NSQF QUALIFICATION FILE

Version 6: Draft of 08 March 2016

NSDA Reference
To be added by NSDA

Electrician

CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE

Directorate General of Training (DGT)
Government of India, Ministry of Skill Development and Entrepreneurship,
Shram Shakti Bhavan, Rafi Marg
New Delhi-110001

Name and address of submitting body:

Directorate General of Training (DGT)
Government of India, Ministry of Skill Development and Entrepreneurship,
Shram Shakti Bhavan, Rafi Marg
New Delhi-110001

Name and contact details of individual dealing with the submission

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Position in the organisation: Deputy Director General (T)

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List of documents submitted in support of the Qualifications File

1. Competency-based curriculum (Annexure 1)
2. Advertisements of different organisations for posts relevant to NTC in the trade
3. Placement figures of few ITIs

4. SUMMARY

Qualification Title	'Electrician'
Qualification Code	DGT/1001
Nature and purpose of the qualification	National Trade Certificate; to train the 10th class pass students in 'Electrician' trade and thus changing a non-worker to worker
Body/bodies which will award the qualification	National Council for Vocational Training (NCVT)
Body which will accredit providers to offer courses leading to the qualification	**National Council for Vocational Training (NCVT)** affiliates the ITIs on the basis of accreditation by Quality Council of India (QCI).
Body/bodies which will carry out assessment of learners	National Council for Vocational Training (NCVT)
Occupation(s) to which the qualification gives access	Electricians have a wide scope of Employability ranging from self-employment, contractual employment to Industrial jobs. • After successful completion of this course, Electricians can aspire to become Electrical Contractors by acquiring the 'B" licence from the Electrical Licence Board. • They can set up their own Rewinding and servicing of Domestic Equipment shop. • Job opportunities are wide open in Defence, Railways, Transport, Ship Building, Electricity Board, various Industries etc • They can also go for further higher studies after successful completion of course. Students who have completed this course have found employment in the following areas: • Service/Maintenance Technician for domestic appliances in Reputed Companies • Winder of Electrical Motors in winding shop • Contractor for domestic wiring and industrial wiring • Armature winder of Electrical fans and motors • Electrical appliance repair in electrical shops • Indian Railway (Asst. Driver, Tech. Gr. III, Appr. Technician) • Local Electricity Board • Assembler of Electrical control Gears • Telephone Department • Installation and Testing division of Auditorium and Cinema Hall • Factories • As Instructor in Govt./Private ITI/ITC • Merchant Navy • Indian Air Force • Self-Employment in Service Centre
Licensing requirements	N/A
Level of the qualification in the NSQF	Level 5
Anticipated volume of training/learning required to complete the qualification	

Sl. No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	2184
2	Professional Knowledge (Trade Theory)	504
3	Workshop Calculation & Science	168
4	Engineering Drawing	252

	5	Employability Skills	110
	6	Library & Extracurricular activities	142
	7	Project work	320
	8	Revision & Examination	480
		Total	**4160***

* The major change is the addition of revision component of approximately 360 hours, hence there is increase in the total no of notional hours.

Entry requirements and/or recommendations	Passed 10th class examination under 10+2 System of education with Science and Mathematics or its equivalent
Progression from the qualification	• Can appear in 10+2 examination through National Institute of Open Schooling (NIOS) for acquiring higher secondary certificate and can go further for General/ Technical education. • Can take admission in diploma course in notified branches of Engineering by lateral entry • Can join industry as semi-skilled worker in the industry and can become supervisor after doing part-time diploma in relevant branch of Engineering • Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC) after which they will be employed in industry as skilled worker and can become supervisor after doing part-time diploma in relevant branch of Engineering • Can join Crafts Instructor Training Scheme (CITS) in the relevant trade after which they will be employed in ITI/ Vocational Training Institute as instructor.
Planned arrangements for the Recognition of Prior learning (RPL)	1. At present the students who have passed 10th class with minimum 3 years' relevant experience can appear for NCVT theory and practical semester examination directly. 2. The students who have passed SCVT examination in 'Electrician' trade can also appear for the NCVT Examination in the relevant semester and Trade directly.
International comparability where known	1. Existence of any official document suggesting the comparability of the qualification with the qualifications in other countries is not known. 2. However, ITI passed out trainees are getting employment in many Gulf countries, European countries, Australia, New Zealand, Singapore etc.
Date of planned review of the qualification.	January 2020

Formal structure of the qualification

Title of component and identification code	**Mandatory/ Optional**	**Estimated size (learning hours)**	**Level**

