

ELECTRICAL FACULTY

COURSES & SYLLABII

INDIAN TECHNICAL EDUCATION SOCIETY, MUMBAI

Implemented From Nov. -2014

INDIAN TECHNICAL EDUCATION SOCIETY, MUMBAI

**CERTIFICATE AND DIPLOMA ELECTRICAL FACULTY
EXAMINATIONS**

SYLLABUS & SCHEME OF THEORY & PRCATICAL EXAMINATIONS



SCHEME OF EXAMINATION

Sr. No.	EXAMINATION AND ABBREVIATION	THEORY PAPER	PRAC. MARKS
CERTIFICATE COURSES			
1	Wireman [W]	One paper of 3 Hrs. 100 Marks	One Pract. of 2 Hrs. 75 Pract. + 15 Journal + 10 Oral = Total 100 Marks
2	Electrician [E]	One paper of 3 Hrs. 100 Marks	- DO -
3	Armature & Motor Rewinding [MW]	One paper of 3 Hrs. 100 Marks	- DO -
DIPLOMA COURSES			
4	Diploma Electrical Engineering Services [DEES (EL)]	Three paper of 3 Hrs. 100 Marks	Two Pract. of 2 Hrs. each 75 Pract. + 15 Journal + 10 Oral = Total 100 Marks each

Minimum Passing for Theory - 35 Marks Each.
Minimum Passing for Practical - 40 Marks Each..

INDIAN TECHNICAL EDUCATION SOCIETY, MUMBAI
CERTIFICATE COURSE
WIREMAN [W]

EXAM SCHEME: **THEORY PAPER 100 MARKS – 3 HRS.**
 PRACTICAL 100 MARKS – 2 HRS.

THEORY SYLLABUS

1. BASIC ELECTRICITY

- ❖ Study of Voltage, Current and Resistance and their units (Kilo, Mega, Milli, Micro)
- ❖ Study the meaning of circuit and know about close circuit, short circuit and open circuit.
- ❖ Ohm's Law, Formula's and problem's on this law.
- ❖ Study of series circuit, parallel circuit and compound circuit their formulas and solve simple problems.
- ❖ Study about power their formulas and units.
- ❖ Study about Electrical energy and Electric bill calculation.
- ❖ Types of supply, polarity testing and effects of electric current.

2. TOOL'S

Study about different types of Tool's, required for electrical work. (wiring or repairing), their names, sizes, precautions to be taken while using different Tolls.

- ❖ Types of Pillars → Combination Pillar, Nose Pillar, side cutting pillar, Cert clip pillar etc.
- ❖ Drilling Tool's → Rawal punch, center punch, chisel, Hand drill, electric Drill, Gimlet etc.
- ❖ Cutting Tools → Hack saw, Hand saw, ordinary saw, Tenon saw, Scraper, Electrician knife, striper, crimping tool etc.
- ❖ Hammering Tools → Ball pin hammer, Nail puller hammer, mallet etc.
- ❖ Measuring tools → Tape, Try square, sprit level, foot rule, S.W.G. etc.
- ❖ Other tools → Tester, screw driver, test lamp bearing puller, Blow lamp, spanners, files, soldering iron etc.

3. ELECTRICAL ACCESSORIES

Study about various accessories use in wiring work their names, capacity and use.

- ❖ Controlling accessories → S. P. switch, two way switch, two way center of switch, Bell push, Intermediate switch, I.C.D.P. and I.C.T.P. switch, Toggle switch etc.
- ❖ Holding accessories → Batten Holder, Angle Holder, Tube Holder, Starter Holder, Edison Screw type holder, pendent holder.
- ❖ Accessories for safety → Kit Kat fuse, Cut – Out, glass fuse, H.R.C. fuse, Cartridge fuse, MCB, ELCB etc.
- ❖ Other accessories → Two pin & Three pin plug, sockets, adaptors, ceiling rose, Gang box etc.

4. CONDUCTOR, SEMI CONDUCTORS AND INSULATOR'S

WIRES AND CABLES

- ❖ Study about conductor, semi conductor and Insulator's, their definitions and examples and use.
- ❖ Study about construction of wire and cables their sizes and use's.
- ❖ P.V.C. wire, C.T.S. wire, V.I.R. wire, flexible wire weather proof cable, enameled copper wire etc.
- ❖ Armored and unarmored cable.

