BTEE-301 CIRCUIT THEORY

Internal Marks:	**40**	**L**	**T**	**P**
External Marks:	**60**	**4**	**1**	**0**
Total Marks:	**100**			

CIRCUITS CONCEPTS: Independent and dependent sources, Signals and wave forms: Periodic and singularity voltages, step, ramp, impulse, doublet, loop currents and loop equations, node voltage and node equations, Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity.

TIME AND FREQUENCY DOMAIN ANALYSIS: Representation of basic circuits in terms of generalized frequency and their response, Laplace transform of shifted functions, transient and steady response, Time domain behaviors from poles and zeros, Convolution Theorem.

NETWORK SYNTHESIS: Network functions, Impedance and admittance function, Transfer functions, Relationship between transfer and impulse response, poles & zeros and restrictions, Network function for two terminal pair network, Sinusoidal network in terms of poles & zeros, Real liability condition for impedance synthesis of RL & RC circuits, Network synthesis techniques for 2-terminal network, Foster and Cauer forms.

FILTERS SYNTHESIS: Classification of filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T-section, π-section, terminating half section, Pass bands and stop bands, Design of constant-K, m-derived filters, Composite filters.

RECOMMENDED BOOKS:

1. Bird John, *Electrical Circuit Theory and Technology*, 2nd Ed., Newnes
2. Chakraborty, Abhijit, *Circuit Theory*, 2nd Edition, Dhanpat Rai, 2001
3. Chaudhury D. Roy, *Networks & Synthesis*, New Age International.
4. Edminister J.A., *Electric Circuits*, 4th Edition, Tata McGraw Hill, 2002
5. Iyer T.S.K.V., *Circuit Theory*, Tata McGraw Hill, 2006
6. Mohan, Sudhakar Sham, *Circuits & Networks Analysis and Synthesis*, 2nd Edition, Tata Mc Graw Hill, 2005
7. Van Valkenberg, M.E., *Network Analysis & Synthesis*, PHI learning, 2009
8. Van Valkenberg, M.E., *Network Analysis & Synthesis*, 3rd Edition, Pearson Education, 2006

Note: *External question paper shall be set following guidelines to paper setter given at Page 61.*

BTEE-302 TRANSFORMERS AND DIRECT CURRENT MACHINES

		L	T	P
Internal Marks:	**40**			
External Marks:	**60**	**4**	**1**	**0**
Total Marks:	**100**			

TRANSFORMERS: Working principle, construction of single phase transformer, EMF equation, phasor diagrams on no-load and on loaded conditions, open circuit and short circuit tests, equivalent circuit parameters estimation, voltage regulation and efficiency, back to back test. Effect of saturation on exciting current and in-rush current phenomenon. Parallel operation of single phase transformers.

AUTO TRANSFORMERS: Principle of operation, equivalent circuit and phasor diagrams, comparison with two winding transformer.

THREE-PHASE TRANSFORMERS: Different types of winding connections, Voltage and current ratios, Parallel operation of three phase transformers. Three winding transformer's equivalent circuit, off-load and on-load tap changing transformer, Scott connections. Testing of transformers.

D.C. GENERATOR: Working principle , construction of DC Machines, Armature windings, single and double layer winding diagrams, E.M.F. and torque equations, armature reaction, effect of brush shift, compensating winding, commutation, causes of bad commutation, methods of improving commutation, methods of excitation of d.c. generators and their characteristics.

D.C. MOTOR: Working principle characteristics, starting of shunt and series motor, starters, speed control methods: field and armature control. Braking: plugging, dynamic and regenerative braking, Testing: Swinburn's test, Hopkinson test, Field test. Estimation of losses and efficiency.

BOOKS RECOMMENDED:

1. Bimbhra P.S., *Electrical Machinery, Khanna Publishers*
2. Fitzgerald A.E., Kingsley C. and Umans S.D., *Electric Machinery*, 6th Edition, McGraw Hill
3. Langsdorff E.H., *Principles of D.C. machines*, McGraw Hill
4. Nagrath I.J. and Kothari D.P., *Electrical Machines*, 4th Edition, Tata McGraw Hill,
5. Say M G, *Alternating Current Machines*, 5th edition, Sir Isaac Pitman & Sons Ltd.