(i)	**Apply safe working practices**	Mandatory	**46**	**4**
(ii)	**Comply environment regulation and housekeeping**	Mandatory	**16**	**4**
(iii)	**Prepare profile with an appropriate accuracy as per drawing.**	Mandatory	**163**	**5**
(iv)	**Prepare electrical wire joints, carry out soldering, crimping and measure insulation resistance of underground cable.**	Mandatory	**163**	**4**
(v)	**Verify characteristics of electrical and magnetic circuits.**	Mandatory	**287**	**5**
(vi)	**Install, test and maintenance of batteries and solar cell.**	Mandatory	**70**	**4**
(vii)	**Estimate, Assemble, install and test wiring system.**	Mandatory	**194**	**5**
(viii)	**Plan and prepare Earthing installation.**	Mandatory	**39**	**5**
(ix)	**Plan and execute electrical illumination system and test.**	Mandatory	**70**	**5**
(x)	**Select and perform measurements using analog / digital instruments**	Mandatory	**70**	**4**
(xi)	**Perform testing, verify errors and calibrate instruments.**	Mandatory	**39**	**5**
(xii)	**Plan and carry out installation, fault detection and repairing of domestic appliances.**	Mandatory	**70**	**5**
(xiii)	**Execute testing, evaluate performance and maintenance of transformer.**	Mandatory	**101**	**4**
(xiv)	**Execute testing, and maintenance of DC machines and motor starters.**	Mandatory	**70**	**4**
(xv)	**Plan, Execute commissioning and evaluate performance of DC machines.**	Mandatory	**163**	**5**
(xvi)	**Distinguish, organise and perform motor winding.**	Mandatory	**132**	**5**
(xvii)	**Plan, Execute commissioning and evaluate performance of AC motors.**	Mandatory	**101**	**5**
(xviii)	**Execute testing, and maintenance of AC motors and starters.**	Mandatory	**101**	**4**
(xix)	**Plan, execute testing, evaluate performance and carry out maintenance of Alternator / MG set.**	Mandatory	**132**	**5**
(xx)	**Execute parallel operation of alternators.**	Mandatory	**39**	**4**
(xxi)	**Assemble simple electronic circuits and test for functioning.**	Mandatory	**225**	**4**
(xxii)	**Assemble accessories and carry out wiring of control cabinets and equipment.**	Mandatory	**132**	**4**
(xxiii)	**Perform speed control of AC and DC motors by using solid state devices.**	Mandatory	**70**	**4**
(xxiv)	**Detect the faults and troubleshoot inverter,**	Mandatory	**70**	**5**

	stabilizer, battery charger, emergency light and UPS etc.			**4**
(xxv)	**Erect overhead domestic service line and outline various power plant layout**	Mandatory	**101**	**5**
(xxvi)	**Examine the faults and carry out repairing of circuit breakers.**	Mandatory	**31**	**4**
(xxvii)	**Plan, assemble and install solar panel.**	Mandatory	**39**	**5**
(xxviii)	**Interpret & use company and technical communication**	Mandatory	**35**	**5**
(xxix)	**Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, and statistics and apply knowledge of specific area to perform practical operations.**	Mandatory	**84**	**5**
(xxx)	**Understand and explain basic science in the field of study including friction, simple machine and heat and temperature**	Mandatory	**84**	**5**
(xxxi)	**Read and apply engineering drawing for different application in the field of work.**	Mandatory	**252**	**5**
(xxxii)	**Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.**	Mandatory	**25**	
(xxxiii)	**Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.**	Mandatory	**15**	**5**
(xxxiv)	**Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.**	Mandatory	**15**	**5**
(xxxv)	**Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.**	Mandatory	**20**	**4**

Please attach any document giving further detail about the structure of the qualification – eg a Curriculum Document or a Qualification Pack.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

SECTION 1
ASSESSMENT

Body/Bodies which will carry out assessment:
National Council for Vocational Training (NCVT)

How will RPL assessment be managed and who will carry it out?
1. At present the students who have passed 10th class with minimum 3 years' relevant experience can appear for NCVT theory and practical semester examination directly.
2. The students who have passed SCVT examination in 'Electrician' trade can also appear for the NCVT Examination in the relevant semester and Trade directly. NCVT will carry out the assessment and State Directorates advertise in newspapers for informing the prospective candidates.

Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable and fair and show that these are in line with the requirements of the NSQF.

(1) Assessment process:
The assessment for the semester-based qualification is carried out by conducting formative assessments, and end-of-semester examinations. The internal assessments for theory subjects and practical are conducted by the concerned instructors for evaluating the knowledge and skill acquired by trainees and the behavioural transformation of the trainees. This internal assessment is primarily carried out by collecting evidence of competence gained by the trainees by evaluating them at work based on assessment criteria, asking questions and initiating formative discussions to assess understanding and by evaluating records and reports, and sessional marks are awarded to them. Theory and practical examinations are conducted in Trade theory, Workshop Calculation & Science, Engineering Drawing and Employability Skills. The question papers for the theory Examinations contain objective type questions. Trade practical examinations are conducted by the respective State Governments. However, the question papers for the Trade practical are prepared by NCVT.

The marking pattern and distribution of marks for the qualification are as under:

<table>
<tr><td colspan="3">Marking Pattern</td></tr>
<tr><td>Sl. No.</td><td>Subject for the trade test</td><td>Maximum marks for the each subject</td></tr>
<tr><td>a)</td><td>Practical</td><td>300</td></tr>
<tr><td>b)</td><td>Trade Theory</td><td rowspan="2">200
Objective type Written test of 200 marks (Trade Theory 150 marks & Employability Skills 50 marks)</td></tr>
<tr><td>c)</td><td>Employability Skills</td></tr>
<tr><td>d)</td><td>Work shop Calculation and Science.</td><td rowspan="2">100
Objective Type Written test of 100 marks (Engineering Drawing 50 marks & Work shop Calculation and Science 50 marks)</td></tr>
<tr><td>e)</td><td>Engineering Drawing</td></tr>
</table>

f)	Internal assessment	100
TOTAL:		700

(2) Minimum pass marks:

40% for each Theory Examination and 25% for each part/section of the Examination separately, and 60% marks for each Trade practical Examination.