5. TYPES OF WIRING, EARTHING

- ❖ Study about different types of wiring methods meaning of electrical points, layout drawing of flat wiring and how to prepare wiring work estimate.
Precautions to be taken while doing wiring work, their advantages and disadvantages.
- ❖ C.T.S. wiring, pipe wiring (P.V.C. and Heavy gauge), Casing capping wiring, consild wiring, etc. testing of wiring
- ❖ Study of earthing, types of earthing, testing of earthing, (pipe earthing and plate earthing)
- ❖ Study of panel wiring

6. METER'S

Study about different types of meters use commonly in electrical field, their construction, connection's, Capacity and precautions while using.

- ❖ Voltmeter, Ammeter, Watt meter, Ohm meter.
- ❖ Energy meter,
- ❖ Megar meter etc.

7. JOINTS, SOLDERING, TAPPING

- ❖ Why joints use in wiring work, types of Joints, precautions while make Joints. Simple twist Joint, 'T' Joint, straight Joint, western Union Joint, Britannia Joint. study of crimping
 - ❖ Study about soldering methods, precaution while solder the Joints.
 - ❖ How Tapping is done after Joints.
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8. OTHER

- ❖ I.S.I. Symbols
 - ❖ Safety Rules
 - ❖ Study about Various Long Forms.
 - ❖ Tube light → Construction, parts, connection, faults and testing.
 - ❖ Ceiling fan → Construction, Parts, Connection, faults and testing.
 - ❖ Series parallel testing board.
 - ❖ Electric Bell's, Electric iron, Hot plate
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SCHEME OF EXAMINATION

THEORY	100 MARKS
PRACTICAL	75 MARKS
JOURNAL	15 MARKS
ORAL	10 MARKS

GUIDELINES FOR QUESTION PAPER SETTERS

- Q. no.1 Compulsory (Objective type). 20 marks
- Q. no.2 to 8 Solve any five questions from Q. 2 to 8 (Subjective type). 16 marks each

The paper setter should take care that (as far as possible) entire syllabus is equally covered.

- ❖ Paper setters are permitted to ask any one wiring diagram in theory paper from practical list like → House wiring, Godown wiring, Stair case wiring, Hospital wiring etc.
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REFERENCE BOOKS

- ❖ WIREMAN (ENGLISH, MARATHI) → By Prakash Shah.
 - ❖ Electrical wiring (HINDI) → By V. B. Joshi.
 - ❖ Vidyut Yashodeep (MARATHI) → Shyam Pitke.
 - ❖ Sulabh Vidyutshastra → by Trambak Wagmare.
 - ❖ Basic Electrical Engineering – by M. L. Anwani
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INDIAN TECHNICAL EDUCATION SOCIETY, MUMBAI

CERTIFICATE COURSE ELECTRICIAN [E]

EXAM SCHEME: **THEORY PAPER 100 MARKS – 3 HRS.**
 PRACTICAL 100 MARKS – 2 HRS.

[E / DEES – (EL) – I]

THEORY SYLLABUS

1. BASIC ELECTRICITY

- ❖ Study of voltage, current, Resistance their units.
- ❖ Close circuit, open circuit, short circuit
- ❖ Ohm's Law
- ❖ Series, Parallel and combine circuit.
- ❖ Power, power factor, Electrical Energy Bill calculation.
- ❖ Types of supply A.C. (1ph, 3ph, 3ph and N), D. C. Supply.
- ❖

I.S.I. SYMBOL'S, I. E. RULES

- ❖ Know about meaning of I.S.I., I.S., I.E., I.S.O. etc.
- ❖ Study of different symbol's use in Electrical Drawing (More than wireman level) (150 To 175 symbols)
- ❖ Study of different I. E. Rule related to electric supply company, H.V., L.V. consumer's House wiring, Industrial Installation, cinema Hall's etc.

