and understandable illustrations and figures.
- Clear description of active and inactive components of electronics.
- Number system used in computers, Gates and Combinational logic gates based devices clearly described.
- Black and white and colour television presented in clear detailed description.

- A K. Mittal

Contents

1.	INTRODUCTION1 - 6
	Sound, Telephone, Wireless, Radio, Television, Electronics, Safety Precautions, First Aid, Artificial Respiration, Fire, Extinguishing, Earthing.
2.	ELECTRICITY
	Atomic Structrure. Ion and Ionisation, Electric Current, Types of Electric Current, Electromotive force, E.M.F., Resistance, Conductance, Basic Electrical Terms, Power and Energy, Conductors, Insulators and Semiconductors, Effects of Current, Standard Wire Gauge, Exercises.
3.	RESISTANCE
	Introduction, Resistance Law, Specific Resistance, Temperature Co-efficient, Ohm's Law, Consumption of Electrical Power, Resistors in Series, Resistors in parallel, Kirchhoff's Law, Wheatstone Bridge, Exercises.
4.	RESISTORS
	Introduction, Carbon Resistors, Characteristics of Carbon Resistors, Colour Code, Tolerance, Power Rating, Stability, Reliability, Wire Wound Resistors, Characteristics of Wire Wound Resistors, Potentiometers, Special Type of Resistors, Exercises.
5.	CELL AND BATTERY
	Introduction, Voltaic Cell, Daniel Cell, Lechlanche Cell, Dry Cell, Lead Acid Cell, Edison Cell or Nickel-iron Cell, Nickel Cadmium Cell, Source and Load E.M.F., Grouping of Cells, Capacity of A Battery, Battery Charging, Battery Charger, Charged and Discharged Conditions of a Battery, Relative Density and Hydrometer, Maintenance of Batteries, Solar Cell, Silver Oxide Cell, Exercises.
6.	MAGNETISM AND ELECTROMAGNETISM
	Magnet, Properties of a Magnet, Molecular Theory of Magnetism, Types of Magnets, Magnetic Keepers, Magnetic Needle, Magnetic Field, Magnetic Flux and Flux Density, Electromagnetism, Permeability, Magnetic Induction, Intensity of Magnetic Field, Intensity of Magnetisation, Magnetic Susceptibility, Magneto Motive Force, Retentivity, Hysteresis, Coercivity, Electromagnet, Electric Bell, Electro Magnetic Relay, Exercises.
7.	A.C. ALTERNATORS, GENERATORS AND MOTORS52 - 70
	Electromagnetic Induction, Faraday's Laws of Electromagnetic, Induction, Fleming's Right Hand Rule, Simple Alternator, Sine-curve and Cycle, Frequency, Time Period, Different Values of A.C., Phase, Power Factor, Wave-length and Velocity, Dynamo or Generator, Dynamo Efficiency, Motor, Fleming's Left Hand Rule, Armature Reaction, Lenz's Law, Starter. Types of Alternators, Types of Generators, Types of D.C. Motors, Speed Control of D.C. Motors, Types of A.C. Motors, L.P. Motor, Stepper Motor, Exercises.
8.	INDUCTANCE
	Induction, Inductance, Self Inductance, Mutual Inductance, Coefficient of Coupling, Coupling Impedance, Inductance Reactance, Lagging of Current in an Inductive Circuit, Time Constant, Inductors in Series, Inductors in Parallel, Exercises.
9.	INDUCTORS AND TRANSFORMERS
	Inductors, Non-inductive Coils, Inductor's Winding, Transformers, Advantages of Transformers, Classification of Transformers, Transformers Classified as per Core, Transformers Classified