(3) Testing and certifications for the course:

- OMR sheet based question paper.
- A panel of expert paper setters, who are graduates in the concerned field with minimum 5-7 years experience, is prepared for setting question papers for the Trade. The panel is vetted by the Member Secretary, NCVT.
- Paper setters are appointed from the panel after the approval of the competent authority for setting the question paper.
- The question papers are then moderated by the Board of Moderation to see if the paper is set as per the requirement and syllabus.
- The manuscripts of the moderated question papers are sent to Government Printing Presses for printing.
- Printed question papers, packed in sealed covers, are despatched to Banks/Police Stations for keeping in safe custody.
- The question papers are handed over to the Chairman/Principal of the Testing Centre two hours before the commencement of the Examination.
- An Examination Board consisting of representatives of industry/Employer/State Government are set up to supervise and monitor the conduct of Examinations at every Centre.
- Theory and practical Examinations are carried out with invigilators/examiners with the overall supervision of the Examination Board.
- Examiners called for evaluation of practical should have minimum technical qualification of a Diploma in the respective engineering field. However, when diploma holders not available, the qualification is suitably relaxed.
- Examiners for practical Examinations are appointed preferably from Polytechnics/Engineering colleges/Industry of repute. Government Departments or from amongst retired qualified personnel possessing requisite qualifications and sufficient experience in the trade/discipline.
- Each State Directorate prepares a panel of Examiners according to the norms as mentioned above and the Examiners are appointed from the panel.
- Flying squads from State Governments as well as the Central Government are constituted to check malpractices during the conduct of Examinations.
- OMR based answer sheets are evaluated by the third party evaluator only. Third party evaluator is selected for three years by open bidding process.
- Evaluation of every practical examination is carried out by the concerned examiner (from industry/ polytechnics) with the overall supervision of the Examination Board in a free and fair manner as per the assessment criteria.
- Till 2014, the marks were compiled by the State Governments as per NCVT guidelines and the results were declared by the State Governments. At present, the marks are compiled by NCVT on its portal www.ncvtmis.gov.in and the results are declared by the State Governments.
- The successful trainees are awarded National Trade Certificates.

Overall assessment strategy:

Assessment of the qualification evaluates trainees to show that they can integrate knowledge, skills and values for carrying out relevant tasks as per the defined assessable outcomes and assessment criteria. The trainees may choose the preferred language for assessment. The underlying principle of assessment is fairness and transparency. While assessing the trainee, assessor is directed to assess as per the defined assessment criteria against the assessable outcomes. The evidence of the competence acquired by the trainees can be obtained by conducting theory and practical examinations, observing the trainees at work, asking questions and initiating formative discussions to assess understanding and evaluating records and reports. The ultimate objective of the assessment is to assess the candidates as per the defined assessment criteria for the assessable/ learning outcomes.

Specific Arrangements for assessment:

- Assessment is outcome-based.
- There are formative and summative assessments in Theory and Practical.
- Assessment is carried out in Trade theory, Trade Practical, Workshop Calculation and Science, Engineering Drawing and Employability Skills.
- While Trade Theory and Trade Practical are used for assessing Trade-related jobs, Workshop Calculation and Science is used to test trainee's numerical skills, Drawing is used to test the ability of the trainee to draw and read sketches and Employability skills is used to test the communication and language skills of the trainee.
- In addition to demonstration of theory and practical knowledge, trainees get a chance to present total personality.

Quality assurance activities:

- Question papers are set by external paper setters
- Evaluation of Theory Examinations is done by third-part agency only. Third party evaluator is selected for three years by open bidding process.
- Trade Practical is examined by External Examiner (as explained above).

Please attach any documents giving further information about assessment and/or RPL.
Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

ASSESSMENT EVIDENCE

Complete a grid for each component as listed in "Formal structure of the the qualification" in the Summary.

NOTE: this grid can be replaced by any part of the qualification documentation which shows the same information – ie Learning Outcomes to be assessed, assessment criteria and the means of assessment.

Title of Component: Electrician

Assessable Outcomes and Assessment Criteria

Specific Assessable Outcomes:

SEMESTER-I		
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**	**MARKS**
1. Prepare profile with an appropriate accuracy as per drawing.	1.1 Identify the trade tools; practice their uses with safety, care & maintenance.	Practical: 12 Theory: 16 Total: 18
	1.2 Prepare a simple half lap joint using firmer chisel with safety.	
	1.3 Prepare tray using sheet metal with the safety.	
	1.4 Practice on fixing surface mounting type of accessories.	
	1.5 Practice on connecting of electrical accessories.	
	1.6 Make and wire up of a test board and test it.	
2. Prepare electrical wire joints, carry out soldering, crimping and measure insulation resistance of underground cable.	2.1 Observe safety/ precaution during joints & soldering.	Practical: 12 Theory: 16 Total: 18
	2.2 Make simple straight twist and rat-tail joints in single strand conductors.	
	2.3 Make married and 'T' (Tee) joint in stranded conductors.	
	2.4 Prepare a Britannia straight and 'T' (Tee) joint in bare conductors.	
	2.5 Prepare western union joint in bare conductor.	
	2.6 Solder the finished copper conductor joints with precaution.	
	2.7 Prepare termination of cable lugs by using crimping tool.	
	2.8 Make straight joint in different types of underground cables.	
	2.9 Measure insulation resistance of underground cable.	
3. **Verify** characteristics of electrical and magnetic circuits.	3.1 Identify types of wires, cables and verify their specifications.	Practical: 12 Theory: 16 Total: 18
	3.2 Verify the characteristics of series, parallel and its combination circuit.	
	3.3 Analyze the effect of the short and open in series and parallel circuits.	
	3.4 Verify the relation of voltage components of RLC series circuit in AC.	

