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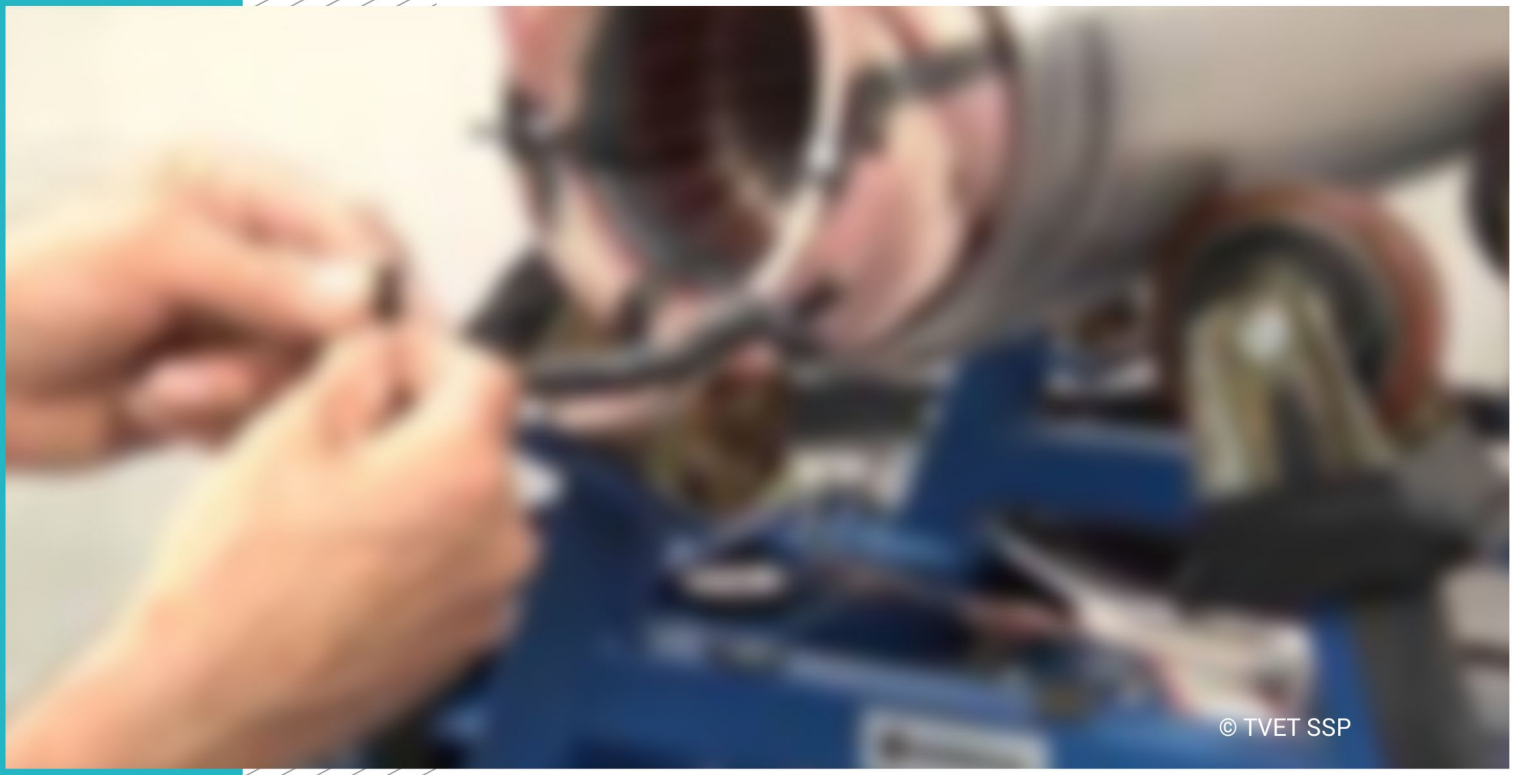
ELECTRICAL MACHINE WINDING TECHNICIAN



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CBT Curriculum

National Vocational Certificate Level 3

Version 1 - September, 2018

NAVTTC

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Contents

Introduction

The Technical and Vocational Education and Training (TVET) sector in Pakistan is passing through a transition period of shifting from a traditional supply and time based training model to a Competency Based Training. In order to build capacity of the technical and vocational Training Institutes in Pakistan, through provision of demand driven Competency Based Trainings,the NAVTTC and TVET Sector Support Program (TSSP) have joined hands together to develop qualifications for Electrical Sector. These qualifications will not only build the capacity of existing workers of the sector but would also support the youth to acquire skills best fit for this sector. The benefits and impact of development of these qualifications will be both on demand and supply side.

