

**MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI**

1	Name of Course	Certificate Course in Wireman (w.e.f. 2018-19)				
2	Max no. of Students	25	Course Code - 302209			
3	Duration	1 year				
4	Course Type	Part Time				
5	No. of Days per week	6 days				
6	No. of hours per day	7 Hrs				
7	Space require	Theory Class Room – 200 sqft Practical Lab – 1000 sqft Total – 1200 Sqft				
8	Entry qualification	S.S.C. Pass				
9	Objective of syllabus	To understand basic of wiring, To understand and use various wireman hand tool, To perform various task related to Wiring in building, industry, and transmission system.				
10	Employment opportunities	work as wireman in electricity board, various industrial and commercial ogranizations, can start own wireman service workshop				
11	Teachers Qualification	Diploma in Electrical or Equivalent and 2 yr Experience.				
12] Teaching Scheme – Training System Per Week						
		Theory	Practical	Total		
		6 Hrs	18 Hrs	24 Hrs		
13] Examination Scheme –						
Sr	Paper Code	Name of Subject	Theory/ Practical	Hours	Max Marks	Min Marks
1	30220911	Wireman	Theory - I	3 Hrs	100	35
2	30220912	Wiring	Theory – II	3 Hrs	100	35
3	30220913	Workshop Calculation, Science and Drawing	Theory – III	3 Hrs	100	35
4	30220921	Wireman	Practical – I	3 Hrs	100	50
5	30220922	Wiring	Practical – II	3 Hrs	100	50
6	30220923	Workshop Calculation, Science and Drawing	Practical - III	3 Hrs	100	50
				Total	600	255

## Wireman

<b>PRACTICAL - I - Wireman</b>	<b>THEORY - I - Wireman</b>
Orientation 1. to make the trainees familiar with shop discipline, lay out of the shop, machines, equipment etc. Installed in the shop, safety precautions including fire fighting equipment's. First aid practice, resuscitation and treatment for electric burns.	Introduction to the trades. Scope for training in the trade, safety precautions. Elementary first aid, resuscitation and treatment for electric shocks, burns etc.
Practice in using steel rule, cutting pliers, screw driver, electrician knife etc. Skinning the insulation of Aluminum conductor cable and copper conductor cable, and joining practice with single and standard conductors.	Description, specification and general care and maintenance of common hand tools, fundamental terms, definitions and units etc. Effects of electric current.
Joints on bare conductors such as Britannia straight, etc. Western union & sleeve. Practice in soldering the above joints. Use of insulated connectors.	Qualities of good electrical conductor. Common conductors. Common conductors, their shape, size & use of wire gauge etc. Insulated conductors in general use. Their kinds as regards insulation 7 voltage, low, medium, high voltage.
Practice in soldering the aluminium conductor cable joints. Use of aluminium flux and Alpac solder Practice in soldering the thimbles of various size with aluminium conductor before inserting into the terminal.	Soldering its purpose different percentages of solder used use of flux. Different fluxes for different purposes or metals, use of resin core solder. Description of soldering equipments. Care & maintenance of the blow lamp, joining of conductors by welding.
Practice in connecting different lighting accessories such as switches, fuses, wall sockets lamp holders etc. Practice in connecting simple circuits with a lamp, bell, dry cell or battery.	Common electrical accessories and specs. Common insulating materials used ohm's law and its application, resistance in series.
Practice in connecting measuring instruments such as volt meter Ammeter etc. Practice in testing & finding polarity of supply characteristic practice in crimp joints of various size on aluminium & copper conductor.	Different types of instruments parallel circuits and its applications work power and energy their inter relations calculations of power & energy in DC circuits.
Practice in connecting simple parallel circuit and study the difference between series & parallel circuits. Practice in testing & connecting domestic appliances such as heater, electric iron, kettle etc.	Protection of surface iron and steel. Painting and galvanising. Precautions in using aluminium conductor cable, laws of resistance.
Measurement of power and energy by using voltmeter kw Hr meter practice in connecting domestic appliances and measuring current voltage drop and power.	Magnetism terms used types and shapes of magnets, properties of magnets, general care & maintenance, methods of magnetising. Magnetic materials.
Chipping practice & practice in grinding, hardening and tempering of chisels.	Introduction to fitting trade, safety precautions to be observed. Description of hammers, chisels etc. Steel rule try square etc. Their general care & maintenance.
Filing practice, filing true to line.	Description of files, types, size, and grades.. use of files their care & maintenance marking tools description and use.

Marking sawing and drilling, practice in hand drilling and power drilling machines.	Description of hacksaw frames, hacksaw blades their specifications, grade etc. Types of drills, description of drilling machine, proper use care & maintenance.
Practice in using taps and dies. Threading hexagonal and square nuts etc. Cutting external threads on stud and on pipes cutting & riveting practices.	Description of taps and dies, types of rivets & riveted joints.
Sawing and planing practice. Practice in using firmer chisel & preparing simple half lap joint, mortise and dovetail joints.	Description of carpenter's hand tools such as saws, planes, chisels etc. Their care & maintenance
Making of single and double rectangular boards. Making teak wood distribution box using dovetail joints. Practice in using sand paper and polishing	Timber its description, seasoning process and their use for different purposes. Introduction to wooden poles and battern finishing and polishing materials and their processes.
Simple sheet metal work- cutting, bending and joining. Jointing of metals by soft soldering. Making of simple sheet metal articles	Sheet metal worker's common hand tools . sheet and wire gauges blow lamp and its use. Pipe and pipe fittings. Description of simple soldering and brazing common joints.
Simple sheet metal work- cutting bending, and joining. Jointing of metals by soft soldering. Making of simple sheet metal articles	Sheet metal worker's common hand tools . sheet and wire gauges blow lamp and its use. Pipe and pipe fittings. Description of simple soldering and brazing common joints.
Practice in wiring different domestic electrical appliances deserving ze rules and safety precautions.	Different types of domestic electrical appliances their specification construction & use.
Practice in making new heating elements, replacement of old ones, testing and repairs to domestic appliances.	Electromagnet- advantages and uses. Principles of electromagnetism, cork screw rule. Right hand thumb rule, magnetic field of current carrying conductor and loop.
Practice in magnetising methods. Tracing the magnetic field set up by a current carrying conductor and a loop.	Solenoid and its polarity, palm rule etc. Magnetic terms and equations.
Tracing the field of electro magnet (solenoid). Study the variation of field strength by varying current, no. Of turns etc. Preparation of a simple electromagnet.	Principle of electromagnetic induction. Faraday's law. Lenz's law Principle of AC generator. Fleming's right hand rule. Use of slip rings and split rings.
Preparation of calling bell. Study of electromagnetic induction . measurement of resistance by drop method.	Parts and functions of DC generator. EMF equations, self and separately, excited generators their application in practical field.
Practice in dismantling the DC generator and study the parts and reassemble. Measuring the resistance of armature, shunt field, series field and identifying the terminals. Measuring the insulation resistance. Building up of voltage and loading of compound generator, both cumulative and differential. Practice in connecting both controlling and protecting equipment.	Types and characteristics of dc generators such as series , shunt and compound their application. Electromagnetic drag, Fleming's left hand rule. Principle of DC motor.