	3.5 Determine the power factor by direct and indirect methods in an AC single phase RLC parallel circuit.	
	3.6 Identify the phase sequence of a 3 ø supply using a phase-sequence meter.	
	3.7 Prepare / connect a lamp load in star and delta and determine relationship between line and phase values with precaution.	
	3.8 Connect balanced and unbalanced loads in 3 phase star system and measure the power of 3 phase loads.	
	3.9 Make the solenoid and determine its polarity for the given direction of current.	
	3.10 Group the given capacitors to get the required capacity and voltage rating.	
SEMESTER-II		
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**	**MARKS**
4. Install, test and maintenance of batteries and solar cell.	4.1 Assemble a DC source 6V/500 mA using 1.5V cells.	Practical: Theory: Total:
	4.2 Determine the internal resistance of cell and make grouping of cells.	
	4.3 Practice on charging of battery and test for its condition with safety/ precaution.	
	4.4 Installation and maintenance of batteries.	
	4.5 Determine total number of cells required for a given power requirement.	
5. **Estimate**, Assemble, install and **test** wiring system.	5.1 Comply with safety & IE rules when performing the wiring.	Practical: 12 Theory: 16 Total: 18
	5.2 Prepare and mount the energy meter board.	
	5.3 Draw and wire up the consumers main board with ICDP switch and distribution fuse box.	
	5.4 Draw and wire up a bank/hostel/jail in PVC conduit.	
	5.6 Identify the types of fuses their ratings and applications.	
	5.7 Identify the parts of a relay, MCB & ELCB and check its operation.	
	5.8 Estimate the cost of material for wiring in PVC channel for an office room having 2 lamps, 1 Fan, one 6A socket outlet and wire up.	
	5.9 Estimate the requirement for conduit wiring (3 phase) and wire up.	
	5.10 Estimate the materials and wire up the lighting circuit for a godown.	
	5.11 Estimate the materials and wire up a lighting circuit for a corridor in conduit.	
	5.12 Test, locate the fault and repair a domestic wiring installation.	
6. Plan and	1.1 Plan work in compliance with standard safety norms related with earthing installation.	Practical: 12

prepare Earthing installation.	1.2 Install the pipe earthing and test it.	Theory: 16 Total: 18
	1.3 Install the plate earthing and test it.	
	1.4 Measure the earth electrode resistance using earth tester.	
	1.5 Carry out earth resistance improvement.	
7. **Plan** and execute electrical illumination system and test.	1.1 Plan work in compliance with standard safety norms related with electrical illumination system.	Practical: 12 Theory: 16 Total: 18
	1.2 Install light fitting with reflectors for direct and indirect lighting.	
	1.3 Assemble and connect a & single twin tube fluorescent light.	
	1.4 Connect, install and test the HPMV & HPSV lamp with accessories.	
	1.5 Prepare and test a decorative serial lamp set for 240 V using 6V bulb and flasher.	
	1.6 Install light fitting for show case window lighting.	
8. **Select** and perform measurements using analog / digital instruments	8.1 Identify the type of electrical instruments.	Practical: 12 Theory: 16 Total: 18
	8.2 Extend the range of MC voltmeter and ammeter.	
	8.3 Measure the frequency by frequency meter.	
	8.4 Measure the power and energy in a single & three phase circuit using wattmeter and energy meter with CT and PT.	
	8.5 Measure the value of resistance, voltage and current using digital multi-meter.	
	8.6 Measure the power factor in poly-phase circuit and verify the same with voltmeter, ammeter, watt-meter readings.	
9. Perform **testing**, **verify** errors and calibrate instruments.	9.1 Test single phase energy meter for its errors.	Practical: 12 Theory: 16 Total: 18
	9.2 Determine the measurement errors while measuring resistance by voltage drop method.	
	9.3 Calibrate the analog multi-meter.	
10. **Plan** and carry out installation, fault detection and repairing of domestic appliances.	10.1 Plan work in compliance with standard safety norms related with domestic appliances.	Practical: 12 Theory: 16 Total: 18
	10.2 Service and Repair of calling bell/ buzzer/ Alarm.	
	10.3 Service and repair an automatic iron.	
	10.4 Repair and service of oven having multi-range heat control.	
	10.5 Replace the heating element in a kettle and test.	
	10.6 Service and repair an induction heater.	
	10.7 Service and repair a geyser.	
	10.8 Service and repair a mixer.	
	10.9 Service and repair of washing machine.	
	10.10 Install a pump set.	
	10.11 Service and repair of table fan.	
	10.12 Service, repair and install a ceiling fan.	
11. Execute **testing**, **evaluate** performance and	11.1 Plan work in compliance with standard safety norms related with transformer.	Practical: 12 Theory: 16 Total: 18
	11.2 Identify the types of transformers and their specifications.	
	11.3 Identify the terminals; verify the transformation ratio of a single phase transformer.	

