VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

F.Y. BSc

Electronics

Paper-I

Electronics Devices & Components

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CONSTRUCTION AND PROPERTIES OF RESISTOR :

Carbon composition. Carbon film, Wire-wound, Logarithmic and linear potentiometer. Colour code, nominal values, Tolerance and Limitation Precession type registers; Pie type and Ayrton perry winding type for non-inductive wire wound resistor. Resistor having P.T.C., V.D.R., L.D.R and its application.

CAPACITOR :

Construction, Dielectric and their types. Dielectric constant, Q-factor, Power factor, Dielectric losses,
Capacitance to size ratio, polar and non-polar capacitance. Breakdown voltage, Kinds of capacitor and its specification.

INDUCTOR :

Construction, Types, design, Core material, their kind and specification, Types of chokes, its frequency limitation and application.

ELECTRONIC TRANSFORMER :

Design of Electronic transformer, Characteristics of electronic power transformer, Characteristics of electronic audio transformer, Design feature of electronic transformer, Current density, Information required by designer, Size of the core, Turns per volt, Wire size, Dimension of core. Audio transformer, Equivalent circuit of audio transformer, Low frequency effect, High frequency response, Transformer symbols, Autotransformer.

SWITCHES :

Types of switches (Toggle, S.P.D.T., D.P.D.T., push to ON/OFF, Multi way switch, Micro switch, Relay, Thumb wheel) Working and application. Types of relay:-Electromagnetic, Reed relay and solid state Relay (Opto couplers). Debounce in switch.

CONNECTOR AND CABLE :

Different types and properties, R.F. connector, BNC connector, IC sockets, Multi-pin RF connector-type connector, Edge connector for PCB, ZIF connector and sockets, Microwave connector, Introduction, characteristics and properties to co-axial cable and UTP cable.

SOLDERS :

Soldering fluxes, Solder alloy ; Tin lead alloy.

TRANSDUCER :

Basic principle and working and construction of strain gauze. Capacitive, LVDT, Piezoelectric, Thermocouple, Thermistor, Microphones and Loudspeaker.

ELECTRONIC IN SOLIDS :

Chemical Bonding, Crystalline structure, Classification of material, Bond Model, Metal insulator, Semiconductor, Trap in semiconductor and recombination, scattering of carrier in semiconductor, Current transport in a semiconductor, Hall effect.

P-N JUNCTION :

Junction formation Technology, Junction behavior-VI Characteristics, Zener and Avalanche breakdown, Zener diode Characteristics, junction diffusion and Transition capacitance, Diode equivalent circuit, Diode equation, Noise in diodes, Switching mechanism and application of Diodes as a switch, Clipper, Clamper etc.

SPECIAL PURPOSE DIODE :

Tunnel diode, Schottky Diode, Photodiode, LED, Solar cell IMPATT, TRAPATT, Gun diode.

BIPOLAR JUNCTION TRANSISTOR :

Construction of BJT, Fundamental of BJT operation. Transistor current composition, Amplification with BJT, Minority current, current Transfer ratio, BJT characteristics, Load line, Operating point, Saturation and cut-off condition BJT as a switch. Transistor Parameters and specification, Types of transistors (power, Switching and general purpose) and its application.

FIELD EFFECT TRANSISTOR :

Comparison of JEET and BJT, advantage of Unipolar device, Construction of PET, Operation characteristic curve, MOSFET construction, Principle and operation, MOSFET and Enhance only MOSFET and their I-V characteristics, Handling and its gate protection.

UNI JUNCTION TRANSISTOR (UJT) :

Construction, working, equivalent circuit, intrinsic stand off ration. Application of UJT as relaxation oscillator.

SILICON CONTROLLED RECTIFIER (SCR) :

Construction, Working, Parameter, Characteristics of SCR, DIAC, TRIAC and two transistor analogy of SCR.

OPTO ELECTRONICS :

Photo-Voltaic cell Light activated PN junction devices, LED, LDR, Photo diodes, Photovoltaic Cell, Photo transistor,
Opto-couplers, Opto-isolators, Semiconductor LASER, Photo detector.

DISPLAY DEVICES :

Construction, Working and types of various display devices like LCD, Dot-matrix Display, Seven segment display, LED Display, Alpha-numeric display.