	as per Output, Transformers Classified as per use, Turns Ratio, Transformer Efficiency, Impedance Ratio, Transformer on Load and No-load, Transformer Losses, Skin Effect, Shielding, Exercises.
10.	CAPACITANCE
	Capacity, Electrostatic Action, Capacitive Reactance, Lagging of Voltage in a Capacitive Circuit, Time Constant, Capacitors in Series, Capacitors in Parallel, Capacity of a Parallel Plate Capacitor, Stray Capacitance, Exercises.
11.	CAPACITORS98 - 106
	Capacitors, Classification of Capacitors, Fixed Capacitors, Adjustable Capacitors, Variable Capacitors, Capacitor Losses, Factors to be Observed while Choosing a Capacitor, Capacitance and Temperature Relation, Capacitor's Colour Code, Exercises.
12.	A.C. CIRCUITS 107 - 118
	Introduction, Pure Resistive A.C. Circuit, Series <i>R-L</i> circuit, Series <i>R-C</i> Circuit, Series <i>L-C</i> Circuit, Series <i>L-C-R</i> Circuit, Parallel <i>R-L</i> Circuit, Parallel <i>R-C</i> Circuit, Admittance, Parallel <i>L-C</i> Circuit, Parallel <i>L-C-R</i> Circuit, Exercises.
13.	RESONANCE
	Mechanical Resonance, Electrical Resonance, Resonance Frequency, Series Resonant Circuit, Series Resonance Curve, Selectivity, Circuit-Q, Bandwidth of Resonance Curve, Parallel Resonant Circuit, Parallel Resonance Curve, Exercises.
14.	ELECTRICAL MEASURING INSTRUMENTS 127 - 141
	Introduction, Torques of Indicating Instruments. Electrostatic Voltmeter, Moving Coil Meter, Current Measurement, Voltage Measurement, Moving Iron Meter, Hot Wire Meter, Thermocouple Meter, Ohm Meter, Multimeter, Watt Hour Meter, Megger (insulation Tester), Wave Meter, Sensitivity of a Measuring Instrument, Accuracy of a Measuring Instrument, Clamp Tester, Exercises.
15.	SOUND AND SOUND INSTRUMENTS
	Sound, Frequency and Wavelength, Classification of Sound Waves, Articulation of Sound, High Fidelity Sound, High Quality Sound, Record Sound, Harmonic Frequencies, Decibel, Microphone, Carbon Microphone, Crystal Microphone, Dynamic Microphone, Ribbon Microphone, Capacitor Microphone, Pressure and Velocity Operated Microphones, Headphone, Earphone, Loudspeaker, Permanent Magnet Dynamic Loudspeaker, Electro-dynamic Loudspeaker, Unit Loudspeaker, Column Speaker, Microphone Mirror, Exercises.
16.	INTRODUCTION TO THERMIONIC VALVES 154 - 167
	Introduction, Electron Emission, Diode Valve, Cathode, Anode, Valves Envelope, Space-charge, Emission Current, Diode's Characteristics, Triode Valve, A, B, C, Supplies, Triode's Characteristics, Valve Constants, Inter-electrode Capacity, Tetrode Valve, Secondary Emission, Pentode Valve, Beam Power Tube, Supercontrol Tube, Photo Tube, Cold Cathode or Neon Tube, Mercury Vapour Tube, Thyratron Tube, Ignitron Tube, Tuning Indicator Tube, Cathode Pay Tube, Multiunit Tubes, Valve Socket, Exercises.
17	JUNCTION DIODES AND TRANSISTORS 168 - 184
813	Introduction, Semi-conductor, 'p' and 'n' Type Materials, p-n Junction Diode, Effect of Temperature on Diodes, Transistor, Construction of Transistors, Working of A p-n-p Transistor, Working of a n-p-n- transistor, Transistor Characteristics, Transistor Gain, Transistor Connection, Transistor Biasing, Transistor Numbering, Transistor Bases. Thermal Runway and Heat Sink, Exercises.