maintenance of transformer.	11.4 Connect and test a single phase auto- transformer. 11.5 Determine the losses (iron loss and copper loss) and the regulation of a single phase transformer at different loads. 11.6 Measure the current and voltage using CT and PT. 11.7 Carry out winding for small transformer of 1KVA rating. 11.8 Test the transformer oil with oil testing kit. 11.9 Connect 3 single phase transformers for 3 phase operation of - a) delta-delta b) delta-star c) star-star d) star-delta. 11.10 Connect the given two single phase transformers a) parallel b) series (secondary only) and measure voltage. 11.11 Connect & test 3 phase transformer in parallel.(Parallel operation)	
SEMESTER-III		
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**	**MARKS**
12. **Plan**, Execute commissioning and **evaluate** performance of DC machines.	12.1 Plan work in compliance with standard safety norms related with DC machines. 12.2 Determine the load performance of a different type of DC generator on load. 12.3 Connect, start, run and reverse direction of rotation of different types of DC motors. 12.4 Conduct the load performance tests on different type of DC motor. 12.5 Control the speed of a DC motor by different method.	Practical: 12 Theory: 16 Total: 18
14. Execute testing, and maintenance of DC machines and motor starters.	13.1 Test a DC machine for continuity and insulation resistance. 13.2 Maintenance, troubleshooting & servicing of DC machines. 13.3 Test armature by using growler. 13.4 Maintain, service and trouble shoot the DC motor starter.	Practical: 12 Theory: 16 Total: 18
14. **Plan**, Execute commissioning and **evaluate** performance of AC motors.	14.1 Plan work in compliance with standard safety norms related with AC motors. 14.2 Draw circuit diagram and connect forward & reverse a 3 phase squirrel cage induction motor. 14.3 Start, run and reverse an AC 3 phase squirrel cage induction motor by different type of starters. 14.4 Measure the slip of 3 phase squirrel cage induction motor by tachometer for different output. Draw slip / load	Practical: 12 Theory: 16 Total: 18

	characteristics of the motor.	
	14.5 Determine the efficiency of 3 phase squirrel cage induction motor by no load test/ blocked rotor test and brake test.	
	14.6 Plot the speed torque (Slip/Torque) characteristics of slip ring induction motor.	
	14.7 Perform speed control of 3 phase induction motor.	
	14.8 Connect, start and run a 3 phase synchronous motor.	
	14.9 Connect start, run, control speed and reverse the DOR of different type of single phase motors.	
	14.10 Install a single phase AC motor.	
15. Execute **testing**, and maintenance of AC motors and starters.	15.1 Test continuity and insulation of various AC motors.	Practical: 12 Theory: 16 Total: 18
	15.2 Maintain, service and trouble shoot of three phase AC motors.	
	15.3 Maintain, service and trouble shoot of different types of single phase AC motors.	
	15.4 Maintain, service and trouble shoot the AC motor starter.	
16. **Plan**, execute **testing**, **evaluate** performance and carry out maintenance of Alternator / MG set.	16.1 Plan work in compliance with standard safety norms related with Alternator & MG set.	Practical: 12 Theory: 16 Total: 18
	16.2 Connect start and run an alternator and build up the voltage.	
	16.3 Determine the load performance of a 3 phase alternator.	
	16.4 Start and load a MG set with 3 phase induction motor coupled to DC shunt generator and build up the voltage.	
	16.5 Perform alignment of MG set.	
	16.6 Preventive and breakdown Maintenance of alternator / MG set.	
	16.7 Explain the effect of excitation current in terms of V-curves of synchronous motor.	
17. Execute parallel operation of alternators.	17.1 Perform parallel operation of an alternator , a. Bright lamp method c. Dark lamp method b. Bright and dark lamp method	Practical: 12 Theory: 16 Total: 18
	17.2 Parallel operation of an alternator by using synchroscope.	
18. Distinguish, **organise** and perform motor winding.	18.1 Rewind the field coil & armature winding.	Practical: 12 Theory: 16 Total: 18
	18.2 Perform motor winding for a table fan and ceiling fan.	
	18.3 Draw winding diagram & rewind a single phase split type motor (Concentric coil winding).	
	18.4 Draw winding diagram & rewind a 3 phase squired cage induction motor (single layer distributed winding).	
	18.5 Draw winding diagram & rewind a 3 phase induction motor (single layer concentric type half coil connection).	

	18.6 Draw winding diagram & rewind a 3 phase squired cage induction motor. (Double layer distributed type winding)	
SEMESTER-IV		
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**	**MARKS**
19. Assemble simple electronic circuits and **test** for functioning.	19.1 Practice soldering on components, lug and board with safety.	Practical: 12 Theory: 16 Total: 18
	19.2 Identify the passive /active components by visual appearance, Code number and test for their condition.	
	19.3 Identify the control and functional switches in CRO and measure the D.C. & A.C. voltage, frequency and time period.	
	19.4 Construct and test a half &full wave rectifiers with and without filter circuits.	
	19.5 Construct circuit by using transistor as a switch.	
	19.6 Construct and test a UJT as relaxation oscillator & electronic timer.	
	19.7 Construct amplifier circuit using Transistor, FET and JFET and test.	
	19.8 Construct and test lamp dimmer using TRIAC/DIAC.	
	19.9 Test IGBT and use in circuit for suitable operation.	
	19.10 Construct and test the universal motor speed controller using SCR with safety.	
	19.11 Construct and test logic gate circuits.	
20. Assemble accessories and carry out wiring of control cabinets and equipment.	20.1 Draw the layout diagram of 3 phase AC motor control cabinet.	Practical: 12 Theory: 16 Total: 18
	20.2 Mount the control elements & wiring accessories on the control panel.	
	20.3 Practice wiring in control cabinet for local and remote control of induction motor.	
	20.4 Draw & wire up the control panel for forward/ reverse operation of induction motor.	
	20.5 Practice wiring for automatic start delta starter.	
	20.6 Draw & wire up control panel for sequential motor control for three motors.	
	20.7 Draw & wire up the control panel for a given circuit diagram and connect the motor.	
	20.8 Test the control panel for all the required logics.	
21. Perform speed control of AC and DC motors by using solid state devices.	21.1 Control the speed of DC motor by using DC drive.	Practical: 12 Theory: 16 Total: 18
	21.2 Speed control of universal motor by using SCR.	
	21.3 Control speed and reverse the direction of rotation of different type of three phase induction motors using VVVF control /AC drive	
22. **Plan**, assemble and	22.1 Plan work in compliance with solar panel installation norms.	Practical: 12