Connection of shunt & compound generators, building up of voltage. Practice in using meager and testing DC generators, attending to minor repair works. General up keep and maintenance.	Armature reaction, use of interlopes and their polarity, connection of inter poles and commutation. Terms use din DC motor such as torque, speed back EMF etc. Their relation & practical application.
Testing of DC motors identifying terminals, connecting, running and reversing of DC shunt and compound motors study of DC three point starter. Study of 4 point starter. Its connection with shunt & compound motor. Connecting speed, controlling devices, measuring the speed using tachometer or revolution counter with stop watch. Use of meager for testing insulation and resistance	Types of DC motor starters : 3 point and 4 point, protective devices used. Methods of controlling speed of DC motors their advantages and disadvantages & industrial application.
Practice in fixing and connecting accessories such as switches lamp holders, fuse plug socket set on TW boards.	Types and characteristics of DC mootr. Industrial application of DC motor starting methods.
Practice in fixing and connecting accessories such as switches, lamps holders, fuses, plug, sockets, etc. On teak wood boards.	Wiring materials used for wiring in cleats, IEE rules & Indian standard regarding cleat wiring
Layout marking on wiring boards. Wiring exercises in cleats : 1) one lamp controlled by one SP switch. 2) Two lamps controlled by two SP switches independently 3) One lamp controlled by two, two way switches.	Fundamentals of AC different terms used their inter relations.
One lamp controlled from any three places using intermediate switch in TRS cable. Further practice in TRS & PVC insulated cable wiring for mixed loads and use of sub meters.IS : 732-1963	General idea of single phase and poly phase system, current power and power factor.
Practice in LC, PVC insulated cable for simple circuit using SP switch. Batten, lamp holder two pin wall socket etc. Further practice in lead covered cable using 2 plate and 3 plate ceiling roses & 3 pin wall socket.IS 732-1963	Description of different electric fitting and accessories such as lamp holders, switches, plugs, brackets, ceiling, rose, cut out main switches shades etc. IS : 732-1963
Practice on LC twin core PVC system using junction boxes main switches, distribution box, two way and intermediate switches.	Wiring material used for TRS and LC/PVC cables. IE rules & Indian standard regarding the above wiring such as distance of clip , fixing of screws, cable bending etc
Joints in casing and capping ( corner 'T' jumper and straight joint) Simple casing, capping, and wiring one lamp controlled by one SP switch. Further practice on complex circuits using bridge joints practice on walls and ceiling for fixing capping & batten. S typical house wiring in casing capping.	Description of rowel tools and rowels plugs, their sizes plugging compound wooden plugs use of cold chisel hammer wall jumper their sizes and uses . introduction to estimates, casing capping materials used, sizes and grades wiring materials for casing capping IE rules & IS regarding casing capping & wiring.
Practice in cutting and threading conduit pipes. Practice in bending cold and hot of conduit other than 90 deg, angle.Fitting of conduit accessories	Conduit pipe wiring materials and accessories types and sizes of conduit.

Practice in preparing conduit frame using different fitting and use of running threads wiring in conduit using metal clas 3 pin plug and earthing the conduit using earth clips and earth wire.IS : 732-196	Position of light heating points- their controls main switch & distribution boards LE rules regarding mixed load. IE and IS rules regarding earthing of conduit. Table for size and no. Of conductors to be drawn in conduit simple estimation IS : 732-1963
Conduit wiring, one lamp controlled from any three places. Testing wiring installation using megger. Practice in fault location in the wiring installation using meger .IS : 732-1963	Open and concealed systems, methods of drawing wires through conduit. Description and use of junction boxes,. Simple estimation.
Further practice and estimation of quantities preparation of estimation for domestic wiring.	Description of rowel tools and rowel plugs, their sizes, plugging, compound wooden plugs use of cold chisel, hammer wall jumper their sizes and uses and introduction to estimates.
Industrial power wiring to a wire a single phase motor with switch and starter. Earthing the installation testing the insulation and earth continuity of the installation.	Different types of motors used in industry their normal method of wiring controlling & starting devices their connection layout and earthing . code of practice for earthing of industrial wiring.
Wiring 3 phase squirrel cage induction motor with star delta starter TPIC switch and earthing starter and motor	Wiring in w/s factories and houses. Knowledge of fire insurance rules and its applications.
Practice in preparing good earth by plate & pipe method and connecting it to the required installation. Checking earth resistance	Purpose of earthing the installat on and machines. Types of earthing such as plate and G.I. Pipe earthing & methods of making good earthing.
Protection of building against lighting: Description of rowel tools and rowel plugs, their sizes, plugging, compound wooden plugs use of cold chisel, hammer wall jumper their sizes and uses and introduction to estimates	Erecting and wiring low pressure ACDC machine and their panel
Practice in making joints in casing and capping, corner T jumper & straight joint. Practice on walls and ceiling for fixing casing & capping batten	Casing, capping materials used sizes and grades wiring materials for casing capping IE rules & IS regarding casing capping and wiring
Erecting and wiring low pressure DC & ac machines and their panels.	IE regulations regard- reading of earth resistance. Measurement of earth resistance- distribution of DC 2 wire & r wire AC 3 phase, 3 wire and 3 phase, 4 wire system.
Practice in TRS cable wiring using main switch, distribution box for lighting & heating circuit	Casing, capping materials used sizes and grades wiring materials for casing capping IE rules IS regarding casing capping and wiring
Wiring domestic installation in TRS cable using distribution box for lighting heating and power circuit according to code of practice.	General insulating materials used in electrical engg. Their properties & uses. Classification of insulating materials on the basis of thermal stability . insulation resistance, dielectric strength, factors effecting the choice of insulating materials
Domestic wiring installation for mixed light and power loads using meters.	Wiring materials, used lighting heating & power installation general idea of fixing meter boards & taking service connection. . sealing of IC cut out & meters IE rules regarding the above. General domestic appliances using heating effect their capacities. Voltage ranges calculation of current, type size and current carrying capacity of different insulated cables, their grades of insulation wire tables. Correct specs. Of cables:

Practice in TRS cable wiring and practice in using single core and twin core cables with 2 way, intermediate & master switches.	Use of rawl tool size, rawl plug plugging compound advantages over wall pegs ( wooden guitties) inter connecting wiring circuits in the main building and auxiliary blocks, meter boards and its location, connection diagram of distribution boards switches, plugs, regulators etc. Study of layout symbols in the preparation of layout diagrams.
Practice in wiring with lead covered cables for simple circuits using SP switch lamp holders, two pin wall sockets etc. Further practice on LCC system using two plate and 3 plate ceiling roses, three pin socket etc.	Lead covered cable system of wiring description and places of use of LC P & VC/PCP cables wiring materials and its description IE rules regarding bending, earth continuity and bending of cable etc. Method of conducting test with megger for a lead covered cable system of wiring
Practice in PVC sheathed and CTS wiring system using junction boxes. Main switch, distribution box two way & intermediate switches, ball with indicating lamp.	Earthing and its importance, earthing iron clad switches, cut out distribution boards. Rules for running earth wire and IE rule governing earthing electrical installation efficient earthing arrangements dangers of
providing an efficient earth maximum earth resistance as per IE rule measuremnt of earth resistance using earth megger. Use of earth leakage circuit breaker.	Practice in trouble shooting in different types of wiring. Causes & remedies for faults in wiring

## Wiring

<b>PRACTICAL - II - Wiring</b>	<b>THEORY - II - Wiring</b>
Cutting and threading of conduit , practice in fitting conduit frames using coupling bends tees and junction boxes to correct dimensions practice in steel conduit wiring.	Conduit wiring materials and accessories used type and size of conduit. Description of parts & correct use of conduit die set. Procedure for concealed conduit wiring
Practice in simple wiring in PVC conduit. Using bends tees and boxes and junction boxes, use of bushes, earth clips and earthing of conduit IS : 3419 –1965	Table for size and number of cable to be drawn conduit IE rules regarding conduit wiring and earthing open and concealed system. Methods of drawings cables through conduit. Estimating the cost of installation of a light and power load (combine circuit)
Light and power wiring in conduit using ICDP switch distribution box, submeter metal eacaped pin plug practice in bending conduit pipe according to the requirements.	Different type of motors used in industry their normal method of wiring controlling & starting devices their connection, layout and earthing IE rules regarding industrial power wiring and earthing. Estimation of the material & cost.
Industrial power wiring practice in wiring up a DC shunt motor with suitable switch and starter in conduit & cables.	Fundamentals of AC single phase system characteristics of series and parallel circuits, calculation of impedance power and power factor simple examples.
Panel board wiring practice.	AC poly phase system advantages, 3 phase star delta connections relation of current and voltage in phase and lines measurement power in AC 3 phase circuit simple calculations in AC 3 phase circuit.

Study of AC series and parallel circuits , measuring voltage and current . practice in connecting single phase watt meter, study the connection of single phase PF motor.	Power in AC 3 phase circuit simple calculations in AC 3 phase measurement of power in AC 3 phase circuit principle of poly phase induction motor – types characteristics and industrial application Relation between line and phase to H.H.P. Starting Equipment required for induction motors, description & internal connections of direct on Line starter. Star delta starter. Over load safety devices – their connections and functions. Internal arrangement of a motor resistance starter for slip ring Ind. Motor
Connection of lamp resistance's in star & delta . study the relationship of phase and line, saline's of voltage and current practice in connecting 3 phase watt meter. Study the connection of 3 phase P.F. Meter, identifying the connections of a squirrel cage induction , motor using lamp and volt meter method. Practice in connecting three phase energy meter	Principle of transformer constructional features E.H.F. in secondary, voltage, current and turn ratio 3 phase transformer different connections, normal capacities, general idea of leading and regulation.
Practice in wiring up a 3 phase squirrel cage induction motor in conduit , using I.C.T.P. , switch , direct and line starter with indicating lamps.	Losses and efficiency of a transformer, temperature rise cooling methods. General procedure of testing a new transformer before commissioning, General care and maintenance periodical testing of checks up. Use of auto transformer IS 1886 –1967 and IS 1180- 1964
Wiring a 3 phase squirrel cage induction , motor using T.P.T.C. , switch , star delta starter and indicator lamps in conduit correct setting of over –load adjustments.	Principle and general types of alternator E.M.F. generated standard generating voltage, general idea of loading and regulation of alternator.
Testing and connecting a single phase and single phase and 3 phase transformer, finding voltage ratio, connecting the transformer for loading through necessary switches and meters connecting for different voltages.	Different types of switches and switch gears such as main switches three range switches , multirange rotary switches , cooker control panels, power circuit switches, thermostats, mercury switches etc.
Preparing the frame for a panel (fabrication of panel board) suitable for a motor generator set consisting of a sq. Cage induction motor & P.C. compound generator IS 3072 part II 1965	Different systems of Industrial wiring such as concealed conduit over head busbar side, busbar, through system description and advantages of different fittings and their connections
Erection of panel board, fixing of controlling starting equipments, necessary meters and practice in panel board wiring with P.V.C. seethed cable	I.E. rules regarding panel erection, busbar spacing busbar chamber working space danger boards, connection of high voltage metering equipments used with busbar .
Earthing of conduit wiring, iron clad switches, circuit breaker, busbar chambers, busbar, trunking metal frames of machines etc. Preparing a good earth, practice in using earth meager for measuring the earth resistance IS- 732 –1963	Fire insurance rules cinematographic rules & cinema. Togaphic rules procedure adopted in carrying out wiring in cinema halls. Types of working, types of controls required, different types of circuits used etc.
Practice in wiring of factories in conformity with the code of practice for electrical installation in conduit IS. 2274 –1963	Incandescent lamps general description, types of caps, type of lamps such as vacuum, gas filled, coiled coil etc. Relative comparison and advantages. Normal wattage's available type of cap for different wattage

