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| **LESSION PLAN 4TH SEMESTER(2020-21)** | | | | |
| **SUBJECT-Th1. ENERGY CONVERSION - I** | | | | |
| **NAME OF THE FACULTY- Siba Ranjan Nayak** | | | | |
| MONTH | MODULE/UNIT | COURSE TO BE COVERED | TOTAL NO. OF CLASS | REMARK |
| **APRIL** | **UNIT-1** | **DC GENERATORS** | **17** |  |
|  |  | 1.1.Operating principle of generator | 01 |  |
|  |  | 1.2.Constructional features of DC machine. | 01 |  |
|  |  | 1.2.1. Yoke, Pole & field winding, Armature, Commutator. | 01 |  |
|  |  | 1.2.2. Armature winding, back pitch, Front pitch, Resultant pitch and commutator- pitch. | 01 |  |
|  |  | 1.2.3. Simple Lap and wave winding, Dummy coils. | 01 |  |
|  |  | 1.3.Different types of D.C. machines (Shunt, Series and Compound) | 01 |  |
|  |  | 1.4. Derivation of EMF equation of DC generators. (Solve problems) | 01 |  |
|  |  | 1.5. Losses and efficiency of DC generator. Condition for maximum efficiency and numerical problems. | 01 |  |
|  |  | 1.6. Armature reaction in D.C. machine. | 01 |  |
|  |  | 1.7. Commutation and methods of improving commutation. | 01 |  |
|  |  | 1.7.1. Role of inter poles and compensating winding in commutation. | 01 |  |
|  |  | 1.8.Characteristics of D.C. Generators | 01 |  |
|  |  | 1.9. Application of different types of D.C. Generators. | 01 |  |
|  |  | 1.10.Concept of critical resistance and critical speed of DC shunt generator | 01 |  |
|  |  | 1.11. Conditions of Build-up of emf of DC generator. | 01 |  |
|  |  | 1.12. Parallel operation of D.C. Generators. | 01 |  |
|  |  | 1.13.Uses of D.C generators | 01 |  |
| **MAY** | **UNIT-2** | **2.D. C. MOTORS** | **15** |  |
|  |  | 2.1.Basic working principle of DC motor | 01 |  |
|  |  | 2.2. Significance of back emfin D.C. Motor. | 01 |  |
|  |  | 2.3.Voltage equation of D.C. Motor and condition for maximum power output(simple problems) | 02 |  |
|  |  | 2.4.Derive torque equation (solve problems) | 02 |  |
|  |  | 2.5. Characteristics of shunt, series and compound motors and their application. | 01 |  |
|  |  | 2.6. Starting method of shunt, series and compound motors. | 01 |  |
|  |  | 2.7. Speed control of D.C shunt motors by Flux control method. Armature voltage Control method. Solve problems | 01 |  |
|  |  | 2.8.Speed control of D.C. series motors by Field Flux control method, Tapped field method and series-parallel method | 01 |  |
|  |  | 2.9.Determination of efficiency of D.C. Machine by Brake test method(solve numerical problems) | 01 |  |
|  |  | 2.10.Determination of efficiency of D.C. Machine by Swinburne's Test method(solve numerical problems) | 02 |  |
|  |  | 2.11.Losses, efficiency and power stages of D.C. motor(solve numerical problems) | 01 |  |
|  |  | 2.12.Uses of D.C. motors | 01 |  |
| **MAY** | **UNIT-3** | **3.SINGLE PHASE TRANSFORMER** | **20** |  |
|  |  | 3.1 Working principle of transformer. | 01 |  |
|  |  | 3.2 Constructional feature of Transformer. | 01 |  |
|  |  | 3.2.1 Arrangement of core & winding in different types of transformer. | 01 |  |