Based upon demand of the industry, these competency-based qualifications for "**Electrical Machine Winding Technician**" are developed under the National Vocational Qualification Frame work (NVQF)(Level 1 to 4). The qualificationscover the competencies based on required knowledge, skills and professional attitude which are essential for getting a job or seeking self-employment.

These qualifications are also in line with the vision of Pakistan's National Skills Strategy (NSS), National TVET Policy and National Vocational Qualification Framework (NVQF). This provides policy directions, support and an enabling environment to the public and private sectors to impart training for skills development to enhance social and economic profile. The National Vocational & Technical Training Commission (NAVTTC) has approved the Qualification Development Committee (QDC).The QDC consist of experts from the relevant industry belonging to different geographical locations across the country and academicians who were consulted during the development process to ensure their input and ownership of all the stakeholders. The National Competency Standards have been used as a reference document for the development of this curricula to be followed by the training institutions across the country.

1.1 Competencies to be gained after completion of the course

The detail of competency standards included in these qualifications is given below:

National Vocational Certificate level 1, in (Electrical Sector) "Electrical Machine Winding Technician"

- Comply with Work Health and Safety Policies
- Obey the Workplace Policies and Procedures
- Follow Basic Communication Skills (General)
- Operate Computer Functions(General)
- Perform Safe Transportation of Faulty Machine

National Vocational Certificate level 2, in (Electrical Sector) "Electrical Machine Winding Technician"

- Comply Personal Health and Safety Guidelines
- Communicate the Workplace Policy and Procedure
- Perform Basic Communication (Specific)
- Perform Basic Computer Application (Specific)
- Maintain Tools/ Equipment and Machinery
- Perform on-site Inspection/testing of machine
- Carry out Mechanical De- Installation of Machine
- Ensure Electrical isolation of Machine

National Vocational Certificate level 3, in (Electrical Sector) "Electrical Machine Winding Technician"

- Apply Work Health and Safety Practices (WHS)
- Identify and Implement Workplace Policy and Procedures
- Communicate at Workplace
- Perform Computer Application Skills
- Manage Personal Finances
- Disassemble Machine at Workshop
- Estimate repair /replacement cost
- Diagnose fault of machine (motor)
- Perform Motor Rewinding
- Perform Transformer Rewinding
- Carry out Re- Assembly of Machine

National Vocational Certificate level 4, in (Electrical Sector) "Electrical Machine Winding Technician"

- Contribute to Work Related Health and Safety (WHS) Initiatives
- Analyse Workplace Policy and Procedures
- Perform Advanced Communication
- Develop Advance Computer Application Skills
- Manage Humane resources

- Develop Entrepreneurial Skills
- Repair / replace allied parts of machine (Motor)
- Repair / replace allied parts of machine (Transformer)

1.2 Purpose of training

The aim of the training is to produce employable skilled manpower to improve the existing capacity of Electrical sector. This training will provide the requisite skills, knowledge and competence to the trainees to carry out **winding of Electrical Machines (Motor &Transformer) and Repair/replace allied parts of electrical machines** as well. It will also enable the existing skilled workers who gained their competencies in the said field through informal and non formal means of training and who are desirous to recognize their competence level through the assessment tool of Recognition of Prior Learning (RPL).This training will enable them to meet the challenges in the field as "**Electrical Machine Winding Technician**" in the industry and will prepare such a competitive skilled workforce who will be globally acceptable and the unemployed youth who get the training will find employment or become successful entrepreneurs

1.3 Overall objectives of training program

The Electrical Machine Winding Technician Qualifications level 1-4 consists of the theoretical and practical details along with the professional attitude of technicians required to perform the tasks assigned as a**Electrical Machine Winding Technician** in electrical industries/Workshop. The main objectives of the qualification are as follows:

- .Performing on-site Testing/ Inspection of E/ Machine
- Carrying out Electrical isolation of Machine
- Carrying out Mechanical de coupling of Machine
- Performing safe transportation of faulty Machine
- Disassembling of faulty Machine
- Detecting faults in E/ Machine
- Performing Cost estimation for the repair/ replacement work

- Repairing /replacement of allied parts of Electric Machine (Motor/Transformer)
- Maintaining Tools/ equipment and Machinery
- Carrying out Rewinding of Motor/ Transformer
- Re-assembling of Electric machine
- Development of entrepreneurial skills

1.4 Date of Validation

The level 1-4 of National vocational qualification on **Electrical Machine Winding Technician** has been validated by the Qualifications Development Committee (QDC) members on12/11/2019 and will remain in currency until Oct. 2022.