install solar panel	22.2 Combination of solar cells for given power requirement	Theory: 16 Total: 18
	22.3 Assemble and install solar panel.	
	22.4 Check the functionality of solar panel.	
23. **Detect** the faults and troubleshoot inverter, stabilizer, battery charger, emergency light and UPS etc.	23.1 Operation and maintenance of inverter.	Practical: 12 Theory: 16 Total: 18
	23.2 Troubleshoot, service and maintain a voltage stabilizer.	
	23.3 Identify the parts, trace the connection and test the DC regulated power supply with safety.	
	23.4 Troubleshoot and service a DC regulated power supply.	
	23.5 Test battery charger for its operation.	
	23.6 Prepare an emergency light.	
	23.7 Carryout maintenance of UPS.	
24. Erect overhead domestic service line and outline various power plant layout.	24.1 Prepare single line diagram of different types of power plants.	Practical: 12 Theory: 16 Total: 18
	24.2 Prepare layout plan and single line diagram of transmission line.	
	24.3 Draw an overhead and domestic service line.	
	24.4 Erect an overhead service line pole for single phase 240v distribution system.	
	24.5 Identify different type of insulator used in HT and LT line	
	24.6 Fasten jumper in insulators.	
	24.7 Connect feeder cable with domestic service line.	
25. **Examine** the faults and carry out repairing of circuit breakers.	25.1. Prepare layout plan and single line diagram of Distribution substation	Practical: 12 Theory: 6 Total: 18
	25.2. Illustrate application of relays in control circuits and examine its operation.	
	25.3. Identify parts of circuit breaker and check its operation.	
GRAND TOTAL		**Practical: 300** **Theory: 150** **Total: 450**

Generic Assessable Outcomes:

SEMESTER-I		
LEARNING / ASSESSABLE OUTCOME	**LEARNING / ASSESSABLE OUTCOME**	**MARKS**
1.Apply safe working practices	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and	Practical: 12

	according to site policy.	Theory: 6 Total: 18
	1.2 Recognize and report all unsafe situations according to site policy.	
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.	
	1.4 Identify, handle and store / dispose-off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.	
	1.5 Identify and observe site policies and procedures in regard to illness or accident.	
	1.6 Identify safety alarms accurately.	
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.	
	1.8 Identify and observe site evacuation procedures according to site policy.	
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.	
	1.10 Identify basic first aid and use them under different circumstances.	
	1.11 Identify different fire extinguisher and use the same as per requirement.	
2.Comply environment regulation and housekeeping	2.1 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.	Practical: 12 Theory: 6 Total: 18
	2.2 Deploy environmental protection legislation & regulations	
	2.3 Take opportunities to use energy and materials in an environmentally friendly manner	
	2.4 Avoid waste and dispose waste as per procedure	
	2.5 Recognize different components of 5S and apply the same in the working environment.	
3.Interpret & use company and technical communication	3.1 Obtain sources of information and recognize information.	Practical: 12 Theory: 6 Total: 18
	3.2Use and draw up technical drawings and documents.	
	3.3 Use documents and technical regulations and occupationally related provisions.	
	3.4 Conduct appropriate and target oriented discussions with higher authority and within the team.	
	3.5 Present facts and circumstances, possible solutions &use English special terminology.	
	3.6 Resolve disputes within the team	
	3.7 Conduct written communication.	
4. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric,	4.1 Semester examination to test basic skills on arithmetic, algebra, trigonometry and statistics.	Practical: 12 Theory: 6 Total: 18
	4.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.	

and statistics and apply knowledge of specific area to perform practical operations.		
5. Understand and explain basic science in the field of study including friction, simple machine and heat and temperature	5.1 Semester examination to test basic skills on science in the field of study including friction, simple machine and heat and temperature. 5.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.	Practical: 12 Theory: 6 Total: 18
6. Read and apply engineering drawing for different application in the field of work.	6.1 Semester examination to test basic skills on engineering drawing. 6.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.	Practical: 12 Theory: 6 Total: 18
7. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	7.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation. 7.2 Their applications will also be assessed during execution of assessable outcome.	Practical: 12 Theory: 6 Total: 18
8. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	8.1 Semester examination to test knowledge on energy conservation, global warming and pollution. 8.2 Their applications will also be assessed during execution of assessable outcome.	Practical: 12 Theory: 6 Total: 18
9. Explain personnel	9.1 Semester examination to test knowledge on personnel finance, entrepreneurship.	Practical: 12

finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	9.2 Their applications will also be assessed during execution of assessable outcome.	Theory: 6 Total: 18
10. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.	10.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services. 10.2 Their applications will also be assessed during execution of assessable outcome.	Practical: 12 Theory: 6 Total: 18
GRAND TOTAL		**Practical: 120** **Theory: 80** **Total: 200**

Means of assessment 1
Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Means of assessment 2

Pass/Fail
The minimum pass percentage is 40% for each Theory Examination and 25% for each part/section of the Examination separately, and 60% marks for each Trade practical Examination.