|  |  | 3.2.2 Brief ideas about transformer accessories such as conservator, tank, breather, and explosion vent etc. | 01 |  |
|  |  | 3.2.3 Explain types of cooling methods | 01 |  |
|  |  | 3.3 State the procedures for Care and maintenance. | 01 |  |
|  |  | 3.4 EMF equation of transformer. | 01 |  |
|  |  | 3.5 Ideal transformer voltage transformation ratio | 01 |  |
|  |  | 3.6 Operation of Transformer at no load, on load with phasor diagrams. | 01 |  |
|  |  | 3.7 Equivalent Resistance, Leakage Reactance and Impedance of transformer. | 01 |  |
|  |  | 3.8 To draw phasor diagram of transformer on load, with winding Resistance and Magnetic leakage with using pf, leading pf and lagging pf load. | 01 |  |
|  |  | 3.9 To explain Equivalent circuit and solve numerical problems. | 01 |  |
|  |  | 3.10 Approximate & exact voltage drop calculation of a Transformer. | 01 |  |
| **JUNE** |  | 3.11 Regulation of transformer. | 01 |  |
|  |  | 3.12 Different types of losses in a Transformer. Explain Open circuit and Short Circuit test.(Solve numerical problems) | 01 |  |
|  |  | 3.13 Explain Efficiency, efficiency at different loads and power factors, condition for maximum efficiency (solve problems) | 01 |  |
|  |  | 3.14 Explain All Day Efficiency (solve problems) | 02 |  |
|  |  | 3.15 Determination of load corresponding to Maximum efficiency. | 01 |  |
|  |  | 3.16 Parallel operation of single phase transformer. | 01 |  |
| **JUNE** | **UNIT-4** | **4. AUTOTRANSFORMER** | **03** |  |
|  |  | 4.1. Constructional features of Auto transformer. | 01 |  |
|  |  | 4.2. Working principle of single phase Auto Transformer.  4.3. Comparison of Auto transformer with an two winding transformer (saving of Copper). | 01 |  |
|  |  | 4.4. Uses of Auto transformer.  4.5. Explain Tap changer with transformer (on load and off load condition) | 01 |  |
| **JUNE** | **UNIT-5** | **5.INSTRUMENT TRANSFORMERS** | 05 |  |
| \ |  | 1.1Explain Current Transformer and Potential Transformer | 02 |  |
|  |  | 1.2Define Ratio error, Phase angle error, Burden. | 02 |  |
|  |  | 1.3Uses of C.T. and P.T. | 01 |  |

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| **SUBJECT-Th2. ANALOG ELECTRONICS AND OP-AMP** | | | | |
| **NAME OF THE FACULTY- Siba Prasad Panda** | | | | |
| MONTH | MODULE/UNIT | COURSE TO BE COVERED | TOTAL NO. OF CLASS | REMARK |
| **APRIL** | **UNIT-1** | **1 P-N JUNCTION DIODE** | **06** |  |
|  |  | 1. 1 P-N Junction Diode  1. 2 Working of Diode | 01 |  |
|  |  | 1. 3V-1 characteristic of PN junction Diode. V-1 characteristic of PN junction Diode | 01 |  |
|  |  | 1. 4 DC load line  1. 5 Important terms such as Ideal Diode, Knee voltage | 01 |  |
|  |  | 1. 6Junctions break down.  1.6.1 Zener breakdown  1.6.2 Avalanche breakdown | 01 |  |
|  |  | 1. 7 P-N Diode clipping Circuit. | 01 |  |
|  |  | 1.8 P-N Diode clamping Circuit | 01 |  |
| **APRIL** | **UNIT-2** | **2.SPECIALSEMICONDUCTOR DEVICES** | **05** |  |
|  |  | 2.1Thermistors, Sensors & barretters | 02 |  |
|  |  | 2. 2 Zener Diode | 01 |  |
|  |  | 2. 3 Tunnel Diode | 01 |  |