2. ELECTRICAL APPLIANCES

- ❖ Study about various appliances use in house hold purpose, their construction, working, faults and reasons, testing, precaution when using them.
- ❖ 1. Electric Iron (ordinary and automatic) 2. Toaster 3. Soldering Iron 4. Storage type Heater 5. Immersion type water heater 6. Table fan 7. Mixer 8. Food processor 9. Washing machine 10. Exhaust fan 11. Ceiling fan 12. Oven 13. Induction heater

3. CELL'S AND BATTERIES

- ❖ To study of electrolysis, electro light and electroplating.
- ❖ Study of primary cells and secondary cell, and their difference, study of following primary cell.
- ❖ Primary cells – Voltaic cell, Danial cell, Dry cell.
- ❖ How to find out Internal resistance of cell.
- ❖ Secondary cell – study about lead acid batteries, their construction, chemical reaction when charging and discharging time, precautions while using batteries.
- ❖ Faults produce in batteries.
- ❖ Capacity of battery
- ❖ Charging methods of battery, constant current and constant voltage method.
- ❖ Indications of charge battery.
- ❖ Know about Hydro meter and High rate cell discharge cell Tester. Testing of battery, maintenance of batteries

4. MAGNET AND MAGNETISM

- ❖ Definition of magnet, their properties
- ❖ Types of magnet (Natural and artificial)
- ❖ Weber's molecular theory
- ❖ Methods of prepare magnet in Lab
- ❖ Study of electromagnet.
- ❖ To study of definition relating to magnet
Like → Magnetic pole, magnetic lines, magnetic field, polar axis, unit pole, magnetic Induction etc.
- ❖ Some definition relating to electro magnet.
Lime → M.M.F., Reluctance, Ampere turn etc.
- ❖ Study about various laws relating to magnet and electromagnet.
- ❖ Right hand rule, cork screw rule, Fleming right and left hand rule, Lenz's law, Faraday's law of electromagnetic induction, end rule
- ❖ Self induction
- ❖ Mutual induction.

5. D. C. MACHINES (GENERATOR & MOTOR)

- ❖ Working Principal of Generator
- ❖ Difference between A.C. and D.C. Generator
- ❖ Study about parts of D.C. Generator
Like → Yoke, pole core pole shoe, field winding Armature, Brush, Front and end plate, Bearings.
- ❖ Types of D.C. Generator based on connection between armature and field winding
1) Series Gen. 2) Shunt Gen. 3) Compound Gen.
- ❖ Study of E.M.F. formula of D.C. Generator.
- ❖ Losses (Mechanical and Electrical), and faults produce in D.C. Generator.
- ❖ Armature reaction
- ❖ Interpol
Study about parts of D.C Motor, Types of D.C Motors, use of D.C Motors

6. TRANSFORMER

- ❖ Introduction of Transformer
- ❖ Working Principle of Transformer
- ❖ Main parts of Transformer
- ❖ Various Types of Transformer
1) Core type Tx. 2) Shell type Tx. 3) Berry type Tx. 4) Step up Tx. 5) Step Down Tx. 6) Current Tx. 7) Potential Tx. 8) Distribution Tx. 9) Auto Tx.
- ❖ Study about Transformer ratio
- ❖ Study about cooling methods of Transformer
- ❖ Efficiency of transformer. Care & maintenance of transformer

7. A. C. MOTOR (1ph & 3ph), STARTER'S

- ❖ Definition of motor
- ❖ Difference between AC and D.C. Motor
- ❖ Working principle of 3ph and 1ph motor's
- ❖ To study various parts of AC motor, like – yoke, stator, Rotor, winding, centrifugal switch, bearings, front and end plate, name.
- ❖ Study about various single phase Motor's split phase motor, capacitor motor (C.S.C.R., Cap. start Induction motor, permanent capacitor motor)
- ❖ Shaded pole motor
- ❖ Universal motor.
- ❖ Study about various Three phase motors
- ❖ 3 ph squirrel cage Induction motor.
- ❖ Slip ring Induction motor.
- ❖ Synchronous motor.
- ❖ Faults and their reasons produce in AC motor's
- ❖ Motor's and their applications.
- ❖ Starter required for 3 phase motors DOL Starter, Semi and Automatic star Delta Starter, Reverse – forward switch.
- ❖ Remote control switch

8. ILLUMINATION

- ❖ To study various definition relating to illumination
- ❖ Study of different methods of illumination, direct method, indirect method, semi direct and semi indirect method.
- ❖ Study of different types of lamps.
Incandescent lamp, Arc lamp, Gas Discharge Lamp (Mercury Vapor lamp, sodium vapor lamp, Neon Lamp etc.) , CFL lamps & its advantages. Study the LED lamp & tube light

9. CONDENSER (CAPACITOR)

- ❖ Study about the definition of condenser, and study of construction of capacitor.
- ❖ Various definition related to capacitor for ex. Capacitance, capacitive reactance.
- ❖ Study of series and parallel connection of capacitor
- ❖ Study of various types of capacitors, their use in electrical field
- ❖ Testing of capacitor

10. MEASURING INSTRUMENTS

- ❖ Study of various types of meters
- ❖ 1) Indicating meter's 2) Integrating meters 3) Recording meter's.
- ❖ Parts of meters
- ❖ Precautions to be taken while using meters.
- ❖ Connections of various meters.

