1	Name of Course	**CERTIFICATE COURSE IN LIFT AND ESCALATOR MECHANIC (W.E.F. 2017-2018)**
2	Course Code	**(303231)**
3	Max. No. of Students Per Batch	25 Student
4	Duration	1 Year
5	Type	Part Time
6	No Of Days / Week	6 Days
7	No Of Hours / Days	4 hrs.
8	Space Required	Class Room – 200 sq.ft, Laboratory – 200 sq.ft MOU with Lift / Escalator manufacturing industry.
9	Minimum Entry Qualification	SSC / HSC / ITI / HSC (Voc) / Diploma in Engg.
10	Objective Of Course	To Create man power in Lift & Escalator Servicing & Maintenance
11	Employment Opportunities	Lift & Escalator Manufacturing industries, Railway, Big Housing & Commercial Complex etc.
12	Teacher's Qualification	Diploma & Degree in Electrical /Electronics/Instrumentation with one year Experience in relevant field
13	Training System	**Training System Per Week** Theory: 06 hrs; Practical: 18 hrs; Total: 24 hrs

14 Exam. System

Sr. No.	Paper Code	Name of Subject	TH/ PR	Hours	Max. Marks	Min. Marks
1	30323111	Basic Electrical & Electronics	TH - I	3 hrs.	100	35
2	30323112	Lift and Escalator operation, Installation & Maintenance	TH - II	3 hrs.	100	35
3	30323121	Basic Electrical & Electronics	PR - I	4 hrs.	200	100
4	30323122	Lift and Escalator operation, Installation & Maintenance	PR- II	4 hrs.	200	100
		Total			**600**	**270**

Practical & Theory - I -- Basic Electrical & Electronics		
Week No.	**Trade Practical**	**Trade Theory**
1	**Occupational Safety** Implementation in the shop floor of the various safety measures. Demonstration on elementary first aid. Artificial Respiration Practice on use of fire Personnel safety • Use of hard hat, Safety belt, Cut resistance gloves • Dust mask, Ear plug, Head lamp,	**Occupational Safety** Basic safety introduction, Personal protection. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution and personal safety message. Use of Fire extinguishers. Visit and observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard. Applications and proper use of - Hard hat, Safety belt, lifeline, Barricade, Cut resistance gloves, goggles, dust musk, head lamp, ear plug, JHA, cardinal rules,
2	Personnel safety • Use of hard hat, Safety belt, Cut resistance gloves • Dust mask, Ear plug, Head lamp, • Demonstrate the emergency safety devices	Study of • Importance of personnel safety in lift • Applications and proper use of - Hard hat, Safety belt, lifeline , Baricade, Cut resistance gloves, goggels, dust musk, head lamp, ear plug, JHA, cardinal rules, • Emergency equipment of the elevator (Emergency light , Automatic rescue device ,door sensor , emergency alarm)
3	Demonstration & Use, care and maintenance of various hand tools. Practice in using cutting pliers, screw drivers, etc. skinning the cables and jointing practice on single strand and multi stranded conductor. Demonstration and Practice on bare conductors joints such as Britannia, straight, T, Western union joints	Identification of Trade-Hand tools-Specifications, Uses and their care maintenance. Fundamental of electricity. Electron theory- free electron, Fundamental terms, definitions, units and effects of electric current Explanation, Definition and properties of conductors, insulators and semi-conductors. Wires/cable & its specification. Types of wire joints & uses.
4	Demonstration and identification of types of cables. Demonstration and practice on using standard wire gauge micro-metre. Practice on crimping thimbles, Lugs.	Introduction of National Electrical Code Voltage grading of different types of Insulators, Temp. Rise permissible. Types of wires and cables standard wire gauge. Specification of wires and Cables insulation and voltage grades-Low , medium and high voltage Precautions in using various types of cables / Ferrules

5	Identification and use of wiring accessories Practice on installation And overhauling common electrical accessories. Fixing of switches, holder plugs etc. in wooden/PVC/ Metallic boards.	Common Electrical wiring Accessories, their specifications in line with NEC Explanation of switches, lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, Use & specification of Fire alarm, MCB, ELCB, and MCCB.
6	**Practice on Earthing** - different methods of earthing. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay.	**Earthing** - Principle of different methods of earthing. i.e. Pipe, Plate etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). In absence of latest revision in respective BIS provision for Earthing it is recommended to follow IEC guidelines.
7-8	Determine the resistance by Colour coding Identification of active/passive components. **Diodes**-symbol - Tests - Construct & Test Half wave rectifier ckt. Full wave rectifier ckt. Bridge rectifier ckt.	**Basic electronics**- Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials –P-N-junction. Classification of Diodes – Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter.
9	**Indian Electricity Rules** • Preparation of check list for Do's and Don'ts for operation and maintenance	**Study of** • Indian Electricity rules pertaining to operation, construction and maintenance of Lifts and Escalators • Statutory provisions for getting license Study of • Types of wires and cables used in lift
10-11	**Basic Panel wiring** • Practice of wiring in control panel • Saddling, dressing and squiring of cables • Fixing and connection of thermostats, timers	• Wiring procedures and techniques • Types of switches for control & power wiring • Types of Thermostats, timers and mercury switches
12	• Mounting/ fixing of MCB, MCCB • Fixing Bus bars • Tapping connections from Bus bars	• Specification & ratings of MCB, MCCB, ELCB, ACB • Bus bars size and spacing • Procedure for control panel erection