SECTION 2
EVIDENCE OF LEVEL

OPTION A

Title/Name of qualification/component: Electrician		**Level: 5**	
NSQF Domain	**Outcomes of the Qualification/Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
Process	**Requires Well Developed Skill** • Estimate, Assemble, install and test wiring system • Plan and prepare Earthing installation. • Perform testing, verify errors and calibrate instruments. • Plan and carry out installation, fault detection and repairing of domestic appliances. • Plan, Execute commissioning and evaluate performance of DC machines • Distinguish, organise and perform motor winding • Plan, execute testing, evaluate performance and carry out maintenance of Alternator / MG set • Plan, assemble and install solar panel **Clear choice of procedures in familiar context** • Estimate, Assemble, install and test wiring system • Plan and prepare Earthing installation. • Plan and execute electrical illumination system and test • Plan and carry out installation, fault detection and repairing of domestic appliances. • Distinguish, organise and perform motor winding • Plan, execute testing, evaluate performance and	The learner requires to demonstrate well developed skill for example 'Estimate, Assemble, install and test wiring system', 'Perform testing, verify errors and calibrate instruments', and 'Distinguish, organise and perform motor winding'. One needs to perform complex set of activities for these outcomes and there is no scope for error as these could cause fatal accidents if not done correctly. The learner requires to apply clear choice of procedures in familiar context for example 'Plan and prepare Earthing installation', 'Plan and carry out installation, fault detection and repairing of domestic appliances' and 'Detect the faults and troubleshoot inverter, stabilizer, battery charger, emergency light and UPS etc'. In all these	5

Title/Name of qualification/component: Electrician		**Level: 5**	
NSQF Domain	**Outcomes of the Qualification/Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
	carry out maintenance of Alternator / MG set • Detect the faults and troubleshoot inverter, stabilizer, battery charger, emergency light and UPS etc	learning outcomes the learner has to apply one's knowledge and decide what needs to be done to either meet the client's requirement or identify and fault and decide how to rectify it or plan as per the layout and conditions available. Hence NSQF Level is 5 for this descriptor	
Professional knowledge	**Knowledge of facts in a field of work or study** • Trade tools specifications. • Cable insulation & voltage grades • Magnetic terms, magnetic materials and properties of magnet. • Comparison and Advantages of DC and AC systems. • Related terms frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, power factor and Impedance etc. • Sine wave, phase and phase difference • Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. **Knowledge of Principles and general concepts in a field of work or study** • Fundamentals of electricity, definitions, units & effects of electric current. • Concept of Standards and advantages of BIS/ISI.	The learner requires to demonstrate knowledge of facts, principles, processes and general concepts, in the field of work or study which is Electrical wiring, electro-magnetisim, repair of electrical appliances and machines, etc. Hence NSQF Level is 5 for this descriptor	5

Title/Name of qualification/component: Electrician			**Level: 5**
NSQF Domain	**Outcomes of the Qualification/Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
	• Ohm's Law; Simple electrical circuits and problems. • Kirchoff's Laws and applications. • Series and parallel circuits. • Open and short circuits in series and parallel networks. • Laws of Resistance and various types of resistors. • Wheatstone bridge; principle and its applications. • Effect of variation of temperature on resistance. • Principles and laws of electro-magnetism • Inductive and capacitive reactance and their effect on AC circuit. • Advantages of AC poly-phase system. • Concept of three-phase Star and Delta connection • Principle and operation of solar cell. • Basic principles of Electro-plating and cathodic protection • Working principles and circuits of common domestic equipment and appliances. • Concept of Neutral and Earth **Knowledge of processes in a field of work or study** • Techniques of soldering. • Different methods of measuring the values of resistance • Wiring circuits planning, permissible load in sub-circuit and main circuit.		

Title/Name of qualification/component: Electrician		**Level: 5**	
NSQF Domain	**Outcomes of the Qualification/Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
	• Inspection and testing of wiring installations. • Special wiring circuit e.g. godown, tunnel and workshop etc. • Plate earthing and pipe earthing methods and IEE regulations. • Method of connecting three single phase transformers for three phase operation.		
Professional skill	• Estimate, Assemble, install and test wiring system. • Plan and prepare Earthing installation. • Plan and execute electrical illumination system and test. • Perform testing, verify errors and calibrate instruments. • Plan and carry out installation, fault detection and repairing of domestic appliances. • Plan, Execute commissioning and evaluate performance of DC/AC machines, transformer/Alternator/MG Set • Distinguish, organise and perform motor winding.	The learning outcomes indicated in the adjacent cell all require cognitive and practical skills to accomplish tasks that involve estimating bill of materials and cost required for the job or planning as per requirement and conditions available or detecting fault and deciding course of action for repair, all of which involve solving problems by selecting and applying basic methods, tools, materials and information. Hence NSQF Level is 5 for this descriptor	5
Core skill	**Desired Mathematical Skills** • Estimate the cost of material for wiring in PVC channel for an office room having 2 lamps, 1 Fan, one 6A socket outlet and wire up.	The learning outcomes for example 'Estimate the materials and wire up the lighting circuit for a godown' and 'Estimate the materials and wire up a lighting circuit for a corridor in conduit' display the learning outcomes	5