11. GENERATION, TRANSMISSION, DISTRIBUTION

- ❖ Study about different types of Generation system of electricity.
- ❖ Study of sources from which electricity is produced
- ❖ Primary source – solar energy
- ❖ Secondary source – Thermal power station, Hydro electric power station, Diesel power station.
- ❖ Study of various insulators use in over head wiring.
- ❖ Poles use in over head wiring
- ❖ Know about over head wiring Earthing pit.
- ❖ Study about under ground caballing
- ❖ Cable's used in under ground wiring.
- ❖ Study about distribution of electricity (L.V.)
- ❖ IE Rules of transmission line

SCHEME OF EXAMINATION

THEORY	100 MARKS
PRACTICAL	75 MARKS
JOURNAL	15 MARKS
ORAL	10 MARKS

GUIDELINES FOR QUESTION PAPER SETTERS

- | | | |
|--------------|--|---------------|
| Q. no.1 | Compulsory (Objective type). | 20 marks |
| Q. no.2 to 8 | Solve any five questions from Q. 2 to 8 (Subjective type). | 16 marks each |

The paper setter should take care that (as far as possible) entire syllabus is equally covered.

REFERENCE BOOKS

- ❖ Basic Electrical Engineering → by M. L. Anwani
- ❖ Sulabh Vidyutshastra → by Trambak Waghmare
- ❖ Wireman (MARATHI / ENGLISH → by Prakash Shah
- ❖ Vidyutshastra → Shyam pitke.t



INDIAN TECHNICAL EDUCATION SOCIETY, MUMBAI

CERTIFICATE COURSE ARMATURE MOTOR REWINDING [MW]

EXAM SCHEME: THEORY PAPER 100 MARKS – 3 HRS.
PRACTICAL 100 MARKS – 2 HRS.

[MW / DEES – (EL) – II]

THEORY SYLLABUS

1. BASIC ELECTRICITY

- ❖ Study of voltage, current, resistance and their units
- ❖ Ohm's Law
- ❖ Series and Parallel circuit and their properties with respect to winding
- ❖ Types of Loads – Inductive, Resistive, Capacitive
- ❖ Power, Power factor, Disadvantages due to low power factor.
- ❖ Methods of improve P. F. by using capacitor Bank.
- ❖ To study types of supply.

2. TOOLS, AND WIRES WINDING MATERIAL, VARNISHING

- ❖ Study of tools required for winding and study of their application. Types of pliers, Types of Saw, Types of hammers, Special Tools required for winding work like – Blow lamp, ceasor, center punch, bearing puller, wire pusher, Coil spreader, soldering iron etc.
- ❖ Study of various types of insulating materials with respect to insulation class an temperature.
- ❖ Insulating paper, sleeves, Tapes, wedges, varnish, Thread's etc.
- ❖ Study about winding wires Enameled copper wire, plastic winding wires
- ❖ Varnishing Dipping and Brushing.
- ❖ Study reason of varnishing, method's of varnishing.
- ❖ Pretest before taking up winding for varnishing.

3. SPECIAL INSTRUMENTS REQUIRED IN WINDING AND METERS

- ❖ Special instrument required for winding work
- ❖ To measure gauge of conductor – S.W.G.
- ❖ To measure diameter of conductor – micro meter.
- ❖ For testing of motor's – series parallel testing board
- ❖ For armature testing – Growler.
- ❖ Meters used in winding work
Voltmeter, Ammeter, Wattmeter, Multi meter, Oho Meter, Clamp tester, Digital etc.

4. MAGNET AND MAGNETISM

- ❖ Study about magnet, Properties and types of magnet.
- ❖ Study of electro magnet.
- ❖ Definitions related to magnet Like – magnetic pole magnetic field, magnetic lines, polar Axis, magnetic induction.
- ❖ To study various laws related to electro magnet, Right hand rule, cork screw Rule, Fleming's right and left hand rule, faradays law of electro magnetic induction.
- ❖ Self induction and mutual induction.