RECOMMENDED BOOKS :

1. Fundamental of Electronics, by B L Theraja.
2. Basic Electronics, Raval K G, Benison Education Publisher
3. Electronic component and material, 2nd edition, by Madhuri A Joshi, Wheeler Publication,1994, 2nd reprint.
4. Basic Electronic devices and system, by Rajkamal 1st edition
5. A Monograph on electronic design and principle, N.C. goyal and R K Khatan.

List of Experiments / Laboratory work for Paper –I

1. Identification and testing of various types of active and passive components.
2. Study of characteristics curve of diode, Zener diode.
3. Study of various switches and transformers.
4. Study of characteristics of thermister (-ve resistance temp. co-efficient)
5. Study of characteristics curve of BJT.
6. Study of h-parameters of transistor.
7. Study of characteristics curve of FET.
8. Study of characteristics curve of diac, triac and SCR.
9. Study of characteristics curve of UJT.
10. Study of characteristics curve of photo diode, transistor and opto coupler.
11. Wave shaping circuits using diode.
12. Measurement of two port parameter.
13. Charging and discharging of capacitor through RC and RLC circuit.

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Paper-II

Network Analysis and Synthesis

NETWORK ANALYSIS USING LAPLACE TRANSFORM :

Laplace transform, Laplace transform of various mathematical functions and unit step function, Laplace transform of integration and differentiation inverse Laplace transform, use of Laplace transform in analyzing simple networks, Laplace transform, step response of RL, RC. And RLC circuits, sinusoidal steady state response of R.L.C.RL. and RLC circuits, effect and evaluation of initial conditions.

SINUSOIDAL FUNCTION :

Sinusoidal functions, average and effective value of periodic functions, instantaneous and Average power factor, phaser representation, balanced three phase current and voltage relationship. Between Y and A connection three phase systems, power in three phase load current.

FOURIER SERIES :

Fourier theorem, Fourier series, evaluation of Fourier coefficients, Fourier analysis of Trapezoidal wave function.

CIRCUIT ANALYSIS THEOREM AND TRANSFORMATIONS :

Definitions, Ohm’s law, KCL, KVL, analysis of one element kind networks, loop and Node variables analysis, reduction of complicated network, T and II conversion, source transformation Duality, basic definition and properties of network topology, Ladder network twin T network, Thevenin, Norton, Superposition theorem and its application, Reciprocity theorem. Compensation Theorem, maximum power transfer and Tellegen’s theorem, Applications of theorems to be analysis of dc and ac circuits.

NETWORK FUNCTIONS :

Concept of port, one-port and two-port network functions, calculation of network functions, Restrictions of pole and Zero locations, relation between pole-Zero locations and time-domain Behaviour, parallel and cascade interconnections of two ports, application of two port parameters to analysis of T, Ladder, Bridged-T, and lattice networks.

NETWORK SYNTHESIS :

Synthesis of two-element kind one port, synthesis of simple RLC one port functions, Elements of transfer function synthesis, constant resistance networks, elements of approximation Theory.

RESONANCE AND SELECTIVITY :

Definition of Q, series resonance and its bandwidth, parallel resonance, impedance of Parallel tuned circuit, maximum impedance conditions, reactance curves, design of parallel Tuned circuit, coupled circuit and effect of coefficient of coupling, transformation of impedance with tapped resonant circuit, image impedance, reactance marching, mutual inductance, Coefficient of coupling.

FILTERS :

Neper, decibel, characteristics impedance of symmetrical networks, current and voltage Ratio as exponential, propagation constant, hyperbolic trigonometry (introduction), properties of Symmetrical networks, filter fundamentals pass and stop bands, behavior characteristics impedance Constant-K, Low high pass filters, M-derived T-π section variations of characteristic Impedance over pass elimination filters, filter circuit design, filter performance, crystal filters, Notch filter.

LIST OF RECOMMENDED BOOKS :

