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# The Gujarat Government Gazette

## EXTRAORDINARY

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**Separate paging is given to this part in order that it may be filed as a Separate Compilation.**

### PART IV-A

**Rules and Orders (Other than those published in Part I, I-A and I-L) made by the Government of Gujarat under the Central Acts.**

### ENERGY AND PETROCHEMICALS DEPARTMENT

**Notification**

Sachivalaya, Gandhinagar, 22nd April, 2013.

No. GU/2013/39/ELA/11-2012/2401/K: In pursuance of Regulation 29 of The Central Electricity Authority (Measuring related to safety and Electricity Supply) Regulation 2010, the Government of Gujarat has prescribed Regulations and Conditions for Issuing Certificates of Competency under Regulation 29 of the Central Electricity Authority (Measuring related to safety and Electricity Supply) Regulation 2010. As provided under regulation 22 of the said Regulations, the syllabus for the Electrical Supervisor's Examinations and Wireman Examinations conducted by Licensing Board are prescribed as under:

### VI. SUBJECTS FOR EXAMINATION

1. Syllabus for the Electrical Supervisor's examination:- The Examination will consist of:-

(1) The following three written papers each of two hours' duration, and each carrying 50 marks:-

| | | |
|---|---|---|
| Paper (I) Compulsory | :- | Electricity – Theory (Elementary Knowledge). |
| Paper (II) Optional | :- | Electricity utilization to be taken up by the candidates desiring to qualify for domestic industrial and other installations. |
| Paper (III) Optional | :- | Mines installations-to be taken up by the candidate desiring to qualify for electrical installations in mines. |

(2) *An oral and practical test carrying 50 marks.

To pass the examination a candidate must secure 20 marks in each written paper and 20 marks in the oral and practical tests.,

No certificate shall be issued unless a candidate passed in the papers (I) and (II) c (I) and (III). Candidates have passed in papers I and II and desire to qualify fo installations, shall be exempted from re-appearing in paper I.

Paper III :- Mines Installations.

## SYLLABUS

## PAPER-1

## ELECTRICITY THEORY (ELEMENTARY KNOWLEDGE)

Principle of electricity: - Electric pressure, current and resistance, Ohms law, Specific resistance. Law of resistance and their application for calculating voltage drop. Series and parallel circuits Practical unit of voltage current, resistance power and energy. Relation between electrical power unit (KW) and mechanical power nit (HP).

Electromagnetism :- production of E.M.E. and Flemings hand rule. Magnetic chemical and heating effects of electric current.Magnetic properties of material.Electromagnet and their applications.

Material :- Conductors, non-conductor and insulators insulating materials and their relative merits. Transformer oil.Effect of heat and moisture on insulation.Lubricants and their uses.
Different type of wires, cables, switches, circuit breakers, cutouts etc. and their safe current carrying capacity.Use of table and data sheet s generally given in electrical hand books.

Generation of Electricity- Natural source of energy Type of prime movers.Method of producing Electro Motive Force, alternating current and direct current.

A.C. Generators (Alternatiors) – Essential components and constructional features.Method of voltage and frequency control.Condition and method for synchronizing.Simple associated switch and its accessories.

D.C. Generators:- Essential components and constructional features. Shunt. Series and compound dynamo and their characteristics Causes of sparking Interpoles, Commutators and their maintenance. Carbon brushes, their adjustment and care. Method of voltage regulation.Condition for parallel operation.Simple associated switch board and its accessories.
Batteries :- Primary cells. Dry cell, storage or secondary batteries or accumulators and their installation. Lead acid cells. Nickel iron or alkaline cell.Initial and subsequent charging of batteries charging circuits and their calculation. Series and parallel circuits maintenance of batteries Use of hydro meters.

A.C.Motors :- Theory of induction, (squirrel cage and slip ring type) synchronous and commuted motors, their uses, installation method of starting and speed control and reversal of direction.

D.C.Motors:- Theory of series, shunt and compound wound type motors their uses installation method of starting and speed control and reversal of direction.

A.C.Circuit :- Knowledge of vectors, phase and phase difference, inductance and Capacitance in an A.C.Circuit. Periodicity or frequency.Power and power factor.Single phase and three phase systems.Star and delta connections. Phase sequence.