|  |  | 2. 4 PIN Diode | 01 |  |
|  | **UNIT-3** | **3.RECTIFIERCIRCUITS&FILTERS** | **07** |  |
|  |  | 3.1Classification of rectifiers | 01 |  |
|  |  | 3.2 Analysis of half wave, full wave centre tapped and Bridge rectifiers | 01 |  |
|  |  | 3.2.1DC output current and voltage | 01 |  |
|  |  | 3.2.2 RMS output current and voltage  3.2.3 Rectifier efficiency | 01 |  |
|  |  | 3.2.4Ripple factor  3.2.5Regulation | 01 |  |
|  |  | 3.2.6 Transformer utilization factor  3.2.7 Peak inverse voltage | 01 |  |
|  |  | 3.3 Filters:  3.3.1 Shunt capacitor filter  3.3.2 Choke input filter  3.3.3 π filter | 01 |  |
| **MAY** | **UNIT-4** | **4.TRANSISTORS** | **07** |  |
|  |  | 4.1 Principle of Bipolar junction transistor | 01 |  |
|  |  | 4.2 Different modes of operation of transistor | 01 |  |
|  |  | 4.3 Current components in a transistor | 01 |  |
|  |  | 4.4 Transistor as an amplifier | 01 |  |
|  |  | 4.5 Transistor circuit configuration & its characteristics  4.5.1 CB Configuration  4.5.2 CE Configuration  4.5.3 CC Configuration | 03 |  |
| **MAY** | **UNIT-5** | **5. TRANSISTOR CIRCUITS** | **07** |  |
|  |  | 5.1 Transistor biasing | 01 |  |
|  |  | 5.2 Stabilization | 01 |  |
|  |  | 5.3 Stability factor | 01 |  |
|  |  | 5.4 Different method of Transistors Biasing  5.4.1 Base resistor method  5.4.2 Collector to base bias  5.4.3 Self bias or voltage divider method | 04 |  |
| **JUNE** | **UNIT-6** | **6.TRANSISTOR AMPLIFIERS & OSCILLATORS** | **13** |  |
|  |  | 6.1Practical circuit of transistor amplifier  6.2DC load line and DC equivalent circuit | 01 |  |
|  |  | 6.3AC load line and AC equivalent circuit  6.4Calculation of gain | 01 |  |
|  |  | 6.5Phase reversal  6.6H-parameters of transistors | 01 |  |
|  |  | 6.7Simplified H-parameters of transistors | 01 |  |
|  |  | 6.8Generalised approximate model  6.9Analysis of CB, CE, CC amplifier using generalised approximate model | 01 |  |
|  |  | 6.9 Analysis of CB, CE, CC amplifier using generalised approximate model | 01 |  |
|  |  | 6.10Multi stage transistor amplifier  6.10.1R.C. coupled amplifier  6.10.2Transformer coupled amplifier | 02 |  |
|  |  | 6.11Feed back in amplifier  6.11.1General theory of feed back  6.11.2Negative feedback circuit  6.11.3Advantage of negative feed back | 01 |  |
|  |  | 6.12Power amplifier and its classification  6.12.1Difference between voltage amplifier and power amplifier | 01 |  |
|  |  | 6.12.2Transformer coupled class A power amplifier  6.12.3Class A push - pull amplifier  6.12.4Class B push - pull amplifier | 01 |  |
|  |  | 6.13Oscillators  6.13.1Types of oscillators  6.13.2Essentials of transistor oscillator  6.13.3Principle of operation of tuned collector, Hartley, colpitt, phase shift, wein­ bridge oscillator (no mathematical derivations) | 02 |  |
| **JUNE** | **UNIT-7** | **7.FIELDEFFECT TRANSISTOR** | **06** |  |
|  |  | 7.1 Classification of FET | 01 |  |
|  |  | 7.2 Advantages of FET over BJT  7.3 Principle of operation of BJT | 02 |  |
|  |  | 7.4 FET parameters (no mathematical derivation)  7.4.1DC drain resistance  7.4.2AC drain resistance  7.4.3Trans-conductance | 02 |  |