Note: *External question paper shall be set following guidelines to paper setter given at Page 61.*

BTEE-303 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Internal Marks:	**40**	**L**	**T**	**P**
External Marks:	**60**	**4**	**1**	**0**
Total Marks:	**100**			

UNITS, DIMENSIONS AND STANDARDS: Introduction to MKS & Rationalised MKSA System, SI Units, Standards of EMF, Resistance, Capacitance and Inductance, Systematic errors

GENERAL THEORY OF ANALOG MEASURING INSTRUMENTS: Operating torque, damping & controlling torque, T/W ratio, Pointers & Scales. Principles of operation of various types of electro mechanical indicating / registering instruments viz. PMMC, dynamometer, induction, thermal, etc. for dc & ac measurement of voltage, current, power, frequency, phase & power factor etc., energy meter: their sources of error & compensation, shunts & multipliers, multi-meter.

POTENTIOMETERS: Basic D.C. potentiometer circuit, Modern form of D.C. potentiometer, measurement of voltage, current, Resistance and calibration of voltmeter & ammeter using D.C. potentiometer, volt ratio box, Self balancing potentiometer, A.C. potentiometers and their applications.

BRIDGES: Sources and Detectors, General equation for bridge balance, Wheatstone bridge and its sensitivity analysis, Kelvin double bridge, AC bridges: applications and conditions for balance, Maxwell's bridge, Hay's bridge, Schering bridge, Wien bridge, DeSauty's bridge, Insulation testing, Sources of errors in bridge circuits, Shielding of bridge elements, Wagner Earthling Device.

MAGNETIC MEASUREMENTS: Flux meter, B-H Curve, Hysteresis loop, Permeameters, AC Testing of Magnetic materials, Separation of iron losses, iron loss measurement by Wattmeter and Bridge methods.

INSTRUMENT TRANSFORMERS: Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, Characteristics of current transformers (CT).and potential transformers (PT). and their Testing.

BOOKS RECOMMENDED:

1. Bell David A., *Electronics Instrumentation and Measurements,* Prentice Hall, India
2. Golding Edward William and Widdis Frederick Charles, *Electrical Measurements and Measuring instruments,* Wheelers India
3. Helfrick A.D. and Cooper W.D., Modern *Electronic Instrumentation. & Measurement Techniques,* Prentice Hall
4. Murthy D. V. S., Transducers and Instrumentation, Prentice-Hall, India
5. Sawhney A. K., *A Course in Electrical & Electronics Measurement & Inst*rumentation., Dhanpat Rai & Sons.

Note: *External question paper shall be set following guidelines to paper setter given at Page 61.*

BTEE-304 ELECTRONIC DEVICES AND CIRCUITS

Internal Marks:	**40**	**L**	**T**	**P**
External Marks:	**60**	**4**	**1**	**0**
Total Marks:	**100**			

BASIC SEMICONDUCTOR AND DIODES: Intrinsic and extrinsic semiconductors, diffusion and drift currents, p-n junction under open-circuit, reverse bias and forward-bias conditions, p-n junction in the breakdown region, Ideal diode, terminal characteristics of junction diode, Load-line analysis of diode circuits, half wave rectifier and full wave rectifiers, Clippers and Clampers, capacitive filters, RC and LC filter, voltage multipliers. Principles, construction, characteristics and applications of Zener diodes, Light Emitting Diodes, Schottky Diode, Varactors

BIPOLAR AND UNIPOLAR TRANSISTORS: Bipolar junction transistor (BJT)- physical structure and modes of operation, Transistor characteristic and parameters, Common Base, Common Emitter and Common Collector Configurations, Transistor biasing, Transistor as a switch, Basics characteristics of an amplifier, Simple transistor model (r_e model), Common Emitter, Common Collector and Common base amplifiers, hybrid equivalent circuit, H-parameters, circuit analysis using h-parameters. Junction field effect transistor (JFET): Characteristics, parameters and biasing. Metal oxide field effect transistor (MOSFET): Characteristics, parameters and biasing. Class a power amplifier, Class B, Class AB Push-pull and Class C-amplifiers.

INTEGRATED CIRCUIT AND OPERATIONAL-AMPLIFIERS: Introduction to IC's, Op-Amps, Op-Amp Characteristics, Feedback, Different feedback configurations, Current– to–voltage converter and voltage-to-current converters, voltage and current amplifiers, mathematical operations using Op-Amp, summing, differential, integrating amplifiers, Comparators and Schmitt trigger

OSCILLATORS AND ACTIVE FILTERS: Oscillations, Feedback oscillator Principles,, RC phase shift oscillator, Wein bridge oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillators, frequency stability, negative resistance in oscillators. Active Filters (1^{st} order) with low pass, high pass, band pass, band stop and all pass. Pin configuration of 555 timer, 555 timer as Oscillator: monostable, bistable and astable multivibrator.