Controlling and Regulating Gear :- Knowledge of various type of switches and circuit breakers and cut-outs, starters, regulators, protective device for both A.C. and D.C. motors and their wiring with the motors.

Transformation ;- Knowledge of single phase and three phase transformers, their construction, use and maintenance. Phasing out.Parallel working.

Auto-transformer:- Transformer taping, Temperature rise. Instrument transformer.

Conversion :- Principle of operation of motor generators sets, rotary convertors, and mercury are rectifiers.

Transmission and Distribution :- (a) Overhead lines and simple calculations and general principle of construction of low, medium and high pressure lines, size of conductors. Lengths of spans, sags, strength of poles, spacing of conductors, cross arms, effect of temperature, wind pressure ice and snow tension on wire insulators, brackets, stays, struts, guard-wires and other protective devices. Earthing and lightning arrestors and lightning conductors and their testing and fault location. (b) Underground Cables ;- Simple calculation and general principles of laying cables direct in ground in through pipes, handling, bending, jointing, plumbing underground and above ground junction boxes. Distributions board and pillars.Joint box compound melting of compound and feeling boxes with compound.Testing and fault location.

Illumination :- Metal filaments lamps fluorescent lamps circuits. High voltage luminous tube Sign installations.Photometric unit and simple measurements.General requirements of efficient lightning and its elementary calculations.Street lightning Time switches.

Safety rules ;- Working knowledge of;-

(I) Measures Related to Safety and Electric Supply Regulation,2010

(II) Wirings Rules

(III) Protection and restoration of person suffering from electric shock.

## PAPER-II
## ELECTRICITY-UTILIZATION

Domestic Installations.

Wiring ;- Wiring layouts of different types such as cleat lead covered wood casing and capping, cab type sheathed, conduit and cables for lighting and power installation in residential premises together with the necessary switchgear. Estimates of materials and cost of different types of installations.Wiring of temporary installation and portable appliances.

Circuit Diagrams :- Electrical connection of various circuits. For-

(I) House wiring including those for main and sub-distribution board, switches and cutouts etc. together with the load statement for each circuit, and

(II) Lifts with their safety devices.

Apparatus-installation and maintenance of heaters, cookers, refrigerators, and other domestics appliances, electric bells and indicators. Small motors for pumps and electric lifts.

Energy measurement and charges-Energy meters both D.C. and A.C. for house service.

Simple calculation relating to cost of energy. Elementary knowledge of methods of charging for energy.

Testing and fault attendance:- Detection and location of fault in domestic appliances and wiring installations. Insulation and continuity tests.Rectification of faults.Tests for insulation resistance to earth.Earth testing.

Protective devices- Elementary knowledge of use of fuses and cutouts.

Earthing of domestic appliances, motors etc. Use of lightning arrestors.

Industrial installations.

Wiring:- Wiring layouts of different types such as cleat, wood casing and capping, metal sheeted, cab type, sheeted, conduit and armored cables for lighting and power installation and industrial premises together with the necessary switchgear. Estimates of a material and cost of different type of installations wiring of temporary installation and portable appliances.

Circuit Diagram- Electrical connection for :-

(I) D.C. and A.C. generators, switch-board, transformer.

(II) Main and sub distributing board with circuit breakers switch fuse-units, with load statement for each circuit.

(III) D.C. and A.C. motors, their starters, regulators.

(IV) Battery charging equipment.

(V) Converting machinery.

(VI) Lifts with their safety devices.

Pump installation:- General principle and elementary calculation of head, power and energy requirements.

Apparatus :- Installation and maintenance of generators, electric motors, electric lifts, electric furnaces, electric welding plants haulage and winding machines, cooling and heating appliances.

Power and energy measurement and charges :- measurement of power, Wattmeter, Energy meters, both D.C. and A.C. power factor correction by capacitors.

Simple calculations relating to cost of power and energy.Elementary knowledge of methods of charging for demand and energy.

Testing and fault attendance :- Detection and location of fault in D.C. and A.C. generators, motors, overhead distribution lines and underground cables, electrical instruments and apparatus and wiring installations, Rectification of fault, Insulation and continuity tests. Tests for insulation resistance to earth.Earth testing.