18.	SPECIAL SEMICONDUCTOR DEVICES
	Introduction, Zener Diode, Tunnel Diode, L.E.D. (light Emitting Diode), Varactor Diode, Photo Conductive Cell, Photo Voltaic Cell, Tetrode Transistor, UJT (Uni Junction Transistor), FET (Field Effect Transistor), MOSFET (Metal Oxide Semiconductor Field Effect Transistor), SCR (Silicon Controlled Rectifier), GTO (Gate Turn-off) Switch, SCS (Silicon Controlled Switch), SBS (Static Bypass Switch), TRIAC, DIAC, I.C. (Integrated Circuit), Classification of I.Cs., Construction of an I.C., Exercises.
10	RECTIFIERS AND POWER SUPPLIES
17.	
	Introduction, Rectification, Classification of Rectifier Circuits, Half-wave Rectifier, Full Wave Rectifier, Comparison of Half-wave and Full-wave Rectifiers, Bridge Rectifier, Battery Eliminator. Ripple Frequency, Ripple Factor, Rectifier Ratings, Voltage Doubler, 3-phase Rectifier, Filter Circuits, Classification of Filter Circuits, Filter Circuits According to Work,
118	Filter Circuits According to Input Component, Filter Circuits Classified as per Circuit Design, Voltage Regulation, Alpha and Beta Cut-off Frequencies, Bleeder Resistor, Power Supplies. A.C. Mains Power Supply, Voltage Stabiliser Type Power Supply, Voltage Regulator Type Power Supply, Converter Type Power Supply, Inverter Type Power Supply, SMPS (Switch Mode Power Supply), UPS (Uninterruptible Power Supply), Speed Control of D.C. Motors, Exercises.
20	
20.	
IH.	Introduction, Amplification, Classification of Amplifiers, Amplifiers Classified on the Basis of Frequency, Amplifiers Classified on the Basis of Ability, Amplifiers Classified on the Basis of Coupling Methods, Amplifiers Classified on the Basis of Power, Cascade Amplifier, Bias Stabilization, Feedback, Negative Feedback Amplifier Circuits. Emitter Follower, Frequency Response, Distortion, Impedance Matching, Optimum Load, Volume Control, Tone Control, Decoupling, Neutralising, High Frequency Transistor Limitations, Public Address Amplifier, Magnetic Amplifier, Exercises.
21.	INTERCOM AND STEREO SYSTEM
	Intercom, Loudspeakers Type Intercom, Telephone Handset Type Intercom, Exchanges, Cordless Telephone, Stereophonics, Stereo Amplifier, Pre-amplifier, Line Transformer Matching System, Exercises.
22.	OSCILLATORS
	Introduction, Essential Requirements of An Oscillator, Various Types of Oscillators, Tuned Collector Oscillator, Hartley Oscillator, Colpitt's Oscillator, Clapp Oscillator, Crystal Oscillator, Phase Shift R-C Oscillator, Multivibrator, Wein Bridge Oscillator, Neon Lamp Saw-tooth
	Oscillator, Blocking Oscillator, Master Oscillator Power Amplifier or MOPA, Beat Frequency Oscillator or B.F.O., Function Generator, Tone Generation, Exercises.
23.	MODULATION AND DETECTION
	Introduction, Carrier Waves, Signal Wave, Modulation, Types of Modulation, Percent of Modulation, Modulation Index, Side Band, Band Width, Limitations of AM, Amplitude Modulator Circuits, High-level and Low-level Modulation, Frequency Modulator Circuits, Necessity of Detection, Features of a Detector Circuit, Diode Detector, A.V.C. or A.G.C., Simple A.V.C. Circuit, Delayed A.V.C. Circuit, Frequency Modulation Detector Circuits, Limiter or Clipper Circuit, Phase Shift Discriminator, Ratio Detector, Frequency Modulator Circuit, Exercises.
24.	RECEIVERS
	Fundamental Principles of Receivers, Crystal Receiver, T.R.F. Receiver, Heterodyning, Principle of Superheterodyne Receiver, Frequency Converter, Conversion Gain, Superheterodyne Receiver,

	Abilities of a Receiver, Noise Limiter, Image Frequency, Selection of I.F. Tuning Ratio, C.W. Reception, Communication Receiver, F.M. Receiver, Wave Ranges or Frequency Spectrum, Band Switches, Alignment, Printed Circuit Board, Fault Finding, Exercises.
25.	TRANSMITTERS ANTENNAS AND FEEDERS
	Introduction, Carrier Wave Transmitter, V.H.F. Transmitter, A.M. Transmitter, SSB transmission, Power Saving in SSB, F.M. Transmitter, Methods of Keying, Power Controlling, Link Coupling, Transreceiver, Antenna, Principle of Transmitting Antenna, Length of a Transmitting Antenna, Type of Transmitting Antenna, Other Antennas, Feeder or Transmission Line, Aerial Tuning, Exercises.
26.	PROPAGATIONOFRADIO-WAVES
	Introduction, Ionosphere, Types of Radiowave Propagation, Critical Angle, Day and Night Frequencies, Silent Zone, Exercises.
27.	RECORDPLAYERANDRECORDCHANGER
	Introduction, Construction of a Record Player, Record Adjustment and Repair, Record Changer, Stereo Record, Stereo Pick-up, Stereo Broadcasting, Pick-up Characteristics, Stylus Pressure Gauge, Exercises.
28.	TAPERECORDER
2 : (Introduction, Principle of Tape Recorder, Specialities of a Tape Recorder, Recording and Reproducing, Construction of a Tape Recorder, Dictating Machines, Magnetic Head, Erasing Head, Magnetic Tape, Recording Level Indicator, Cassette Tape Recorder, Stereo Tape Recording, Two-in-one, Maintenance of Tape Recorders, Dictaphone, Copier (Tape Recorder), Motors used in Tape Recorders, Car Stereo Cassette Player, Repairing of Tape Recorders, VCP, VCR, CD, Optical Recording, CD Player, DVD Player, Exercises.
29.	OSCILLOSCOPE AND ELECTRONIC TEST INSTRUMENTS
	Introduction, Cathode Ray Tube (CRT), CRO Circuit, Measurement of Voltage and Current, Measurement of Phase and Frequency, Oscilloscope, Impedance Bridge, A.F. Oscillator, B.F.O. (Beat Frequency Oscillator), Output Meter, Signal Generator Pattern Generator, Frequency Modulator, Distortion Analyser, Transistor Tester, P.H. Meter, Digital Voltmeter, Exercises.
30.	TELEVISION
	Introduction, Principle of Movie Picture, Outline off Telecasting, T.V. Frequency Range, TV. Communication Range, Electron Multiplier, T.V. Camera Tube, Scanning, Video Signal, Composite Video Signal, Single Sideband Transmission, Aspect Ratio, Outline of A T.V. Receiver, TV. Circuits, R.F. Tuning, Picture Tube and Associated Circuits, Picture Tube, Video Amplifier, Sync Separator and Wave Shaping Circuits, A.G.C. (Automatic Gain Control), Horizontal Oscillator and Amplifier, E.H.T. (Extra High Tension) Supply, Vertical Oscillator and Amplifier, Sound Section, Fault-finding in T.V. Receivers, Colour Television — Introduction, Compatibility, Primary Colours and Their Mixing, Colour T.V. Camera, Matrix, Colour TV Systems, Composite Colour Plexed Video Signal, Colour TV Receiver, Colour Picture Tube, Fault Finding in CTV, CCTV, LCDTV, LEDTV, PLASMATU, Exercises.
31.	DIGITALELECTRONICS
	Binary System, OCTAL System, HexaDecimal Number System, Binary Arithmetic, Standard Logic Circuits, Universal Logic Circuits, Positive and Negative Logics, Boolean Algebra, Minimization, Minterms and Maxterms, Karnaugh Map (K-Map), Adder, Subtractor, Encoder and Decoder, Multiplexer and Demultiplexer, Flip-flop (FF), Shift registers, Counters, 7-segment display, Digital to Analog (D/A) Converter, Analog to Digital (A/D) converter, Memory, Data Storage Capacity, Digital Codes, Exercises.