|  |  | 7.5 Biasing of FET | 01 |  |
| **JUNE** | **UNIT-8** | **8.PERATIONAL AMPLIFIERS** | **09Z** |  |
|  |  | 8.1 General circuit simple of OP-AMP and IC - CA - 741 OP AMP | 01 |  |
|  |  | 8.2 Operational amplifier stages  8.3Equivalent circuit of operational amplifier | 01 |  |
|  |  | 8.4 Open loop OP-AMP configuration | 01 |  |
|  |  | 8.5 OPAMP with fed back  8.6 Inverting OP-AMP | 01 |  |
|  |  | 8.7 Non inverting OP-AMP | 01 |  |
|  |  | 8.8 Voltage follower & buffer | 01 |  |
|  |  | 8.9 Differential amplifier  8.9.1 Adder or summing amplifier  8.9.2 Sub tractor  8.9.3 Integrator  8.9.4 Differentiator  8.9.5 Comparator | 03 |  |

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| **SUBJECT-TH3.ELECTRICAL MEASUREMENT & INSTRUMENTATION** | | | | | |
| **NAME OF THE FACULTY- Siddharth Sethi** | | | | | |
| MONTH | MODULE/UNIT |  | COURSE TO BE COVERED | TOTAL NO. OF CLASS | REMARK | |
| **APRIL** | **UNIT-1** |  | **1.MEASURING INSTRUMENTS** | **05** |  | |
|  |  |  | 1.1 Define Accuracy, precision, Errors, Resolutions Sensitivity and tolerance | 01 |  | |
|  |  |  | 1.2Classification of measuring instruments. | 01 |  | |
|  |  |  | 1.3Explain deflecting, controlling and damping arrangements in indicating type of instruments | 02 |  | |
|  |  |  | 1.4 Calibration of instruments. | 01 |  | |
| **APRIL** | **UNIT-2** |  | **2. ANALOG AMMETERS AND VOLTMETERS** | **10** |  | |
|  |  |  | 2.1.Describe Construction, principle of operation, errors, ranges merits and demerits of:  2.1.1Moving iron type instruments | 01 |  | |
|  |  |  | 2.1.2 Permanent Magnet Moving coil type instruments | 01 |  | |
|  |  |  | 2.1.3 Dynamometer type instruments | 02 |  | |
|  |  |  | 2.1.4 Rectifier type instruments | 02 |  | |
|  |  |  | 2.1.5 Induction type instruments | 02 |  | |
|  |  |  | 2.2 Extend the range of instruments by use of shunts and Multipliers | 01 |  | |
|  |  |  | 2.3 Solve Numerical | 01 |  | |
| **MAY** | **UNIT-3** |  | **3. WATTMETERS AND MEASUREMENT OF POWER** | **08** |  | |
|  |  |  | 3.1 Describe Construction, principle of working of Dynamometer type wattmeter. (LPF and UPF type) | 03 |  | |
|  |  |  | 3.2 The Errors in Dynamometer type wattmeter and methods of their correction | 02 |  | |
|  |  |  | 3.3 Discuss Induction type watt meters | 03 |  | |
| **MAY** | **UNIT-4** |  | **4. ENERGYMETERS AND MEASUREMENT OF ENERGY** | **08** |  | |
|  |  |  | 4.1 Introduction | 02 |  | |
|  |  |  | 4.2 Single Phase Induction type Energy meters - construction, working principle and their compensation & adjustments | 06 |  | |
|  |  |  | 4.3 Testing of Energy Meters | 02 |  | |
| **MAY** | **UNIT-5** |  | **5. MEASUREMENT OF SPEED, FREQUENCY AND POWER FACTOR** | **07** |  | |
|  |  |  | 5.1 Tachometers, types and working principles | 02 |  | |
|  |  |  | 5.2 Principle of operation and construction of Mechanical and Electrical resonance Type frequency meters | 02 |  | |
|  |  |  | 5.3 Principle of operation and working of Dynamometer type single phase and three phase power factor meters | 03 |  | |