1.5 Codes of Qualifications

The International Standard Classification of Education (ISCED) is a framework for assembling, compiling and analyzing cross-nationally comparable statistics on education and training. ISCEDcodesfor these qualifications areassigned as follows:

ISCED Classification for Electrical Machine Winding Technician **level 1-4**	
Code	**Description**
0713 E&E 024	National Vocational Certificate level 1, in (Electrical Sector) “Electrical Machine Winding Technician”
0713 E&E 025	National Vocational Certificate level 2, in (Electrical Sector) “Electrical Machine Winding Technician”
0713 E&E 026	National Vocational Certificate level 3, in(Electrical Sector) “Electrical Machine Winding Technician”
0713 E&E 027	National Vocational Certificate level 4, in (Electrical Sector) “Electrical Machine Winding Technician”

1.6 Members of Qualifications Development Committee

The following members participated in the qualifications development and of these qualifications:

S#	Name	Designation	Contact No	Email	Organization	Role in Q. D. C
1.	Mr. Arif Hussain Shah	Sr. Manager Electrical			Pak China Chemicals, Faisalabad	Work shop Participants
2.	Mr. Jaffar Ali	Motor Winder / Owner			Mian Electric, Lahore	Work shop Participants
3.	Mr. Aqeel Ahmad	Motor Winder / Owner			Hafiz Electric Repairing Works, Lahore	Work shop Participants
4.	Engr. Safdar Ali	Deputy Manager Technical			Millat Equipment Ltd., Lahore	Work shop Participants
5.	Mr. Muhammad Naheed	Electrical Motor Winder			Creative Electronics – Sky Power, Lahore	Work shop Participants
6.	Mr. Zafar Iqbal	Director			Zafar Electric and Mechanical Workshop, Gujranwala.	Work shop Participants
7.	Mr. Afzal Bashir	Senior Instructor			P-TEVTA, GCT, Sialkot	Work shop Participants
8.	Mr. Hakim Ali Ujjan	Assistant Professor			S-TEVTA, GCT, Hyderabad	Work shop Participants
9.	Mr. M. Mahboob Butt	Chief Instructor	0335-4004652	mmahboobbutt@gmail.com	P-TEVTA, GCT, Sahiwal	Work shop Participants
10.	Mr. Umar Zaman Khan	Assistant Professor			KP-TEVTA, GCT, Swat	Work shop Participants
11.	Mr. Maqsood Ahmad	Chief Instructor			PVTC / VTI, Lahore	Work shop Participants
12.	Mr. Abdul Razzaq	Senior Instructor			P-TEVTA, GCT, Gujranwala	Work shop Participants
13.	Mr. Ahmed Bux Lilla	Manager			Transfopower, Lahore	Work shop Participants

S#	Name	Designation	Contact No	Email	Organization	Role in Q. D. C
14.	Mr. Ibrahim Sarfraz	Application Engineer			KSB Pumps, Lahore	Work shop Participants
15.	Engr. Abdul Maqsood	Principal / DACUM Facilitator	0300-9030560	Wadood22@yahoo.com	KP-TEVTA, Mardan	DACUM Facilitator
16.	Mr. Ayoub Elahi	Data Center Officer	0323-9877097	ayoubelahi@hotmail.com	UOL, Lahore	Co Facilitator
17.	Mr. Saad Saeed	Provincial Coordinator			GFA, Lahore	Provincial Coordinator

1.7 Entry level of trainees

The entry requirement for National Vocational Certificate level 1-4, in (Electrical Sector) “Electrical Machine Winding Technician “are given below**:**