13	• Identification of different types of transformer • Connection of Control transformers. • Use of C.T. & P.T. • Connection of three phase transformer • Measure voltages at different tapings	**Study of** • Single Phase Transformer • Three Phase Transformer • Types & Connections
14-15	**AC/DC DRIVES** • Identification of different parts of AC/DC drive • Identification of terminals of AC/DC drive	**Study of** • Types of AC/DC drives • Functions and block diagram • Terminal connections – control and power
16-17	• Connection and operation of lift motor through VVVF drives • Speed control through drive • Practice connection and operation of lift motor through drive • Connection of A/D and D/A converters with drive	• Applications of AC/DC drive • Basic parameter setting in variable voltage variable frequency(VVVF) drive • Size and selection of drives used in lifts and escalators • Study of Specific control logic for lift motor operation • Parameter settings of drives for lift motor operation. • Interfacing of A/D and D/A converters with drive
18	**FUNCTIONAL OPERATION OF LIFT** • Familiarization with different control system • Its installation and repair	**Study of** • Various systems of control of lift and their utility • Rheostatic control and variable voltage control • Single speed, double speed, and logic circuit control.
19	• Understating the automatic leveling function • Practice and set various operations	• Automatic levelling with change of load, Auxiliary motor micro drive • Automatic levelling with main motor at various speeds • Automatic levelling devices.
20	• Practice manual and automatic push bottom operation • Identify different alarming modes	• The floor selector type, hoist-way switching devices • Operation without mechanical contact. Manual operation, Push bottom, • Automatic operation holds in push bottom operation, full automatic push button operation, dual operation and signal operation. • Alarming system

21	• Identification of different components of control circuits. • Tracing of control circuit diagram and Necessary repair.	Study of • Various electrical & electronic control circuits • Logic circuits used in lifts.
22	• Inspection of performance during Test & Trial. • Record of observation.	• Test and trial of mechanical, Electrical and electronic system Of lift.
23	• Practice alteration and adjustment as necessary	• Procedure of test with minimum And maximum level.
24-25	**SAFETY FUNCTIONS** • Housekeeping practice • Practice of safe working in lift – Electrical safety, Safety while working on live controller. • Safety while working on top of car & lift pit. • General awareness On public safety components. • Door safety. Demonstration of PPE	• Safety of maintenance personnel - Safe use of hand &power tools. • Proper method of hand lifting rigging and hoisting. • Proper use of ladders step Ladders. • Clothing, safety shoes, safety glasses, Safety belt, hand- protective Cream, leather gloves. Hard hats, Safety net etc.
26	**Revision**	**Revision**

Practical & Theory – II Lift and Escalator operation, Installation & Maintenance		
Week No.	**Trade Practical**	**Trade Theory**
1	Operation of lift • Demonstrate the working of elevator • Components of elevator	Study of • Components of elevator • Types of elevator • Capacity, speed of the elevator
2	• Practice Fixing of template • Practice Fixing of bracket • Practice Fixing of guide rail • Practice Fixing of template • Practice Fixing of bracket • Practice Fixing of guide rail	• Methods and procedure for Template setting • Hoist way measurement, Bracket Measurement & fixing. • Guide rail hoisting & plumbing.
3	• Demonstrate counter weight, buffer, car frame , emergency stop switch • Demonstrate landing zone, top over travel	• Concept of counter weight, buffer, car frame , emergency stop switch • Different types of door, landing zone, top over travel, head room,
4	• Demonstration of over speed Governor, safety circuit, overhead clearance, car bottom clearance	• Elevator safety (over speed Governor, safety circuit, overhead clearance, car bottom clearance) • Common safety features of the elevator - ATT, overload, ISC, Fire, Earth quake
5	Type, construction and parts of lift • Demonstration of elevator types • Demonstration of types of elevator well/pit	Study of • Types of elevator – passenger elevator ,service elevator, freight elevator • Concept of elevator well, elevator pit, pit depth
6	• Practice fixing Guide rails, reed switch, magnet • Observe running clearance	• Types and procedure of fixing Guide rails, reed switch magnet • Importance of Running clearance
7	• Fixing of ropes/belt • Fixing of limit switches • Inspect car top • Fixing/checking of electromagnet brake	• Types of Ropes, Coated steel belt • Types of limit switch and their application • Importance Car top Inspection • Electromagnetic brakes for lifts.