| **JUNE** | **UNIT-6** |  | **6. MEASUREMENT OF RESISTANCE,INDUCTANCE& CAPACITANCE** | **08** |  | |
|  |  |  | 6.1Classification of resistance  6.1.1. Measurement of low resistance by potentiometer method. .  6.1.2. Measurement of medium resistance by wheat Stone bridge method.  6.1.3. Measurement of high resistance by loss of charge method | 02 |  | |
|  |  |  | 6.2 Construction, principle of operations of Megger & Earth tester for insulation resistance and earth resistance measurement respectively | 02 |  | |
|  |  |  | 6.3 Construction and principles of Multimeter. (Analog and Digital) | 02 |  | |
|  |  |  | 6.4 Measurement of inductance by Maxewell's Bridge method | 01 |  | |
|  |  |  | 6.5 Measurement of capacitance by Schering Bridge method | 01 |  | |
| **JUNE** | **UNIT-7** |  | **7. SENSORS AND TRANSDUCER** | **09** |  | |
|  |  |  | 7.1. Define Transducer, sensing element or detector element and transduction elements | 01 |  | |
|  |  |  | 7.2. Classify transducer. Give examples of various class of transducer | 01 |  | |
|  |  |  | 7.3. Resistive transducer  7.3.1 Linear and angular motion potentiometer.  7.3.2 Thermistor and Resistance thermometers.  7.3.3 Wire Resistance Strain Gauges | 02 |  | |
|  |  |  | 7.4. Inductive Transducer  7.4.1Principle of linear variable differential Transformer (LVDT)  7.4.2 Uses of LVDT | 01 |  | |
|  |  |  | 7.5. Capacitive Transducer.  7.5.1 General principle of capacitive transducer.  7.5.2 Variable area capacitive transducer.  7.5.3 Change in distance between plate capacitive | 03 |  | |
|  |  |  | 7.6. Piezoelectric Transducer and Hall Effect Transducer with their applications | 01 |  | |
| **JUNE** | **UNIT-8** |  | **8. OSCILLOSCOPE** | **05** |  | |
|  |  |  | 8.1. Principle of operation of Cathode Ray Tube | 01 |  | |
|  |  |  | 8.2. Principle of operation of Oscilloscope (with help of block diagram). | 02 |  | |
|  |  |  | 8.3. Measurement of DC Voltage & current | 01 |  | |
|  |  |  | 8.4. Measurement of AC Voltage, current, phase & frequency | 01 |  | |

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| **SUBJECT-TH4.GENERATION TRANSMISSION & DISTRIBUTION** | | | | | | | | | |
| **NAME OF THE FACULTY- Chinmaya Patra** | | | | | | | | | |
| MONTH | MODULE/UNIT |  | COURSE TO BE COVERED | |  | TOTAL NO. OF CLASS | TOTAL NO. OF CLASS | |  | |
|  | **UNIT-1** |  | 1. **GENERATION OF ELECTRICITY** |  |  | **07** | |  |
|  |  |  | 1.1 Elementary idea on generation of electricity from Thermal, Hydel, Nuclear, Power station |  |  | 03 | |  |
|  |  |  | 1.2 Introduction to Solar Power Plant (Photovoltaic cells). |  |  | 02 | |  |
|  |  |  | 1.3 Layout diagram of generating stations |  |  | 02 | |  |
|  | **UNIT-2** |  | 1. **TRANSMISSION OF ELECTRIC POWER** |  |  | **05** | |  |
|  |  |  | 2.1 Layout of transmission and distribution scheme |  |  | 01 | |  |
|  |  |  | 2.2 Voltage Regulation & efficiency of transmission |  |  | 01 | |  |
|  |  |  | 2.3 State and explain Kelvin's law for economical size of conductor |  |  | 02 | |  |