Title	Entry requirements
National Vocational Certificate level 1, in (Electrical Sector) “Electrical Machine winding Technician”	Entry for assessment for this qualification is open. However, entry into formal training institutes, based on this qualification may require skills and knowledge equivalent to middle (school /Grade 8 certificate).
National Vocational Certificate level 2, in (Electrical Sector) “Electrical Machine Winding Technician”	Entry for assessment for this qualification is open. However entry into formal training institute for this qualification is a person having National Vocational Certificate level 1, in (Electrical Sector) “Electrical Machine Winding Technician”
National Vocational Certificate level 3, in (Electrical Sector) “Electrical Machine Winding	Entry for assessment for this qualification is open. However entry into formal training institute for this qualification is a person having National Vocational Certificate level 2, in

Title	Entry requirements
Technician”	(Electrical Sector) “Electrical Machine Winding Technician”
National Vocational Certificate level 4, in (Electrical Sector) “Electrical Machine Winding Technician”	Entry for assessment for this qualification is open. However entry into formal training institute for this qualification is a person having National Vocational Certificate level 3, in (Electrical Sector) “Electrical Machines Winding Technician”

a. Minimum qualification for teachers/instructor

- Should have completed intermediate or equivalent qualifications
- Must be a holder of G -I Certificate or Three years DAE in Electrical Technology.
- Must be able to communicate effectively
- Must have at least 4 years teaching experience.

b. Medium of Instruction

Urdu, local language

c. Duration of the course

The proposed curriculum is composed of **32 Modules** that will be covered in 1800 **Learning hours**.

The distribution of contact hours is given below:

Total contact Hrs = 1800 Or Credit hours =180

Theory: 360 hours (20%)

Practical: 1440 hours (80%) institute com industry attachment

2. Categorization and Levelling of the Competency Standards

Code	NVQF-Level	S#	Name of Duty or (Module)	Category	Level Description	Learning Hours	Credit Hours
0713001129		14	Disassemble Machine at Workshop	Technical	3	90	9
0713001131		15	Diagnose fault of machine (motor)	Technical	3	90	9
0713001130		16	Estimate repair /replacement cost	Technical	3	50	5
0713001132		17	Perform Motor Rewinding	Technical	3	110	11
0713001133		18	Perform Transformer Rewinding	Technical	3	110	11
0713001134		19	Carry out Re- Assembly of Machine	Technical	3	70	7
102200846	Level	20	Apply Work Health and Safety Practices (WHS)	Generic	3	30	3
041700840	-3	21	Identify and Implement Workplace Policy and Procedures	Generic	3	20	2
001100852		22	Communicate at Workplace	Generic	3	30	3
061100858		23	Perform Computer Application Skills	Generic	3	40	4
041300867		24	Manage Personal Finances	Generic	3	30	3
			Total Learning & Credit Hours of Level - 3			**670**	67

3. Overview of the curriculum for " Electrical Machine Winding Technician" (Level 1-4)

Module Title and Aim	Learning Units		Theory[1] Days/hours	Workplace[2] Days/hours	Timeframe of modules
Module A. Disassemble Machine at Workshop	**LU1.**	Prepare for work to disassemble machine at workplace	**18**	**72**	**90**
	LU2.	Shift Machine to work Bench			
	LU3.	Perform marking for Positions of Parts			
	LU4.	Perform numbering on Machine parts as per Inventory Record			
	LU5.	Remove the Faulty Parts			
	LU6.	Ensure safe and Sequential Placing of healthy parts of Machine			
Module B. Diagnose fault of machine (motor)	**LU1.**	Prepare for work to diagnose fault of machine (Motor)	**18**	**72**	**90**
	LU2.	Verify pre inspection test results of machine			
	LU3.	Check Alignment of Rotor Shaft			
	LU4.	Check Bearing/ Bush of Machine			
	LU5.	Update Test Results of Machine			
	LU6.	Identify the Faulty Parts of Machine			
Module C. Estimate Repair/Replacement Cost	**LU1.**	Prepare for work to estimate repair/replacement cost	**10**	**40**	**50**
	LU2.	Estimate Cost of the required Materials			
	LU3.	Estimate Transportation Charges			