Practice in wiring of circuits (line ) a used in a cinema wiring cinema hall and cabin in conformity with cinematographic rules in concealed conduit .	Different discharge lamps – advantages and disadvantages over incandescent lamps principle of difference discharge lamps starting accessories used
Practice in connecting different discharge lamps , fluorescent lamp mercury vapour lamp, neon signs- lamps , their wiring in conduit with different type of industrial fitting for lamps and street lights	A.C. single phase motors, different types , their working principles, characteristics, starting devices and application .
Using flexible conduit – practice in wiring for different types of equipment	Illumination different terms used. Standard levels of illumination in different places and purposes advantages and qualities of good illumination different type of reflector- fitting and mounting heights for factory, domestic and commercial lighting installation
Industrial lighting installation, use of different fitting and equipments observing the proper mounting heights, number of lamps position and spacing of lamps as per the level of illumination required , IS. 3646 PART I 1966	Methods of connecting a busbar channel, under ground cable description , place of use , advantages different types of cables including paper and cambric insulated cables
Practice in terminating an U.G. Cable to a busbar chamber . Soldering lugs the cable, connecting to busbar, taking loop connection for another circuit from the busbar. IS 1255 – 1967	General idea of laying method and jointing, precautions to be observed and different accessories used for medium voltage termination IS 693 –1965
Practice in bare conductor jointing such as Brittanica straight and tea joints, western union joint-sleeve joint. Use of parallel groove clamps. Binding insulator.	Line proting devices general working principle, brief description connection and places of use. Different types of stays Description and application of cable trunking system IS 3961. Part I 1967, IS 3961-Part II 1967, IS 3961 Part III 1988, IS 1961-Part IV-1968
Overhead line practice – fixing of cross insulation fixing of stay stringing and tensioning of conductors – ampering,. Earthing the poles , fixing lighting arresters IS 3043 - 1966	Electrical measuring instrument such as moving coil moving iron, dynamometer type etc. Their working principles different forces acting, use of different instruments – difference between volt – meters & ammeters, shunts, and multipliers , single phase and 3 phase energy meters, mergers, whetstone, Bridge etc.
Practice in fixing conduit on face and web of girders by standard clips. Preparation of girder clips according to the requirements. Fixing of conduit on steel structure and wire up for light and power, preparation of clamps for fixing ceiling fan on girders and fixing fans	Common faults , causes and remedies in domestic and industrial wiring installation. Method of locating faults. Importance and advantages of maintenance. Points to be observed to maintain the installation preventive maintenance and routine tests
Testing wiring installation of light and power, filling test forms. Locating and rectifying faults such as open circuit short circuit , ground etc. Use of test lamp for testing supply for off and on. Use of double test lamp in poly phase supply.	Wiring including earthing of different domestic appliances such as electric heater, air circulator, cookers, water heater, automatic water boiler , bells and signaling equipment and indicators

Wiring for fire and burglar alarms, different arrangements	Different – distribution system – their relative merit and demerit . permissible voltage drops in low and medium voltage line necessity & method of balancing of loads
Practice in wiring circuits as used in auditorium,. Flood lighting , stage lighting, different arrangements for colour effect. Distribution of lead in different circuits , emergency lighting , Study of layout symbols and preparing estimate for a domestic wiring installation with a given layout Two or three typical layout diagrams.	Purpose of advantages of estimation,. Different factors to be considered. Estimating for domestic lighting for power and industrial wiring installation,\
Estimation of material with full specification to wire up a given machine with its panel board, observing I.E. rule regarding the working space etc.	Principle of electron theory , direction of currents, different terms used, principle of diode , triode-their application in the industry.
Use of different types of fuse gears – including H.R.C.. practice in estimating an industrial wiring installation IS 732 –1963	Importance of industrial electronic in the modern industry, photocell and amplifier , different types of cables used precautions to be observed. Knowledge of different electronic symbols . elementary knowledge on transistor and its circuits IS 2032 (PART VIII –1965) use of standard electrical formula problems e.g .determination of voltage current , resistance, impedance , reactance, capacitance, power factor etc.
Wiring for telephone and music channel as required in hotels and multistoried buildings	Different cables used for telephone and music channel wiring and their specification, procedure for shielding telephone and music channel wiring from other wiring