Protective device- Elementary knowledge of earthing of generators, motors, machines, installations and appliances use of lightning arrestors, fuses, including higher rupturing capacity of fuses, cutouts, circuit breakers, overload and no volt protection thermal trips. Field breaking switches and over speed protection.

## PAPERS – III
## MINES INSTALLATIONS

Wiring- Wiring layouts of different types such as cleat, lead covered, wood casing capping, cab-type sheathed, conduit and cables for lighting purposes and conduct and cables for power installation with necessary switchgear. Different types of trailing cables and their uses.

(i) Circuit Diagrams :- Electrical connection for :-

(a) D.C. and A.C. generators, switch boards, transformer etc.

(b) Distribution boards with circuit breakers, switch fuse units and gate lend switches with load statement for each circuit.

(c) D.C. and A.C. motors, their starters and regulators.

(ii) Apparatus :- Installation and maintenance of :-

(a) Electric, winders, haulages and pump unit their control gear and starters.

(b) Rectifier, rotary converters and electric locomotives.

(c) Portable and transportable machineries. Coal cutting machines loaders, conveyers, Gate Lend switches drill panels with drill unit and their control system.

(III) General principles and elementary calculation of load power and energy consumption in pumping hauling and winding installation and other working face machineries.

Power and Energy measurement and charges :- Measurement of power, Wattmeter, energy meters both D.C. and A.C. power factor correction by capacitors, simple calculation relating to cost of power and energy. Elementary knowledge of method of charging for demand and energy.

Testing and Fault attendance :- Detection and location of earth or other fault in electrical apparatus and cables.

Insulation and continuity test. Rectification of faults. Tests protective device. Earth testing.

Protective devices :- Elementary knowledge of earthing of metal frames of machineries, Use of fuse, Overload, No volt and earth leakage protection of circuit breakers.

Safety Rules :- Working knowledge of earthing of – The Central Electricity Authority (Measuring related to safety and Electricity Supply) Regulations 2010 with particular reference to chapter.

Note :- Candidates desiring to qualify only for electrical installation mines need not appear for compulsory section under part II. Part I, however, compulsory for such candidate also.

**ORAL AND PRACTICAL TEST.**

An oral and practical test based on the syllabus written papers will be held.

2. **Syllabus for wiremen's examination** – The examination will consist of practical test (3 Hours) carrying 100 marks and written test (2 Hours) carrying 40 marks in the examination and oral test carrying ten marks.

To pass the examination the candidate must secure at least fifty marks in practical, fifteen marks in written and oral test and an aggregate of seventy five marks in the examination.

Electric pressure (Volts).
Electric Current (amperes)
Power (Watts)
Energy (Watt-hour)
Ohm's Law
Difference between A.C. and D.C. supply.
Conductors and insulators.
Use of Standard wire Gauge.
Connection of voltmeters and ammeters.
Reading of Energy Meters.
Simple calculations of power and energy.
Testing the supply for OFF and ON A.C. and D.C.,
Positive and Negative Live and Dead conductors
Various uses of the Test Lamp and Bell.
Connection and Diagrams for distribution and fuse boards.
Cut-out Ceiling roses, Lamp holders, Switches (including two way and intermediate)
Wiring of fittings of small motors and other domestic appliances.
Wiring on cleats, in wood casing metal sheeted T.R.S.PVC.
Cab Type sheeted, conduits etc.
The installation of electric bells and indicators.
Connection of A.C. and D.C. fans and regulators, common fault in them and their remedies.
Knowledge of danger point simple lighting and power installation.
Method of carrying (Overhead) bare PVC, lead covered, Cab Type sheeted wires and latest type of wires over short distances.

Testing for faults.Measuring insulation resistance to earth by megger.
Precaution and method of treatment in case of a person suffering from electric shock.
Making straight and tee joints in stranded insulated wires.
Soldering lugs on wires and cables.
Making joints such as Britannia, Western Union in bare copper aluminum and A.C.S.R. wires.

By order and in the name of the Governor of Gujarat,

**H. C. PATEL**
Under Secretary to Government,

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GOVERNMENT CENTRAL PRESS, GANDHINAGAR.