	LU4.	Estimate Labour Cost of the materials			
	LU5.	Calculate accumulative cost of the materials			
	LU6.	Liaise with client/customer on repair cost			
	LU7.	Arrange the required Materials/Parts			
Module D. **Perform Motor Rewinding**	**LU1.**	Prepare for work to perform motor rewinding	**22**	**88**	**110**
	LU2.	Shift Faulty part of Motor to work Bench			
	LU3.	Remove the Winding Coils			
	LU4.	Collect the required Materials for Rewinding			
	LU5.	Prepare Core for Rewinding			
	LU6.	Interpret Wiring Diagram			
	LU7.	Make a Former for Coil Winding			
	LU8.	Prepare Coil Winding Machine for Rewinding			
	LU9.	Set the Coils in the Core slots			
	LU10.	Interlink Coils as per number of Poles			
	LU11.	Perform Winding Tests			
	LU12.	Perform Binding of Coils			
	LU13.	Conduct Baking of Winding			
	LU14.	Verify Winding Tests			
Module E. Perform Transformer Rewinding	**LU1.**	Prepare for work to perform transformer rewinding	**22**	**88**	**110**
	LU2.	Collect Faulty Coil of Transformer			
	LU3.	Compile data of Faulty Transformer			
	LU4.	Collect the Materials required for Winding			
	LU5.	Prepare a Former for Coil Winding			

	LU6. Prepare Coil on Winding Machine **LU7.** Re- Assemble the Coil on Core **LU8.** Make Connections as per rating plate of Transformer **LU9.** Calculate Turn Ratio of Transformer **LU10.** Conduct Baking of live part/coil of Transformer			
Module F. Carry out Re-Assembly of Machine	**LU1.** Prepare for work to carryout re- assembly of machine **LU2.** Arrange parts of the Machine **LU3.** Re- Assemble the Machine **LU4.** Ensure Quality of Repair Work **LU5.** Ensure safe storing/placing of Machine **LU6.** Tag the Machine ready for delivery	**14**	**56**	**70**
Module G. Apply Work Health and Safety Practices (WHS)	**LU1. Implement safe work practices at work place** **LU2. Participate in hazard assessment activities a work place** **LU3. Follow emergency procedures at workplace** **LU4. Participate in OHS consultative processes**	**6**	**24**	**30**
Module H. Identify and Implement Workplace Policy and Procedures	**LU1. Identify workplace policy & procedures** **LU2. Implement workplace policy & procedures** **LU3. Communicate workplace policy& procedures** **LU4. Review the implementation of workplace policy & procedures**	**4**	**16**	**20**
Module I. Communicate at Workplace	**LU1. Communicate within the organization** **LU2. Communicate outside the organization** **LU3. Communicate effectively in workgroup** **LU4. Communicate in writing**	**6**	**24**	**30**
Module J. Perform Computer Application Skills	**LU1. Prepare In-page documents as per required information**	**8**	**32**	**40**

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Module-A
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	LU2.	**Prepare Spreadsheets as per required information**			
	LU3.	**Use MS Office as per required information**			
	LU4.	**Perform computer graphics in basic applications**			
	LU5.	**Create Email account for communications**			
Module K. Manage Personal Finances	**LU1.**	**Develop a personal budget**	**6**	**24**	**30**
	LU2.	**Develop long term personal budget**			
	LU3.	**Identify ways to maximize future finances**			

4. Detail of Modules

Module A: 0713001129 Disassemble Machine at Workshop

Objective: This Modulecovers the knowledge & skills required to Disassemble Machine at Workshop through Prepare for work , Shift Machine to work Bench ,Perform marking for Positions of Parts ,Perform numbering on Machine parts as per Inventory Record ,Remove the Faulty Parts ,Ensure safe and Sequential Placing of healthy parts of Machine

Duration: 90 Hours **Theory:18 Hours** **Practice: 72 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for work to disassemble machine at	**The trainee is able to:** • Identify the required PPE's • Collect the required PPE's	• Prepare list&Recognition of required Tools, Equipment and PPEs for	**Th.2Hrs.** **Pr. 4Hrs.**	**Tools** • Computer System/Laptop • Printer	Class room/Lab/ Workshop

workplace	• Identify the required tools and equipment • Collect the required tools and equipment • Ensure functional condition of PPE's/Tools and equipment • Ensure safe working conditions ➢ Clear Passage ➢ Cleanliness ➢ Adequate light ➢ Ventilation	mechanical De-Installation of Machine • Importance of functional conditions of required Tools, Equipment and PPEs and their use • Importance of safe working condition regarding • Clear passage • Cleanliness • Adequate light • Ventilation		**Consumable Material** • Lead Pencil • Rubber • Tag Inventory register	
LU2. Shift Machine to work bench	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Ensure safe shifting	• Use of required PPEs • Describe procedure for safe shifting of faulty	**Th. 3Hrs.** **Pr. 15 Hrs.**	**Tools** • **Consumable Material** • Lead Pencil • Rubber	Class room/Lab/ Workshop