5. D. C. MOTORS

- ❖ Definition of motor, it's application, Types of motors A.C. and D.C.
- ❖ Main parts of D. C. Motors – yoke, pole core, pole shoe, field coil, Armature, brush, bearing, front & End plate.
- ❖ Working of D. C. Motor
- ❖ Types of D. C. motor series, shunt and compound motor
- ❖ Types of slot's make of starter, Armature and rotor – Open type slot, Semi close slot, close type slot.
- ❖ How to start D. C. shunt motor.
- ❖ Losses and faults produces in D. C. motor.
- ❖ Armature reaction
- ❖ Inter pole.

6. TRANSFORMER, ALTERNATOR

- ❖ Definition, working principle of Transformer
- ❖ Main parts of Transformer
- ❖ Step up and HT Transformer.
- ❖ Transformer Efficiency
- ❖ Cooling method's of Transformer.
- ❖ Current Transformer (CT) and Potential Transformer (PT)
- ❖ Study of alternator, definition and working principal of Alternator.
- ❖ Various terms used with reference to AC supply for ex – Alternating current, cycle, frequency, Time period, peak value, R.M.S. value.
- ❖ Study of star Delta connection
- ❖ Know about poly phase.

7. A. C. MOTORS (1 PH, 3 PH) AND STARTERS

- ❖ Definition of motor
- ❖ Working principal of 3 ph and 1 ph motor's
- ❖ To study various parts of A. C. motor
- ❖ Study about various single phase motors
- ❖ Split phase motor's
- ❖ Capacitors motor's
- ❖ Shaded pole motor
- ❖ Universal motor.
- ❖ Study about various Three phase motors.
- ❖ 3 ph squirrel cage induction motor
- ❖ Slip ring Induction motor
- ❖ Faults and their reasons produce in A. C. Motors
- ❖ Testing of Motor
- ❖ Motor's and their applications
- ❖ Starters required for 3 phase motors
D.O.L. starter, Semi and Automatic star Delta starter R/F switch, Auto transformer starter.

8. CAPACITOR

- ❖ Study the construction of capacitor
- ❖ Some definition relating to capacitor Like Capacitance, capacitive Reactance.
- ❖ Series parallel connections of capacitor
- ❖ Testing of capacitor
- ❖ Use of capacitor in electrical field.

9. WINDING TERMS

- ❖ Study of various forms used in winding like Coil pitch, Coil span, Pole pitch, front pitch back pitch.
- ❖ Know about Armature winding.
- ❖ Lap and wave winding
- ❖ Progressive and retrogressive winding
- ❖ Single, Double and Triple layer winding
- ❖ Study about how prepare Data and diagram of Armature winding
- ❖ Balancing of armature.
- ❖ Study of 1 ph stator winding Data / Drawing and which points to be noted when the done winding work.
- ❖ Study of 3 ph stator winding Data / Drawing and which points to be noted when the done winding work.
- ❖ Various definition related to winding like Coil, coil side, coil led, Tapping, Coil Group per phase coil, Layer and Double Layer winding in 3 ph motor. (Winding Drawing list same as give in practical list)

SCHEME OF EXAMINATION

THEORY	100 MARKS
PRACTICAL	75 MARKS
JOURNAL	15 MARKS
ORAL	10 MARKS

GUIDELINES FOR QUESTION PAPER SETTERS

- | | | |
|--------------|--|---------------|
| Q. no.1 | Compulsory (Objective type). | 20 marks |
| Q. no.2 to 8 | Solve any five questions from Q. 2 to 8 (Subjective type). | 16 marks each |

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INDIAN TECHNICAL EDUCATION SOCIETY, MUMBAI

**DIPLOMA ELECTRICAL ENGINEERING SERVICES
(DEES(EL - III))**

INDUSTRIAL ELECTRICIAN

Theory Paper I	:	Syllabus for this paper is same as Certificate Course in ELECTRICIAN [E] Refer this syllabus booklet Page No. 5 to 7	100 Marks
Theory Paper II	:	Syllabus for this paper is same as Certificate course in ARMATURE & MOTOR REWINDING [MW] Refer this syllabus booklet Page No. 8 & 9	100 Marks
Theory Paper III	:	Theory syllabus for this Diploma Paper III is given below.	100 Marks
Practical I and II	:	Two separate Practicals Practical – I same as E Practical – II same as AM	100 Marks 100 Marks