## TRADE : WIREMAN

<b>I</b>	<b>DOMESTIC APPLIANCES</b>	
<b>1.</b>	FOOD MIXER	IS 5250-1980
<b>2.</b>	COOKING OVEN	IS 5790-1970
<b>3.</b>	STORAGE WATER HEATERS	IS 2082 –1978
<b>4.</b>	IMMERSION WATER HEATERS	IS 368-1977
<b>5.</b>	ELECTRIC IRONS	IS 366-1976
<b>6.</b>	INSTANTANEOUS WATER HEATER	IS 366 –1976
<b>7.</b>	SOLDERING IRONS	IS 959-1980
<b>II</b>	<b>CABLES &amp; CONDUCTORS</b>	
<b>8.</b>	ALUMINIUM CONDUTOR FOR OVER HEAD TRANSMISSION	IS 398 PT, I ,II.& III 1976
<b>9.</b>	PVC INSULATED CABLES	IS 694 –1977
<b>10.</b>	PVC INSULATED HEAVY DUTY CABLES	IS 1554 (PT. I ) 1977
<b>11.</b>	CROSS LINKED POLYTHELENE CABLE	IS 7098 – PT.II-1977
<b>12.</b>	LIFT CABLES	IS 4289 –1967
<b>13.</b>	PAPER INSULATED CABLE	IS 992 –1973
<b>14.</b>	POLYTHELENE INSULATED CABLES	IS 1596 –1977
<b>15.</b>	CURRENT RATING FOR CABLES	IS 3961 –PTS. I TO V
<b>16.</b>	RUBBER INSULATED CABLES	IS 434 PT I & II
<b>17.</b>	VIBRATION DAMPERS FOR OVER HEAD LINES	IS9708 –1980
<b>III</b>	<b>ELECTRICAL INSTALLATIONS</b>	
<b>18.</b>	INSTALLATION AND MAINTENANCE OF OVERHEAD POWERLINES	IS 5613 PT I SEC II 1971
<b>19.</b>	INSTALLATION AND MAINTENANCE OF SERVICE LINES	IS 8061- 1976

20.	EARTHING	IS 3043-1966
21.	METHOD OF MEASUREMENT OF ELECTRICAL INSTALLATION IN BUILDINGS	IS 5908-1970
22.	WIRING IN HOSPITAL	IS 7733-1975
23.	ELECTRICAL WIRING INSTALLATION	IS 732-1963
24.	GRAPHICAL SYMBOLS USED IN ELECTRICAL INSTALLATION	IS 2032 –PT, I 1969
25.	ELECTRICAL LAYOUT IN RESIDENTIAL BUILDING	IS 4648 –1968
26.	HOSPITAL LIGHTING	IS 4347-1967
27.	INSTALLATION OF PAPER INSULATED CABLES	IS 1255-1967
28.	INSTALLATION OF BELLS AND CALL SYSTEM	IS 2884 –1978
29.	LIGHTING OF PUBLIC THOROUGHFARES	IS 1944 PT. III 1970
30.	PROTECTION OF BUILDING AGAINST LIGHTING	IS 2309 –969
IV	<b>INSULATION</b>	
31.	INSULATING TAPES	IS 2448 –PT, I & II
32.	INSULATING OIL	IS 335 –1972
V	<b>FANS</b>	
33.	CEILING FANS	IS 374 –1979
34.	PEDESTAL FANS	IS 1169-1967
35.	TABLE FANS	IS 555-1979
36.	VENTILATING FANS	IS 2312-1967
VI	<b>ILLUMINATING ENGINEERING</b>	
37.	FLAME PROOF ELECTRIC LIGHT FITTING	IS 2206 PT. I & II
38.	FLOOD LIGHTS	IS 1947 –1980
39.	INTERIOR ILLUMINATION	IS 3646 –PT.I 1966
40.	LIGHTING FOR PUBLIC THOROUGHFARE(FOR BRIDGES ETC.)	IS 1944 PTV 1981
41.	LIGHTING FOR ROADS WITH SPECIAL REQUIREMENTS	IS 1944 PT VII 1981
42.	WATERPROOF ELECTRIC LIGHTING FITTINGS	IS 3528 –1966
VII	<b>INSULATORS &amp; ACCESSORIES</b>	
43.	STORING INSULATOR UNITS	IS 3528 –1966
44.	INSULATOR FITTINGS FOR OVERHEAD POWER LINE	IS 3188 –1980
45.	PROCELEIN BUSHINGS	IS 7421 –1974
VIII	<b>LAMPS</b>	
46. FL	FLOURESCENT LAMPS	IS2418 –pt.i1977
47.	LAMPS FOR AERODROME LIGHTING	IS 8901 –1978
48.	LAMPS FOR RAILWAY SIGNALLING	IS 9589 –1980
49.	LAMPS FOR LIGHTING ON BOARD SHIPS	IS 2592 –1980
50.	HPMV LAMPS	IS 2183 –1973
IX	<b>LIFTS ETC.</b>	
51.	OPERATION & MAINTENANCE OF LIFTS	IS 1860 –1980
52.	CONTRACTORS	IS 2959- 1975
53.	HEAVY DUTY AIRBREAK SWITCHES	IS 4047 –1967
54.	DISTRIBUTION FUSE BOARDS	IS 2675 –1966
55.	MOTOR STARTERS	IS 8544 PT. I AND III
56.	BUS BARS	IS 375 –1963
X	<b>WIRING ACCESORIES</b>	
57.	CONDUITS FOR ELECTRICAL INSTALLATIONS	IS 9537 PT. I 1980
58.	FITTINGS FOR RIGID NON- METALLIC CONDUITS	IS 3419-1976
59.	FITTINGS FOR RIGID STEEL CONDUITS	IS 2667 –1976
60.	FLEXIBLE STEEL CONDUITS	IS 3480-1966
61.	SWITCHES	IS 3854-1966
62.	THREE PIN PLUGS SOCKET	IS 1293-1967
63.	CEILING ROSES	IS 371- 1979
XI	<b>SAFETY</b>	