	of machine to work bench • Record shifting of machine to work bench	machine to work bench • Describe process for updating Inventory Record at the work bench		• Tag • Inventory register	
LU3. Perform marking for Positions of Parts	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Identify the parts to be marked for position marking • Perform marking for position of parts as per machine catalogue	• Selection and Use of required PPEs • Importance of marking on parts as per catalogue for the specific machine	**Th. 3 Hrs.** **Pr. 10 Hrs.**	**Tools** • Scriber • Number Punch • Hammer **Consumable Material** • Lead Pencil • Rubber • Tag • Inventory register • Sand Paper	Class room/Lab/ Workshop
LU4. Perform numbering on Machine parts as per Inventory	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Identify the parts of machine for allotment of specific number	• Selection and Use of required PPEs • Importance of numbering on parts as per inventory record for the	**Th. 2 Hrs.** **Pr. 11 Hrs.**	**Tools** • Scriber • Number Punch Tool • Hammer **Consumable Material** • Lead Pencil • Rubber • Tag	Class room/Lab/ Workshop

Record	• Perform numbering on machine parts as per inventory record	specific machine		• Inventory register	
LU5. Remove the faulty parts	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Identify faulty parts of machine • Remove the faulty parts of machine • Mark specific numbering on faulty parts of machine	• Selection and Use of required PPEs • Importance of identification of faulty parts of machine • Describe numbering procedure on faulty parts of machine	**Th. 5 Hrs.** **Pr. 17 Hrs.**	**Tools** • Scriber • Number Punch Tool • Hammer **Consumable Material** • Lead Pencil • Eraser • Tag • Inventory register	Class room/Lab/ Workshop
LU6. Ensure safe and Sequential Placing of healthy parts of Machine	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Mark specific numbering on healthy parts of machine • Place healthy parts of machine at safe	• Selection and Use of required PPEs • Importance of marking on healthy parts of machine • Importance of placing healthy parts of machine in	**Th.3 Hrs.** **Pr. 15 Hrs.**	**Tools** **Consumable Material** • Lead Pencil • Eraser • Tag • Inventory register	Class room/Lab/Workshop

	place in sequential order • Record the placement/location of healthy parts	sequential order • Importance of recording the placement/location of healthy parts			

Critical Evidence(s) Required

The candidate needs to produce any or all of the following documents/evidences:

1. **Portfolio**
2. **Assignment(s)/Project(s)**
3. **Relevant Certification(s)**
4. **Relevant Job/Experience Letter**

Furthermore, the candidate must execute **demonstration(s)**, which may include but are not limited to, the following:

- Ensure safe shifting of machine to work bench.
- Identify faulty parts of machine
- Remove the faulty parts of machine
- Perform marking for position of parts and make inventory

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Module-B
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Module B: 0713001131 Diagnose Fault of Machine (Motor)

Objective: This Modulecovers the knowledge & skills required to diagnose fault of machine (motor)throughPrepare for work,Verify pre inspection test results of machine ,Check Alignment of Rotor Shaft ,Check Bearing/ Bush of Machine ,Update Test Results of Machine ,Identify the Faulty Parts of Machine