Total: 500 marks

INDIAN TECHNICAL EDUCATION SOCIETY, MUMBAI
DEES – (EL) PAPER – III
THEORY SYLLABUS

1. POWER GENERATION SYSTEMS, TRANSMISSION DISTRIBUTION

- ❖ Study about various types of power station's their Drawing's, block diagram, capacity of various power station's
- ❖ Their advantages and disadvantages
- ❖ Thermal power station's.
- ❖ Hydro Electric power station's,
- ❖ Atomic power station's.
- ❖ Gas turbine power station's.
- ❖ DIESEL Power station's
- ❖ Windmill plant
- ❖ Solar energy plant.
- ❖ Study about Transmission systems
- ❖ Why Transmission is high, study about Transmission voltages
- ❖ Like 11kv, 22kv, 33kv, 66kv, 132kv etc.
- ❖ Study different poles and lowers use in Transmission line's their Drawing
- ❖ Study about O.H. and under ground wiring
- ❖ Types of guarding use for OH lines.
- ❖ Various definition related to above like main feeder, Transmission feeder, Distribution lines, service mains etc.
- ❖ Layout Drawing of Transmission, Distribution
- ❖ Study about various Electrical Distribution system REDIAL DISTRIBUTION, RING DISTRIBUTION, Their Drawing Grid Distribution.
- ❖ Tree Distribution.

2. H. T. Transformer

- ❖ Working of Transformer.
- ❖ Study about H. T. Transformer's Power TX and Distribution TX.
- ❖ C.T. & P.T.
- ❖ Difference between then
- ❖ Parts of above TX.
- ❖ Efficiency of TX.
- ❖ Various testing of TX.
- ❖ Parallel connections of two TX.
- ❖ Maintenance of TX. – Daily, weekly, Monthly, ½ yearly, yearly, after five years.
- ❖ Oil Testing.

3. SUB STATION

- ❖ What is sub station ? Importance of substation in Transmission and Distribution system.
- ❖ Equipment use in sub stations, their names and use is sub station For ex – Transformer, C. B., Isolator, Fuse, Lightning Arrestor, metering panel etc.
- ❖ Work of Sub Station.
- ❖ Types of substations like –
 1. Transformer substation a) step up Sub Station's b) Step Down Sub Station's
 2. Secondary sub Station's
 3. Distribution sub Station's
 4. Switching sub Station's
 5. Power factor correction sub Station's
 6. Converting sub. Station's
 7. Industrial sub station
 8. Indoor sub station's
 9. Out Door sub station's
 10. Pole minted sub station's(2 pole, 4 pole structure)
 11. Plinth mounted sub station's
 12. Under Ground sub station's
- ❖ Various Drawing's of sub stations
- ❖ Single line Diagram of 11 kv Indoor sub station's.

4. SWITCH GEARS AND PROTECTIONS

- ❖ Why earthing need in sub station's and installation of plate & pipe earthing , Earth resistance
 - ❖ Study about need of Double earthing for Industrial or Substation equipments
 - ❖ Know about lightning Arrestor, working of this
 - ❖ And types of lightning arrestor of ex.
 - ❖ Horn gap lightning arrestor
 - ❖ Oxide film arrestor
 - ❖ Auto valve arrestor
 - ❖ Thyrite Arrestor
 - ❖ Electrolytic Arrestor.
- Use of Ground conductor for H. T. Lines.
-

ISOLATER AND CIRCUIT BREAKERS

- A) Know difference between switch, Isolator and circuit breaker's
- ❖ Drawing of Isolator
 - ❖ Study about different types of C.B. their use, capacity, Connections etc. Study about M.C.B., ELCB, Minimum oil C.B., Vacuum C.B., SF₆ CB, Air blast C.B. etc.
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5. DC MACHINES (MOTOR AND GENERATOR) :

- ❖ EMF equation and Building of EMF.
 - ❖ Open circuit characteristic and Load circuit characteristic of Generator.
 - ❖ Armature and field control of D.C. motor and its performance.
 - ❖ Various fault in DC machine.
 - ❖ Applications.
 - ❖ Field coil winding and connections.
-

A C MACHINES (ALTERNATOR, 3 Φ INDUCTION MOTOR) :

- ❖ Alternator construction and EMF equation.
 - ❖ Parallel operation of Alternator and load sharing process.
 - ❖ 3 Φ induction motor. Construction and working.
 - ❖ Slip ring induction motor and Rotor resistance starter.
 - ❖ 3 Φ induction motor performance and torque speed curve.
 - ❖ Applications.
-