8	• Fixing of cams and pulleys • Demonstrate fixing of Machine beam and beam support • Demonstration/fixing of spur gear, worm gear and Bearings	• Types of Drum & pulleys, guiding shoes, cam, Toe guard, retiring cam, limit cam and sheave used in lift • Process of fixing Machine beam and beam support • Dead end hitch, spur gear, worm gear and Bearings • Difference between Geared and Gearless machine
9	• Demonstrate fixing of car components • Fixing of car lighting and fan • Fixing/ adjustment of compensation chain, governor tension weight	• Components of Car Operating Panel • Hall fixture and lantern • Compensation chain, cage bulldog clip, governor tension weight and counter screen,
10	• Demonstrate/practice installation of door • Demonstrate/practice installation of cage • Practice rope fitting	• Types of Doors and procedure of installation • Cage fitting, function of isolation. • Concept and Calculation of roping/ run by (1:1 , 2:1, 4:1)
11	• Practice installation of travelling cable • Demonstrate safe use of scaffolding	• Procedure of travelling cable installation. • Types scaffolding & their standards • Concept of scaffold less installation system
12	• Preparation of check list for commissioning and its report • Preparation of documents for licensing • Checking of wiring , motor, check list before start up • Inspection run and normal run	• Concept of commissioning • Procedure/steps of commissioning • Procedure of getting elevator license and commissioning certificate
13-14	**SELECTION AND INSTALLATION OF LIFTS** • Measure and adjust clearance between wall and car • Measure and adjust clearance between adjacent car. • Calculate car area for different no. of passengers • Calculate elevator speed for different applications • Calculate capacity of elevator (Kg) as per no. of passengers • Installation of different types of ropes, guide, buffers, counter weight, etc. • Installation of governor and pulley • Installation of car gate	**Study of** • Size and shape of car • Clearance and allowances between Car and the wall. • Space required for the erection of lift of different capacity. • Required car are a according to no. Of passenger. • Selection of elevator speed for various types of lift. • Capacity of elevator • Selection of location of Lift Machine. • Selection of rope, guiderail, buffers, counter weight • Systematic installation procedure • Types of governor and pulley • Types of Car gate, etc.

15-16	**Basic Construction and Parts of Escalators** • Demonstration of different escalator arrangements • Demonstration of moving walkways • Practice calculation of boarding and alighting areas for different sizes and types of escalators • Practice calculation of pit area and support requirements • Demonstration of different parts of step and step chain assembly • Demonstration of comb plate and hand rail parts • Demonstration/fixing of different control and electrical equipment • Demonstration/fixing of drive unit, drive chain and shaft. • Fixing Different covers and panels • Fixing barriers and caution plates	**Study of** • Types of Escalator arrangements – parallel, multiple parallel, cross over • Typical applications • Moving walkways and applications • Selection/ Calculation of – speed, step widths, inclination • Boarding and alighting areas • Pits and supports • Components/Parts of escalators • Step parts and assemblies • Step chain parts and assemblies • Comb plate parts • Hand rails and related parts Electrical and control parts • Motors and brake assemblies • Drive unit, drive chain and shafts • Lubrication system and other miscellaneous parts • Covers, Decking, trim plates, panels, etc. • Barriers, barrier assembly and caution plates
17-18	**MAINTENANCE PROCEDURE** • Checking of physical location of all components of lift as per drawing • Practice repairing and replacement of different mechanical components. • Practice repairing and replacement of different electrical and electronic Components • Checking of physical location of all components of escalators and moving walkways as per drawing • Servicing of various technical/ electrical parts of escalators and moving walkways as per drawing	• Concept of lift maintenance. • Methods / Types of maintenance. • Preparing check List. • Concept of maintenance schedule. • Preparing and follow-up of maintenance schedule • Preventive maintenance, running maintenance and brake-down maintenance. • Spare parts used for lift and escalators maintenance. • Inventory / stocking of spare parts. • Preservation of spare parts.
19	**LUBRICATION** • Practice draining out old grease and oils • Refilling oil dashpot sand grease cups. • Lubrication on car gate, cam Bellows, buffer, rope, guiderail etc.	• Types of lubricants, its properties and use in lifts. • Importance of lubrication. • Lubrication During installation and periodical lubrication. • Disadvantage of improper lubrication