REGULATED POWER SUPPLIES: Unregulated power supplies, line and load regulations, Zener diode voltage regulators, transistor series and shunt regulators, current limiting, Op-Amp voltage regulators, integrated circuit (LM-3XX) voltage regulators. Introduction to switching regulators. Working of Switched Mode Power Supply (SMPS).

BOOKS RECOMMENDED

1. Boylestad, Robert.L. *Electronic Devices and Circuit Theory,* Pearson Education
2. Cathey Jimmie J., *Theory and Problems of Electronic Devices and Circuit*s, McGraw-Hill
3. Floyd Thomas L., *Electronic Devices*, Pearson Education
4. Gayakwad, Ramakant A. *OP-AMPS and Linear Integrated Circuits*, Prentice Hall of India
5. Malvino Albert Paul and Bates David, *Electronic Principles*, edition 7^{th}, Tata McGraw Hill
6. Millman Jacob, *Integrated Electronic Devices and Circuits*, Tata McGraw Hill

Note: *External question paper shall be set following guidelines to paper setter given at Page 61.*

BTEE-305 Laboratory-I (Semi-conductor Devices and Circuit Theory)

		L	T	P
Internal Marks:	**30**			
External Marks:	**20**	**0**	**0**	**2**
Total Marks:	**50**			

List of Experiments:

1. To draw V-I characteristics of PN junction diode (Ge, Si, switching and signal).
2. To design half wave rectifier.
3. To design full wave and bridge rectifiers.
4. To study transistor characteristics in common base and common emitter configurations.
5. To study the FET characteristics.
6. To design, study and compare various transistor biasing techniques.
7. To design regulated power supply using zener diode/ voltage regulator IC.
8. To study of an emitter follower circuit.
9. To verify Superposition theorem.
10. To verify Norton's theorem.
11. To verify Thevenin's theorem.
12. To verify maximum power transfer theorem.
13. To study the response of constant K-filters.
14. To study the response of m-derived filters
15. Diode clippers and clampers.

BTEE-306 Laboratory-II (Electrical Machines-I)

		L	T	P
Internal Marks:	**30**			
External Marks:	**20**	**0**	**0**	**2**
Total Marks:	**50**			

List of Experiments

1. To Load test on a single phase transformer.
2. To perform Open circuit and short circuit tests on a single phase transformer and hence find equivalent circuit, voltage regulation and efficiency.
3. To find the efficiency and voltage regulation of single phase transformer under different loading conditions.
4. To perform parallel operation of two single phase transformers.
5. To study the various connections of three phase transformer.
6. To perform Scott connections on three phase transformer to get two phase supply.
7. To study the constructional details of direct current (d.c.) machine and to draw sketches of different components.
8. To measure armature and field resistance of direct current (d.c.) shunt generator and to obtain its open circuit characteristics.
9. To obtain load characteristics of direct current (d.c.) shunt/series /compound generator.
10. To draw speed-torque characteristics of direct current (d.c.) shunt/series /compound generator.
11. To study direct current (d.c.) motor starters.
12. To perform Swinburne's test (no load test) to determine losses of direct current (d.c.) shunt motor.

BTEE-307 Laboratory-III (Measurements)

		L	T	P
Internal Marks:	**30**			
External Marks:	**20**	**0**	**0**	**2**
Total Marks:	**50**			

List of experiments:

1. Study of principle of operation of various types of electromechanical measuring instruments.
2. a) To measure high value of DC current by a Low Range DC Ammeter and Shunt.
   b) To measure high value of DC voltage by a Low Range DC Voltmeter and Multiplier
3. a) To measure high value of AC Current by a Low Range AC Ammeter and Current Transformer.
   b) To measure high value of AC Voltage by Low Range Voltmeter and Potential Transformer
   Measurement of resistance using Wheatstone Bridge.
4. To measure active and reactive power in 3 phase balanced load by one wattmeter method.
5. To measure the active power in three phase balanced and unbalanced load by two wattmeter method and observe the effect of power factor variation on wattmeter reading.
6. To calibrate and use the Induction Energy Meter.
7. Measurement of resistance using Kelvin's Bridge.
8. Measurement of self inductance using Anderson's Bridge.
9. Measurement of capacitance using Schering Bridge.
10. Plotting of Hysteresis loop for a magnetic material using flux meter.
11. Measurement of frequency using Wein's Bridge.
12. To study the connections and use of Current and potential transformers and to find out ratio error.
13. Determination of frequency and phase angle using CRO.
14. Measurement of unknown voltage using potentiometer.
15. To find 'Q' of an inductance coil and verify its value using Q- meter.