|  |  |  | 2.4 Corona and corona loss on transmission lines |  |  | 01 | |  |
|  | **UNIT-3** |  | 1. **OVER HEAD LINES** |  |  | **07** | |  |
|  |  |  | 3.1 Types of supports, size and spacing of conductor |  |  | 01 | |  |
|  |  |  | 3.2 Types of conductor materials |  |  | 01 | |  |
|  |  |  | 3.3 State types of insulator and cross arms |  |  | 02 | |  |
|  |  |  | 3.4 Sag in overhead line with support at same level and different level. (approximate formula effect of wind, ice and temperature on sag) |  |  | 01 | |  |
|  |  |  | 3.5 Simple problem on sag |  |  | 02 | |  |
|  | **UNIT-4** |  | 1. **PERFORMANCE OF SHORT & MEDIUM LINES** |  |  | **07** | |  |
|  |  |  | * 1. Calculation of regulation and efficiency |  |  | 07 | |  |
|  | **UNIT-5** |  | 1. **EHV TRANSMISSION** |  |  | **07** | |  |
|  |  |  | 5.1 EHV AC transmission.  5.1.1. Reasons for adoption of EHV AC transmission. 5.1.2. Problems involved in EHV transmission |  |  | 04 | |  |
|  |  |  | 5.2 HV DC transmission.  5.2.1. Advantages and Limitations of HVDC transmission system |  |  | 03 | |  |
|  | **UNIT-6** |  | 1. **DISTRIBUTION SYSTEMS** |  |  | **07** | |  |
|  |  |  | 6.1 Introduction to Distribution System |  |  | 01 | |  |
|  |  |  | 6.2 Connection Schemes of Distribution System: (Radial, Ring Main and Inter connected system) |  |  | 02 | |  |
|  |  |  | 6.3 DC distributions.  6.3.1 Distributor fed at one End.  6.3.2 Distributor fed at both the ends.  6.3.3 Ring distributors |  |  | 02 | |  |
|  |  |  | 6.4 AC distribution system.  6.4.1. Method of solving AC distribution problem.  6.4.2. Three phase four wire star connected system arrangement |  |  | 02 | |  |
|  | **UNIT-7** |  | 1. **UNDERGROUND CABLES** |  |  | **06** | |  |
|  |  |  | 7.1 Cable insulation and classification of cables |  |  | 02 | |  |
|  |  |  | 7.2 Types of L. T. & H.T. cables with constructional features |  |  | 01 | |  |
|  |  |  | 7.3 Methods of cable lying |  |  | 02 | |  |
|  |  |  | 7.4 Localization of cable faults: Murray and Varley loop test for short circuit fault/ Earth fault |  |  | 01 | |  |
|  | **UNIT-8** |  | 1. **ECONOMIC ASPECTS** |  |  | **06** | |  |
|  |  |  | 8.1 Causes of low power factor and methods of improvement of power factor inpower system |  |  | 01 | |  |
|  |  |  | 8.2 Factors affecting the economics of generation: (Define and explain)  8.2.1 Load curves.  8.2.2 Demand factor.  8.2.3 Maximum demand.  8.2.4 Load factor.  8.2.5 Diversity factor.  8.2.6 Plant capacity factor |  |  | 03 | |  |
|  |  |  | 8.3 Peak load and Base load on power station |  |  | 02 | |  |
|  | **UNIT-9** |  | 1. **TYPES OF TARIFF** |  |  | **03** | |  |
|  |  |  | * 1. Desirable characteristic of a tariff |  |  | 01 | |  |
|  |  |  | * 1. Explain flat rate, block rate, two part and maximum demand tariff. (Solve Problems |  |  | 02 | |  |
|  | **UNIT-10** |  | 1. **SUBSTATION** |  |  | **05** | |  |
|  |  |  | 10.1 Layout of LT , HT and EHT substation |  |  | 02 | |  |
|  |  |  | 10.2 Earthing of Substation, transmission and distribution lines. |  |  | 03 | |  |