32.	MICROPROCESSORS
	Introduction, Block diagram of intel 8085, Pinout diagram of intel 8085, Instruction set of Intel 8085, Addressing modes, Instruction Cycle, Timing Diagram, Interrupts, Memory Mapped I/O and I/O Mapped I/O, Assembly Language Programming, Intel 8086, 32-bit and 64-bit
	Microprocessors, Programmable Peripheral Interface 8255 (PPI 8255), Timer / Counter 8253 / 8254, Interrupt Controller 8259, DMA Controller 8257, Universal Synchronous / Asynchronous Receiver and Transmitter (USART) 8251, Microcontroller, Embedded System, Exercises.
33.	COMPUTERPERIPHERALS
	Introduction, Mother Board, BUS, SLOT, CPU, Coprocessor, Memory Structure, Memory Modules, Memory Bank, Support Chips, BIOS (Basic Input / Output System), Error Detection, FDD (Floppy Disk Drive), HDD (Hard Disc Drive), Pen Drive, Keyboard, Mouse, I/O Cards (Input / Output Cards), Smart card, Exercises.
34.	DIGITAL COMMUNICATION
	Introduction, PCM, Sampling and Quantization, Companding, Encoding, Regeneration and Reconstruction of PCM Wave, Delta Modulation, Limitations of Delta Modulation, Adaptive Delta Modulation, Multiplexing, Digital Modulation Techniques, Microwave, Satellite Communication System, Radar, Direction Finder, Navigation, I.L.S. (Instrument Landing System), Exercises.
35.	NETWORKANDCOMMUNICATION
	Data Communication, Modes of Data Transmission, Narrow Band, Voice Band and Broad Band, Serial and Parallel Communication, RS - 232 or EIA - 232 or TIA - 232, RS - 485 or EIA - 485 or TIA - 485, RS - 422 OR EIA - 422 or TIA - 422, Networking of Computers, LAN (Local Area Network), Ethernet, WAN (Wide Area Network), MAN (Metropolitan Area Network), ARCNET (Attached Resource Computer Network), PROFIBUS (Process Field Bus), Controlnet, Internet, Exercises.
36.	TELEPHONY
	Fundamental Telephone System, Telephone Number, Telephone Line, Telephone Set, Telephone Exchange, Electronic Exchange of SPC System, Cellular Telephone System, Frequency Band Alloted to Cellular Telephone Service, Roaming, GSM (Global System for Mobile), CDMA (Code Division Multiple Access), WILL (Wireless in Local Loop), MDF (Main Distribution Frame), Exercises.
37.	SPECIFICDEVICES
	Induction Heating, Servomechanism, Timer Circuit, Operational Amplifier, D.C. or Direct Coupled Amplifier, Darlington Amplifier, Differential Amplifier, Transducer, Laser, Liquid Crystal Display, Thermocouple, R.T.D., Tacho Generator, Alarm Circuits, Digital Meters, Remote Control, Water Level Sensor and Control Circuit, Exercises.
	APPENDIX
	Computer Hardware and Telephony Terminology
	APPENDIX
	Symbols used in Electronics