### Theory –III & Practical - III - Workshop Calculation, Science and Drawing

	W/S CAL. & SCIENCE
1.	Simple arithmetic addition, subtraction , Multiplication, Division of whole and partial number. Properties of metals and their importance in trade
2.	Fraction & decimals , conversion of fraction to decimals and vice versa/
3.	Properties of C.I. & its types, uses. properties of Non –ferrous metals and how its identifications.
4.	Properties of copper, Zinc , mild steel , aluminum etc.
5.	Properties of Brass steel , bearing metals, timber etc.
6.	Decimals, Division, multiplication
7.	Logarithm and how to find out mantisa & characteristics.
8.	Properties of C.I steel
9.	Work , power , energy
10.	Motion, velocity and problems.
11.	Volume, mass, density applied problems.
12.	Properties of metal and their applications
13.	Square roots, power conversion of decimal to British & vice versa
14.	Square roots, power conversion of decimal to British and Vice versa
15.	Multiplication power root of a number
16.	Problems on work , power & energy
17.	Ratio & percentages and problems
18.	Meaning to stress, strain, energy , elasticity
19.	Meaning of stress, strain, energy , elasticity
20.	Stress and its important factors example.
21.	Ration and proportions, ratio, fining forms and ratio proportions direct and indirect proportions
22.	Application of ratio and proportion to shop problems
23.	Mixed direct and indirect proportion problems
24.	Machines – basic principles , velocity ratio. mechanical advantages , efficient simple problems.
25.	Algebraic symbols & fundamental algebraic operations signs & symbols used in algebra, co-efficient , terms like terms and unlike terms
26.	Addition and subtraction , multiplication and division
27.	Logarithm and antilogarithms . Problems on logarithms
28.	Simple machines like winch pulley & compound axel etc. with examples.
29.	Factors and equation of algebric formula.
30.	Factors and equations-types of factorisations.
31.	Heat treatment of steel-hardening, appealing, tempering, normalizing, case hardening-standard and measurements-equations-simple simultaneous quadratic.
32.	Application construction and solution of problem by equations.
33.	Atmospheric pressure. pressuregauge gauge pressure & absolute pressure.
34.	Power & exponent & laws of exponent.
35.	Arithmetical operations involving logarithms in the computations.
36.	Problems related to trade using logarithm tables.
37.	Density of solid and liquids simple experiments and determination.
38.	Specific gravity principle of Archemedies.
39.	Relation between specific gravity and density. Simple experimental determination.
40.	Geometry- Fund-mental geometrical definitions angles and properties of angles, triangles and properties of triangles.
41.	Pythagoras theorem, properties of similar triangles.
42.	Revision of !st year topics.
43.	Revision of 1 <sup>st</sup> year topics.
44.	Rectangle, square, rhombus, parallelograms etc. and their pproperties.
45.	Circle and properties of circles Regular polygon.
46.	application of geometry to shop problem
47.	Heat & temp. thermometric scales their conversions.
48.	Temp. measuring instruments.
49.	quantity of specific heat of solids liquids & gears.
50.	Heat loss and heat gain with simple problem
51.	Mensurations, plain figures-triangles, square rectangles, parallelogram.
52.	Plain figures-trapezium, regular polygons, circle, hollow circles.
53.	Plain figures segment and sector of circle, ellipse fillets.
54.	Solid figures- prism, cylinder, pyramid, cone.
55.	Solid figures-frustum of cones sphere, spherical segment.

56.	Material weight and cost problems related to trade.
57.	Trigonometry, Trigonometrical ratios use of trigono table.
58.	Finding height and distance trigonometrically
59.	Area of triangle by trigonometry.
60.	Application of trigonometry to shop problems.
61.	Application of trigonometry to shop problems.
62.	Triangle of forces. Parallelogram of forces.
63.	Composition and resolution of forces.
64.	Representation of forces by vectors. Simple problem on lifting tackles like jib cranes, wall crane and solution of problem with the aid of vectors.
65.	Simple problems on strength and crank lever.
66.	Center of gravity-simple experimental determination stable-unstable and neutral equilibrium simple explanation.
67.	Friction-co-efficient of friction.
68.	Simple problem related to friction.
69.	Magnetic substances neutral and artificial magnets.
70.	Bausch principle of electricity. Method of magnetization & uses of magnets,.
71.	Basic principle of electricity.
72.	Use of fuses, conductors switches, insulator etc.
73.	Simple electric circuits. Simple calculations.
74.	Ohm's law-simple calculations-electrical insulation materials.
75.	Graphs-Abscissa & ordinates, graphs of straight line, related to 2 sets of varying quantities.
76.	Further practice on logarithm.
77.	Shop problems on estimation of material, time taken for machining a job elementary time and motion study.
78.	Shop problems on estimation of material, time taken for machining a job, elementary time and energy.
79.	Transmission of power by belt pulley and gear drive.

	<b>ENGINEERING DRAWING</b>
1.	Reading of simple drawing , Engineering drawing & its importance and instruments used in drawing
2.	i) Making of Title blocks as per IS 465 1988 ii) Various sizes of drawing sheets iii) Various types of pencils & sharpening methods. iv) Types of lines & their application as Per SP 46: 1988
3.	use of drawing tools simple geometrical construction
4.	Geometrical construction regular polygone circles
5.	Geometrical construction of polygon inscribed circles
6.	Curves and types of curves & their application and method of drawing curves
7.	Geometrical construction, cycloid, hyperbola parabola curves, ellipse.
8.	Free hand sketch of lines, polygons , ellipse etc.
9.	Free hand sketch of basic tools and simple geometrical const. cone, pyramid , frustum / prism etc. / sphere
10.	Construction of scale diagram, division of odd parts of scale with drawing instruments by sketch
11.	Letters and its types and drawing of letters
12.	Methods of ellipse. How to draw by drawing the instruments .
13.	Simple dimensions with technics and location of parts as per dimensions , angle , taper
14.	Transforming of various measurement, linear , Angular , Circular etc.
15.	Pictorial drawing Isometric drawings of simple block
16.	Oblique views of simple geometrical construction
17.	Isometric drawing on simple blocks
18.	Isometric drawing on completed jobs
19.	Free hand sketches of trade related hand tools cutting tools, measuring tools
20.	Free hand sketches of trades related hand tools m measuring tools
21.	orthographic drawing application of both first angle and third angle methods in representing the drawing for simple & complex machine blocks given for exercise with dimensions
22.	Orthographic drawings application of both first angle and third angle. Methods in representing the drawing for simple and complex machine blocks given for exercises with dimensions
23.	Standard method of sectioning as per IS-696. Exorcises for different sectional views on the given orthographic drawing of machine parts, castings etc.
24.	Standard method of sectioning as per IS 696. Exercise for different sectional views on the given orthographic drawing of machine parts, casting etc.
25.	Inter conversion of Isometric to orthographic drawings and vice-versa. Related problems such as V blocks-simple stepped blocks, block oriented by various machining operations etc.