Duration: 90 Hours **Theory: 18 Hours** **Practice: 72 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for work to diagnose fault of machine (Motor)	**The trainee is able to:** • Identify the required PPE's • Collect the required PPE's • Identify the required tools and equipment • Collect the required tools and equipment • Ensure functional condition of PPE's/Tools and equipment • Ensure safe working conditions ➢ Clear Passage ➢ Cleanliness ➢ Adequate light	• Demonstration regarding selection & use of required Tools, equipment &PPEs • Importance of functional status of PPEs, Tools'& equipment / machinery • Importance of conducive / ambient workplace environment ➢ Clear Passage	**Th. 2 Hrs.** **Pr. 3 Hrs.**	**Tools** • Spanner Set Screw Driver Set • Allen key Set • Clamp Meter • Safety Belt • Ladder **Consumables Items** • Hand Gloves • Safety Shoes • Safety Goggles	Class room Lab/Work shop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
	➢ Ventilation	➢ Cleanliness ➢ Adequate light ➢ Ventilation			
LU2. Verify pre inspection test (On site test) results of machine	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Verify **/** Check numbering on machine parts as per inventory record • Perform testing with Megger ➢ Ground/Earth Fault ➢ Short Circuit ➢ Open Circuit • Record test result • Compare both the onsite and current test results	• Demonstration regarding selection &use of required Tools, equipment &PPEs • Describe verification of numbering on machine parts as per inventory record • Describe method of testing machine with Megger regarding the following: ➢ Ground/Earth Fault ➢ Short Circuit ➢ Open Circuit • State method of recording test results • State Importance of comparison between onsite& current test	**Th.** **3 hrs.** **Pr.** **18 Hrs.**	**Tools** • Megger • Screw driver set • Spanner set • Combination plier • Elenkey set **Consumable Material** • Lead Pencil • Eraser • Paper / Performa of test results • Inventory register	Class room Lab/Work shop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
		results			
LU3. Check Alignment of Rotor Shaft	**The trainee is able to** • Wear the required PPE's • Pick the required tools and equipment • Check alignment of rotor shaft with the help of dial gauge • Check the rotor shaft size as per bearing size • Check run out of the rotor shaft • Record result	• Demonstration regarding selection & use of required Tools, equipment &PPEs • State Importance of checking alignment of rotor shaft & method of checking • State Importance of checking bearing size of rotor shaft & method of checking • Describe method of checking run out of rotor shaft • State Importance of recording test results	**Th.** **4 Hrs.** **Pr.** **14 Hrs.**	**Tools** • Dial Gauge • Screw driver set • Spanner set • Combination plier • Elenkey set • Outside calliper • Inside calliper • Vernier calliper **Consumable Material** • Lead Pencil • Eraser • Paper / Performa of test results • Inventory register	Class room/Lab/ Workshop
F4. Check Bearing/ Bush of	**The trainee is able to:** • Wear the required PPE's	• Demonstration regarding selection & use of required Tools, equipment &PPEs	**Th.** **3 Hrs.** **Pr.** **14 Hrs.**	**Tools** • Screw driver set	Class room/Lab/ Workshop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
Machine	• Pick the required tools and equipment • Inspect the bearing/bush for ➢ noise ➢ Axial/Radial Play/Looseness ➢ Stickiness ➢ Lubrication ➢ Breakage • Check bearing / bush of machine • Record result	• Describe techniques of inspection & checking of bearing / bush regarding ➢ Noise ➢ Axial / Radial play / looseness ➢ Stickiness ➢ Lubrication ➢ Breakage • Method of recording test results		• Spanner set • Combination plier • Elenkey set • Bearing Puller • Outside calliper • Inside calliper • Vernier calliper **Consumable Material** • Lead Pencil • Eraser • Paper / Performa of test results	
LU5. Update Test Results of Machine	**The trainee is able to:** • Collect onsite inspection test results of machine • Collect test results of machine conducted in workshop • Update test results of machine	• State Importance of comparison of test results • State Importance of updating test results	**Th. 3Hrs.** **Pr. 10 Hrs.**	**Tools** **Consumable Material** • Lead Pencil • Eraser • Paper / Performa of test results	Classrom /Lab/Work shop

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU6. Identify the Faulty Parts of Machine	**The trainee is able to:** ➢ Check test results of machine ➢ Identify faulty parts of machine ➢ Perform Numbering on faulty parts of machine according to inventory record ➢ Tag faulty parts of machine	➢ Describe method of detection of faulty parts of machine on the bases of test results ➢ State importance & method of numbering on the faulty parts of machine ➢ State importance & method of tagging on faulty parts of machine	**Th.** **3 Hrs.** **Pr.** **13 Hrs.**	**Tools** **Consumable Material** • Lead Pencil • Eraser • Paper / Performa of test results • Tags	Classrom/ Lab/Work shop

Critical Evidence(s) Required

The candidate needs to produce any or all of the following documents/evidences:

1. **Portfolio**
2. **Assignment(s)/Project(s)**
3. **Relevant Certification(s)**
4. **Relevant Job/Experience Letter**

- Furthermore, the candidate must execute **demonstration(s)**, which may include but are not limited to, the following:
- Inspect the bearing/bush for (Noise, Axial/Radial Play/Looseness,Stickiness, Lubrication, Breakage).
- Identify faulty parts of machine
- Check alignment of rotor shaft with the help of dial gauge
- Check the rotor shaft size as per bearing size
- Check run out of the rotor shaft