1. A Sudhalakar & S.P. Shyammohan, Circuit & Networks : Analysis & Synthesis & Synthesis (1996) TMH,New Delhi (Ch,1-37,8,13,-16)
2. J D Ryer, Networks, Lines and Field,(1998) TMH,Snew Delhi,(Ch 1,2,4)
3. Network Analysis and synthesis, Raval K.G. Bension Education Pub.
4. G.K.Mithal, Network Analysis, (1994) Khaman Publishers (Ch-1,3,6,7,9,12,15,22,23)
5. D R Cunningham & John a Stuller, Basic Circuit Analysis, Jaico Publishing (Ch.1-7,14,16).
6. D Ray Chaudhary, Networks & Systems, Wiley Eastern (Ch,1-10,12,15)
7. M. E. Van Valkenburg, Network Analysis, (1990), TMH,New Delhi.
8. M. E. Van Valkenburg, B.K. Kinariwala, Linear Circuits, PHI New-Delhi.
9. F.F.Kuo, Network Theory and filter Design (19800, Willey Easter, New Delhi.
10. V.K.Atre, Network Theory and filter Design,(1980), Willey Easter, New Delhi.
11. W.H. Hayt and J.E. Kemmerly, Engineering Circuit Analysis (1993) McGraw Hill, New,New Delhi.
12. 2000 solved Problems in Electronics, Schaum series, McGraw Hill Pub.

List of Experiments/ Laboratory work for Paper-2:

1. Study of KVL.
2. Study of KCL.
3. Verification of Network theorem, Norton's theorem.
4. Study of Thevenin's theorem.
5. Study of Superposition theorem.
6. Study of series resonance and its bandwidth Q.
7. Study of Parallel resonance and its bandwidth and Q.
8. Study of low pass T filter circuit.
9. Study of low pass TT filter circuit.
10. Study of high pass T filter circuit.
11. Study of high pass TT filter circuit.
12. Study of phase and voltage relation in RLC circuit.

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Paper-III

Electronics Circuit Design and Application

TRANSISTOR BIASING CIRCUITS :

Basic transistor circuit, operating point, significance of the operating point in thermal run away, factors contributing to thermal instability, fixed base biasing, Collector-to-base biasing, Emitter biasing, Voltage divider bias with emitter bias, bias compensation techniques, FET its operation and characteristics curves, JEET as VVR low frequency common drain, common source amplifiers, Design Examples.

SMALL SIGNAL AMPLIFIER :

Small signal linear transistor amplifier equivalent circuits and performance of CB,CE and CC configuration, basic transistor configuration in h-parameters, various (h,y,z) parameters of transistor, classification of amplifiers, low frequency response of a CE amplifier, effect of bypass and coupling capacitor on frequency response of an amplifier, complete response of the RC coupled amplifier, transformer coupled amplifier, cascaded amplifiers, gain bandwidth limitations.

FEEDBACK IN AN AMPLIFIER :

Feedback in an amplifiers, types of feedback, characteristics of negative feedback, loop gain, types of negative feedback, their effects on impedance levels, gain, phase margin stability of feedback amplifiers.

HEAT SINK THEORY :

Transistor dissipation, thermal resistance, heat sink theory, mounting and selection of heat sink size.

LARGE SINGAL POWER AMPLIFIER :

Hybrid model of transistors at high frequencies, variation of hybrid parameters, emitter follower at high frequencies, class. A power amplifier efficiency, collector dissipation and power output, harmonic distortion, push-pull amplifier : Class A & B, cross over distortion use of complementary symmetry transistor pair.

TUNED AMPLIFIER :

Introduction to tuned circuits, properties of coil, Bandwidth of resonant circuit, insertion losses, requirements of tuned amplifiers, types of tuned amplifiers, single tuned and primary tuned amplifiers, RF voltage amplifier.

MULTIVIBRATORS AND OSCILLATORS :

Feedback requirement for oscillation, Barkhausen criterion, circuit requirement for oscillation, basic oscillation circuit, analysis working and design of LC and RC oscillators (Hartley, Colpitt, Phase Shift, Wein), analysis operation and design of various types of multivibrator (astable, bistable, monostable) and its triggering, Schmidt trigger, negative resistance oscillator.

PULSE AND WAVE SHAPING CIRCUITS :

RC circuit operation, equations RC circuit response to square waves, integrating-differentiating circuits, RC ramp generator, constant current ramp generator, Bootstrap ramp generator, free running ramp generator, triangular wavefrom generator, pulse generator circuits.

List of Recommended Books :

1. A. Mottershed, Elctronics Devices & Circuits (1993), PHI, New Delhi.
2. Y. N. Bapat, Electronic Circuits and systems,(1993) TMH, New Delhi.
3. D. A. Bell, Solid State Pulse Circuits, 4th Ed, PHI, New Delhi.
4. Millman & Halkias, Electronics Devices & Circuits, 1989,Mc-Graw Hill
5. N. C. Goyal, R. K. Khetan, Monograph on Electronics Design.