20-21	**TESTING OF LIFT** • Servicing and checking of lift's main supply, switches, fuses and contacts. • Examine & adjust all moving contacts of The controller, • Tightening connections and secure wires. • Check motor connections brush position, air gap, bearing etc. • Check brake shoe, magnetic coil, oil in magnet case, dash pot adjustment etc. • Check oil level at worm gear, replace oil if necessary. • Check shaft bearing, drum, drive sheave for excessive play &proper lubrication.	**Study of** • Effects of faulty power supply, i.e. Single phasing, loose contact, improper voltage etc. • Effect of wrong brush bedding and positioning • Effects faulty and loose Braking system. • Different types of bearings used in lift. Their specification and properties.
22	• Careful examination of safety governor for proper operating condition and lubrication. • Carefully examine all ropes for any damage and broken wire and proper lubrication. • Examine main &counter weights, guide rail for lubrication and efficient functioning of brackets and rail clips.	• Gear, worm and worm wheel used in lift and their function • Function of various parts of governor
23-24	• Check car shoes, buffers and its lubricants. • Carefully examine safety devices, tripping Rod for its setting (seteven) • Check leveling for car platform. • Check emergency opening of door and other emergency safety devices. • Check movement of travelling cables for foul. • Examine top and bottom final shaft way limit switches and other limit switches for their proper operation • Renew contacts or replace limit switches if required	• Types of spring, function and use. • Concept of wear and tear. • System of levelling and alignment
25	• Familiarization with Auto Rescue Device operating system and connection to lift System	• Explanation and function of Auto rescue device (ARD)
26	Revision and Examination	

LIST OF TOOLS and EQUIPMENT

Sr. No.	*Name of the items*	*Quantity*
1	First aid box	1 No
2	C- Clamp 200 mm, 150 mm and 100 mm	2 No
3	Spanner Adjustable 150 mm, 300mm	2 sets
4	Blow lamp 0.5 ltr	1 No
5	Melting Pot	1 No
6	Ladel	1 No
7	Chisel Cold firmer 25 mm X 200 mm	2 No
8	Chisel 25 mm and 6 mm	2 No
9	Hand Drill Machine-13 mm	1 No
10	Portable Electric Drill Machine 6 mm capacity	1 No
11	Allen Key	2 sets
12	Oil Can 0.12 ltr	1 No
13	Grease Gun	1 No
14	Out Side Micrometer	1 No
15	Rawl plug tool and bit	1 No
16	Pully Puller	1 No
17	Bearing Puller	1 No
18	Megger -500v- Digital	2 No
19	Scissors blade 150 mm	1 No
20	Crimping Tool 5 in 1	2 No
21	Wire stripper 20 cm	2 No
22	Chisel Cold flat 12 mm	2 No
23	Mallet hard wood 0.50 kg	2 No
24	Hammer Extractor type 0.40 kg	1 No
25	Hacksaw frame 200 mm 300 mm adjustable	2 No
26	Try Square 150 mm blade	2 No
27	Outside and Inside Divider Calliper	1 No
28	Pliers flat nose 150 mm	2 No
29	Pliers round nose 100 mm	2 No
30	Tweezers 100 mm	2 No
31	Snip Straight and Bent 150 mm	2 No
32	D.E. metric Spanner set	2 No
33	Drill hand brace	1 No
34	Drill S.S. Twist block 2 mm, 5 mm 6 mm set of 3	1 No
35	Gauge, wire imperial	1 No
36	Soldering Iron 25 watt, 65 watt, 125 watt	4 No
37	Copper bit soldering iron 0.25 kg.	2 No
38	Desoldering Gun	4 No
39	Hand Vice 50 mm jaw	1 No
40	Table Vice 100 mm jaw	1 No
41	Digital Multi Meter	4 No
42	Working Bench 2.5 m x 1.20 m x 0.75 m	2 No
43	Fire Extinguisher CO2, 2 KG	1 No
44	Fire Buckets With Stand	1 No

B: Machinery & Equipment :		
Sr. No.	**Name of Item**	**Qty**
1	Working model of Escalator	1 No with MOU
2	Electromagnet break assembly	1 No
3	Over speed governor for passenger lift	1 No
4	Door simulator set (car door, landing door and door drive unit)	1 No
5	5/8 Passenger lift installed with all control and safety accessories	1 No
6	Basic Electronics Trainer	2 No
7	30V-0-30V, 5 A DC Regulated Power Supply	2 No
8	Sensor Trainer (Contain Sensor used in Lift & Escalator)	2 No
9	Basic Electrical Trainer	2 No
10	DC compound motor 2 KW, 220V with switch fuse unit, voltmeter, ammeter, field regulator, armature regulator and four point starter	1 No
11	Universal motor with starting panel – 0.75 KW, 240V	1 No
12	Digital AC drive trainer – 3 Phase, 2 KW	1 No
13	Desktop multimedia computer – i3/i5 processor, 4GB RAM, 1 TB HDD, 19.5" TFT monitor. With suitable UPS and computer table	1 No

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