Title/Name of qualification/component: Electrician			**Level: 5**
NSQF Domain	**Outcomes of the Qualification/Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
	• Estimate the requirement for conduit wiring (3 phase) and wire up. • Estimate the materials and wire up the lighting circuit for a godown. • Estimate the materials and wire up a lighting circuit for a corridor in conduit. • Basic skills in Arithematic, Algebra, Trignometry and statistics and apply knowledge of specific area to perform practical operations. **Understanding of social/political** • Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality. • Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources. • Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth. **Organising information and communication** Interpret & use company and technical communication • Conduct appropriate and target oriented discussions with higher authority and within the team.	where the learner needs to display desired mathematical skill; understanding of social, political; and some skill of collecting and organising information, communication. Hence NSQF Level is 5 for this descriptor	

Title/Name of qualification/component: Electrician		**Level: 5**	
NSQF Domain	**Outcomes of the Qualification/Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
	• Present facts and circumstances, possible solutions &use English special terminology. • Resolve disputes within the team • Conduct written communication.		
Responsibility	• Prepare profile with an appropriate accuracy as per drawing. • Estimate, Assemble, install and test wiring system. • Plan and prepare Earthing installation. • Plan and execute electrical illumination system and test. • Perform testing, verify errors and calibrate instruments. • Plan and carry out installation, fault detection and repairing of domestic appliances. • Execute testing, evaluate performance and maintenance of transformer. • Execute testing, and maintenance of DC machines and motor starters. • Plan, Execute commissioning and evaluate performance of DC machines. • Distinguish, organise and perform motor winding. • Plan, Execute commissioning and evaluate performance of AC motors. • Execute testing, and maintenance of AC motors	The role of Electrician is independently responsible to perform the work as per specifications and their own analysis of what needs to be done based on their understanding of electrical processes, principles and standards. This is indicated in all the learning outcomes. Hence NSQF Level is 4 for this descriptor	4

Title/Name of qualification/component: Electrician			**Level: 5**
NSQF Domain	**Outcomes of the Qualification/Component**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
	and starters. • Plan, execute testing, evaluate performance and carry out maintenance of Alternator / MG set. • Assemble simple electronic circuits and test for functioning. • Plan, assemble and install solar panel. • Read and follow engineering drawing for different application in the field of work.		

OPTION B

Title/Name of qualification/component: Enter the title here			**Level:** Add level number
NSQF Domain	**Key requirements of the job role**	**How the job role relates to the NSQF level descriptors**	**NSQF Level**
Process			
Professional knowledge			
Professional skill			
Core skill			
Responsibility			

SECTION 3
EVIDENCE OF NEED

What evidence is there that the qualification is needed? The trade forms a part of the Recruitment Rules of major Employers. Advertisements of some major employers (Government) like are enclosed. Placement records from few ITIs are enclosed.
What is the estimated uptake of this qualification and what is the basis of this estimate? The employment prospect for this qualification is very high. There is also high demand for starting the training programme for this trade amongst new institutes. As of now the total seating capacity of the training programme is approximately 10,93,638 (including 30% supernumeraries) in 10,675 ITIs.
What steps were taken to ensure that the qualification(s) does (do) not duplicate already existing or planned qualifications in the NSQF? The qualification is originally designed and approved by NCVT for the Craftsmen Training Scheme and is in existence for the last 60 years. NCVT has been entrusted with the responsibilities of prescribing standards and curricula for craftsmen training, advising the Government of India on the overall policy and programmes, conducting All India Trade Tests and awarding National Trade Certificates. The qualifications of other bodies are of small duration, are specific and cater to specific job roles whereas this qualification prepares the trainee for multiple job roles like installing, replacing and repair of wiring, conduits, lighting and other fixtures and servicing electrical equipment.
What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated? • Mentor Council (MC) for the Power sector was formed in 2014 to review the curriculum of this qualification under the sector. • CSTARI, the research wing of DGT, reviews and updates the qualification, in consultation with industries and other stakeholders, on a regular basis by conducting trade committee meetings. • DGT will keep on doing continuous comparative study in the trade by referring to relevant upcoming qualifications in the National Qualifications NQR and relevant sectors.

Please attach any documents giving further information about any of the topics above.
Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

SECTION 4
EVIDENCE OF PROGRESSION

What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?

- Qualifying trainee will obtain an NCVT Certificate in Fitter trade which gives the following options of progression to the trainee:
    - i) National Apprenticeship Certificate or
    - ii) National Craft Instructor Certificate or
    - iii) lateral entry to Diploma in Mechanical/ Production/ Industrial Engineering, as permitted by State Boards of Technical Education.
    - iv) Can join industry as semi-skilled worker in the industry and can become supervisor after doing part-time diploma in relevant branch of Engineering
- Can appear in 10+2 examination through National Institute of Open Schooling (NIOS) for acquiring higher secondary certificate and can go further for General/ Technical education.

Please attach any documents giving further information about any of the topics above.
Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.