CONTACTOR PROGRAMMING :

- ❖ Contactor programming of D.O.L. starter.
 - ❖ Contactor programming of semi automatic starter.
 - ❖ Contactor programming of automatic star delta.
-

6. A) BUSBAR B) CAPACITOR INSTALATION

A) BUSBAR

- ❖ Study about Bus bar
- ❖ Metals use of bus bar's
- ❖ Bus bar Rating
- ❖ Method's of Bus bar connection's use in various place's
- ❖ Single Bus bar method
- ❖ Duplicate bus bar method
- ❖ Sectional bus bar method.
- ❖ Know about Lug's and Crimping Tool's.

- B) Use of capacitor in industrial installation. Study about power factor, losses of low P. F. How improve low P. F. with the help of capacitor bank.
- ❖ Testing of capacitor.
-

C) INDUSTRIAL WIRING (ESTIMATION AND COSTING) :

- ❖ Supply connection, Termination, Lug selection and crimping.
 - ❖ Conduct wiring accessories and conduct wiring.
 - ❖ Bus bar's
 - ❖ Deciding rating of conductor, cable, fuses and switches.
 - ❖ Estimating type of labor, Labor charges and material cost, overhead charges.
 - ❖ Study about Industrial wiring, sample layout Drawing of Industrial wiring.
 - ❖ Materials use for above wiring like – Cables, S. F. unit's, clamps, I.C.D.P., I.C.T.P. switches, Distribution Boxes.
 - ❖ Precaution's while Installing Industrial wiring.
-

7. DESIGN OF PANEL BOARD :

- ❖ Control wiring and power wiring of panel board.
- ❖ Selection of contactor, voltage and current rating of contactors.
- ❖ Use of timer in control circuit.
- ❖ Various Logical circuit designs.
- ❖ Mounting of various accessories and fabrication.

8. TESTING OF ELECTRICAL EQUIPMENT ;

- ❖ Transformer testing – open circuit test and short circuit test of transformer.
- ❖ Finding the copper and iron lost of transformer and it's efficiency, all day efficiency.
- ❖ Transformer on No load and On load and it's performance.
- ❖ Dielectric test, temp rise test and polarity test of transformer.
- ❖ 3 Φ induction motor testing No load test and Blocked rotor test of 3 Φ induction motor.

9. INDUSTRIAL ELECTRONICS:

- ❖ Basic electronics
- ❖ Inverter and working of inverter circuit. Application of inverter.
- ❖ Electronic speed control of DC motor, SCR control.
- ❖ Electronic speed control of AC motor variable frequency control.
- ❖ Electronic time delay relay, type of time delay, Relay on delay / off delay.
- ❖ Application of Electronic circuit, Light dimmer, Electronic fan regulator, Battery charger, Emergency light circuit etc.

10. INSTALATION AND COMMISSIONING

A

- ❖ Parts of Lift's installation like lift well, Guide Rail, Counter weight, Lift car, car Buffers, counter weight buffers, Gear's, Motor, rope Indicators, safety gears,
- ❖ Know about machine room
- ❖ Safety equipment use in Life installation. Slack rope switch, Terminal slow down switch, Terminal stopping switch, over speed governor.
- ❖ Various types of Lifts.
Passenger Lift, Goods Lift, Service Lift, Faire Lift, Hospital Lift etc.
- ❖ Rules related to Lift Installation.
- ❖ Know about water pumps Installation's, precautions, while Installing pump.

B Water pump Know about water pumps Installation's, precautions, while installing pump.

C Fire fighting

11. STAND BY POWER SUPPLY B) WASHING MACHINE

A) Stand by Power Supply

- ❖ Need of stand by Power supply.
- ❖ Sources of stand by power supply.
- ❖ Diesel Generator set.
- ❖ Inverter, wiring methods of Inverter's
- ❖ U.P.S.

B) Washing Machine

- ❖ Construction of machine, Parts of Machine, faults produce in Washing Machine Testing.

GUIDELINES FOR QUESTION PAPER SETTERS

Q. no.1 Compulsory (Objective type). 20 marks

Q. no.2 to 8 Solve any five questions from Q. 2 to 8 (Subjective type). 16 marks each

The paper setter should take care that (as far as possible) entire syllabus is equally covered.