26.	Interconversion of isometric, oblique drawings to orthographic drawings and vice-versa. Related problems such as V-blocks simple stepped blocks, block oriented by various machining operations etc.
27.	Free hand sketch of sectional tools.
28.	Interconversion of isometric, oblique drawing to orthographic drawings and vice-versa. Related problems such as V block simple stepped blocks, blocks oriented by various machining operations.
29.	Surface development of simple geometrical solids like cube, rectangular block, cone, pyramid, cylinder, prism etc.
30.	Interpenetrating of solids and conventional application of intersectional curves on drawings.
31.	Screw thread their standard forms as per I.S. external and internal thread conventions on the feature for drawings as per I.S.I.
32.	Sketches for bolts nuts screw and other screw screwed members
33.	Standard rivet forms as per ISI
34.	Riveted joints.
35.	Riveted joints butt
36.	Sketches of keys, cutter & pin joint.
37.	Sketches of keys, cotter and pin joints.
38.	Sketches for simple pipe unions with simple pipe line drawings.
39.	Concept of preparation of assembly drawing and detailing simple assembly and their details of trade related tools/jobs/exercises with dimensions from the given sample or model. Tool post for the lathe with screw and washer.
40.	Concept of preparation of assembly drawing and dove tailing. Simple assemblies and their details of trade related tools /jobs the exercises with dimensions from the given sample or models. Tool post for the lathe with washer and screw.
41.	Details and assembly of Vee block with clamps.
42.	Detail assembly of shaft and pulleys
43.	Details and assembly of vee blocks with clamps.
44.	Details and assembly of bush bearing.
45.	Types of curves. How to draw.
46.	Details and assembly of simple coupling.
47.	Details and assembly of a simple hand vice.
48.	Blue print reading simple exercises related to missing lines.
49.	Blue print reading simple exercises related to missing views.
50.	Simple exercises related to missing symbols.
51.	Simple exercises related to missing sections.
52.	Simple exercises to missing dimensions.
53.	Hand drawing for in-dictating switches, buttons control m/c. tool axis's quadrant point value.

#### WIREMAN

#### LIST OF TOOLS AND EQUIPMENT

S.NO.	ITEM TRAINEES TOOL KIT	FOR INSTRUCTORS	FOR TRAINEES
1	Combination pliers 200 mm insulated	1	16
2	Screw driver 200 mm	1	16
3	Screw driver 100 mm	1	16
4	Terminal screw drover 75 mm connections	1	16
5	Neon tester 500 volts pencil bit type	1	16
6	Knife D.B. Electrician	1	16
7	600 mm four fold box wood rule	1	16
8	Hammer ball pein 0.25 kg.	1	16
9	Try square 200 mm	1	16
10	Firmer chisel 12 mm	1	16
11	Firmer chisel 6 mm	1	16
12	Tenon saw 250 mm	1	16
13	Wood rasp file 250 mm	1	16
14	File half round 2 <sup>nd</sup> cut 250 mm	1	16
15	File round 150 mm	1	16
16	Plumb bob 115 gms.	1	16
17	Bradawl 150 mm x 6 mm square pointed	1	16
18	Ratchet brace 6 mm capacity	1	16
19	Rachet bits 4 mm x 6 mm	1	16

20	Hard wood mallet 1 kg. (75 mm x 150 mm )	1	16
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SHOP TOOLS, INSTRUMENTS AND GENERAL OUTFIT (PER UNIT OF 16 TRAINEES )			
1)	Pliers side cutting 200 mm	8	
2)	Pliers flat nose 150 mm	4	
3)	Pliers round nose 200 mm	4	
4)	Pliers long nose 200 mm	8	
5)	Screw driver heavy duty 250 mm	8	
6)	Screw driver 7 mm x 300 mm square blade	8	
7)	Ratchet screw driver 200 mm ., 150 mm & 100 mm	4 each	
8)	Firmer chisel 18 mm	8	
9)	Firmer chisel 25 mm	8	
10)	Mortise chisel 16 mm	4	
11)	Iron plane 300 mm x 50 mm blade	1	
12)	Marking gauge	4	
13)	Bevel square 150 mm	4	
14)	Cold chisel flat 25 mm x 200 mm	4	
15)	Cold chisel flat 18 mm x 200 mm	4	
16)	Hammer ball pein 0.25 kg.	4	
17)	Hammer ball pein 0.75 kg.	4	
18)	Hammer ball pein 1.00 kg.	4	
19)	Hammer cross pein 0.50 kg.	4	
20)	Hammer sledge 3.5 kg.	1	
21)	Rawl tool holder and bit no. 8,10,14, &16	2 each	
22)	Wall jumper octagonal 37 mm x 450 mm and 37 mm x 600 mm	2 each	
23)	Centre punch 100 mm	2	
24)	Scriber 150 mm	2	
25)	Hammer ball 0.12 kg.	2	
26)	File flat 300 mm 2 <sup>nd</sup> cut	4	
27)	File flat 300 mm 2 <sup>nd</sup> cut	4	
28)	File flat 250 mm bastard	4	
29)	File flat 250 mm smooth	4	
30)	File half round 150 mm 2 <sup>nd</sup> cut	4	
31)	File half round 150 mm smooth	4	
32)	File round 300 mm 2 <sup>nd</sup> cut	4	
33)	File round 150 mm smooth	4	
34)	File triangular 150 mm 2 <sup>nd</sup> cut	2	
35)	Spanner double ended set of 6	2 set	
36)	Adjustable spanner 350 mm	1	
37)	Foot print grin 250 mm	2	
38)	Allen key	2	
39)	Steel rule 300 mm	2	
40)	Steel measuring type 20 meters	4	
41)	Hacksaw frame adjustable 200 mm to 300 mm	4	
42)	S.S. Twist drill 3 mm, 5 mm, 6 mm, and 4 mm	4	
43)	Hand augar 12 mm, 15 mm 18 mm and 25 mm	2 each	
44)	Spirit level 300 mm	1	
45)	Electric soldering iron 30 watt 230-250 v	2	
46)	Electric soldering iron 30 watts 230-250 v	1	
47)	Blow lamp 1 litre capacity	2	
48)	Laddle tool	2	
49)	Melting pot 200 mm x 150 mm	1	

50)	Forge with hand blower	1
51)	Pipe vice 100 mm	4
52)	Conduit die set suitable for 9 mm , 18 mm, 25 mm, 30 mm	4 set
53)	Bench vice 150 mm	4
54)	Bench vice 100 mm	2
55)	Hand vice 50 mm jaw	4
56)	Rubber gloves 5000 volts	2 pairs
57)	Safety belt with provision for keeping tools	1
58)	Ladar bamboo 6 meters	2
59)	Tower ladder 3 meters on tyre wheels	1
60)	Portable extension ladder aluminium 6 to 9 meters	1
61)	Crow bar octagonal steel 25 mm x 150 mm	2
62)	Iron pen 450 mm	2
63)	Trawl 150 mm	2
64)	Megger 500 volts (iron clad )	2
65)	Voltmeter M.C. 0-300	1
66)	Voltmeter M.C. multirange 0-15,30,50,75 v	1
67)	Voltmeter M.C. Multirange 0-75, 150, 300,600 v	1
68)	Voltmeter centre zero 15-0-15 volts	1
69)	Voltmeter M.C. Multirange 0-150,300,600v	1
70)	Voltmeter M.I. multirange 0-50,75,100,150 v	1
71)	Ammeter M.I. 0-1 amp panel board type	2
72)	Ammeter M.I. 0-5 Amp panel board type	2
73)	Ammeter M.I. 0-15 amp panel board type	2
74)	Ammeter M.C. 0-1 amp panel board type	2
75)	Ammeter M.C. 0-3 amp. Panel board type	2
76)	Ammeter M.C. centre zero 5-0-5	2 amp
77)	Single phase K.W.H. meter 5 A 250V-AC	2
78)	D.C. Energy meter (Ampere hour type ) 5 A 250 V	1
79)	3 phase K.W. Hrs. Meter 15 A 440 V	1
80)	Watt meter Dynamo meter type with multirange 0-25, and 5 amps, and 1-100,150, and 250 V	1
81)	AVO Minor 0-5,100,200,500 millamperes 0-100-1000,10000 ohms 0-150,300,600 V AC / DC	1
82)	Earth meggar 0-10 ohms 500 v with all accessories	1
83)	Hot-wire ammeter 0-15 amps	1
84)	Conduit pipe cutting and threading machine adjustable for 15 mm to 30 mm	1
85)	Conduit pipe bending machine suitable for 15 mm 18 mm 25 mm & 30 mm pipe	1
86)	Variable resistance 14 ohms 5 amp.	2
87)	Variable resistances 250 ohms 1.8 amps double barrel type	2
88)	Variable resistance 350 amps 1.5 amps double barrel type	2
89)	A.C. Ceiling fan 1200 mm sweep single phase 75 w 250 V with regulator	1
90)	Table fan A.C. 400 mm sweep 60 W single phase 250 v	1
91)	Crimping tool	1 SET
92)	RUBBER MATTING 2 meters x 1 m x 9 mm	2
93)	Wiring board on stand 3 m x 1 m with 0.5 m projection on the top	16
94)	Work bench 2.5 x 1.20 x 0.75 m	2
95)	Lockers cup board 8 lockers in each	2
96)	Almirah 1.8 x 1.2 x 0.45 Mts.	2
97)	Instructor 's table	1

98)	Instructors' chair	1
99)	Demonstration table 2.5 x 1.20 x.75 m	1
100)	Blackboard	1
101)	Stools	16
102)	H.P. Mercury vapour lamp complete	2
103)	H.P. mercury vapour lamp 400 wt. With lantern	2
104)	Fluorescent lamp complete with choke starter continuous rough fitting for following sizes 1500 mm, 1200 mm , 600 mm, 450mm, 80 wt. 40 wt. 20 wt. 15 wt.	4 each
105)	Neon discharge lamp 5 wt.	4
106)	Neon sign I.T.I. complete unit	1
107)	Short focus parabolic reflector for 500 to 1000 wt. Lamp	2
108)	Short focus parabolic reflector for 200 wt. Lamp	2
109)	Reflector for flood lighting downward and forward as used in petrol pump godownyard swimming pool etc	2
110)	Street lighting lanterns for 60 to 200 wt. Lamps with focusing arrangements	2
111)	Industrial light fitting adds dispensing Concentrating Distributing Parabolic	4 each
112)	Maxlume bracket flexible light fitting for machines	3
113)	Lighting arrestors Choke type Pellet type Auto value Thyrie Granular	1 each
114)	First aid box	1
115)	Buckets with sand 1 unit of 3 buckets	1
116)	Blanket astestos	1
117)	Fire extinguisher (for elect. Based fire )	2
118)	First aid treatment chart for electric shock	1
119)	Safety precaution chart	1
120)	Conversion chart	1

	<b>GENERAL MACHINERY</b>	
1.	Electric drill machine 6 mm capacity universal type 250 V	1
2.	Electric drill machine 12 mm capacity 250 volts universal type	1
3.	Squirrel cage induction ,motor 3 H.P . 400 VOLTS with D.L. ON starter	1
4.	Squirrel cage induction ,motor 5 H.P. 400 Volts with star delta starter	1
5.	D.C. Compound 3 H.P. 250 Volts with 4 point starter and field regulator (laboratory type )	1
6.	D.C. shunt motor 3 H.P. 250 V with 3 point starter and speed regulator (laboratory type )	1
7.	Transformer single phase 1 K\ .V. 250/I 0 V	2
8.	CAPACITOR MOTOR ¼ H.P. Single phase 250 V	1
9.	Split phase motor ¼ H.P. single phase 250 V	1
10.	Universal motor 750 W AC /DC 250 V	1
11.	M.G. set consisting of squirrel cage induction motor 5 H.P. 400 V 50 cycles with directly coupled D.C. compound generator 3 k .W 250 with built in panel board consisting of  1        3 phase air circuit breaker 2        star delta starter (contract type , 8 points ) 3        shunt field regulator 4        D.C. circuit breaker 5        Suitable voltmeter on A.C. AND D.C. side 6        Field circuit ammeter 7        Indicating lamps on both the sides (AC AND DC)	1 SET

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