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Module-C
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Module C: 0713001130 Estimate Repair/Replacement Cost

Objective: This Modulecovers the knowledge & skills required to Estimate Repair/Replacement Cost through Prepare for work , Estimate Cost of the required Materials , Estimate Transportation Charges , Estimate Labour Cost of the materials , Calculate accumulative cost of the materials , Liaise with client/customer on repair cost , Order parts , Arrange the required Materials/Parts ,

Duration: 50 Hours **Theory: 10 Hours** **Practice: 40 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for work to estimate repair/replacement cost	**The trainee is able to:** • Identify the required stationary, equipment, software and materials • Collect the required stationary, equipment, software and materials	• Prepare list &Recognition of required Tools, Equipment and PPEs for mechanical De-Installation of Machine • Importance of functional conditions of required Tools, Equipment and PPEs and their use • Importance of safe working	**Th. 1 Hrs.** **Pr. 3 Hrs.**	**Tools** **Consumables:** • Computer & printer • Lead Pencil • Eraser • Paper / Performa of estimation Calculator	Class room / workshop / labs

		condition regarding • Adequate light • Ventilation			
LU2. Estimate Cost of the required Materials	**The trainee is able to:** • Prepare list of the materials/parts required for repair/replacement • Estimate quantity of materials/faulty parts of machine • Estimate cost of the required material/parts	• Describe procedure for estimation of repair / replacement of faulty parts of machine: ➢ Materials / parts ➢ Quantity of materials / parts ➢ Cost of the required materials / parts	**Th.** **2 Hrs.** **Pr.** **7 Hrs.**	**Tools** **Consumable Material** • • Computer & printer • Lead Pencil • Eraser • Paper / Performa of estimation • Calculator	Classroom/Lab/ Workshop
LU3. Estimate Transportation Charges	**The trainee is able to:** • Estimate transportation charges of pick and drop of machine • Estimate transportation charges on collection/purchase	• Describe procedure for estimation of transportation charges for: ➢ Pick & drop of the machine ➢ Collection / purchase of	**Th.** **1 Hrs.** **Pr.** **4 Hrs.**	**Tools** **Consumable Material** • • Computer & printer • Lead Pencil • Eraser • Paper /	Classroom/Lab/ Workshop

	of material/parts of machine	materials / parts		Performa of estimation • Calculator	
LU4. Estimate Labour Cost of the materials	**The trainee is able to:** • Estimate man hours for pick and drop of machine • Estimate man hours for arrangement of material/parts • Estimate man hours required for repair work	• Describe procedure for estimation of man / work hour (labour cost) for repair of machine: ➢ Pick & drop of the machine ➢ Collection / purchase of materials / parts ➢ Repair work	**Th.** **1 Hrs.** **Pr.** **6 Hrs.**	**Tools** **Consumable Material** • Computer & printer • Lead Pencil • Eraser • Paper / Performa of estimation • Calculator	Classroom/Lab/ Workshop
LU5. Calculate accumulative cost of the materials	**The trainee is able to:** • Calculate the estimated costs: ➢ Material Cost ➢ Transportation Cost ➢ Labour Cost ➢ Overhead Charges ➢ Set the profit margin • Calculate the accumulative cost	• Describe procedure for estimation of accumulative cost for repair of machine: ➢ Material cost ➢ Transportation cost ➢ Labour cost ➢ Overhead charges ➢ Profit margin	**Th.** **1 Hrs.** **Pr.** **6 Hrs.**	**Tools** **Consumable Material** • Computer & printer • Lead Pencil • Eraser • Paper / Performa of estimation • Calculator	Classroom/Lab/ Workshop

LU6. Liaise with client /customer on repair cost	**The trainee is able to:** • Inform the client/customer about total cost • Negotiate with the client/customer about total cost • Finalize the total cost • Make agreement with the client/customer	• Describe importance of Liaising with the client / customer • Describe procedure for making written agreement with the client /customer	**Th.** **2 Hrs.** **Pr.** **7 Hrs.**	**Tools** **Consumable Material** • Computer & printer • Lead Pencil • Eraser • Paper / Performa of estimation • Calculator	
LU7. Arrange the required Materials / Parts	**The trainee is able to:** • Collect list of the estimated material/parts for repair • Check availability of the required parts/material in the store • Place purchase order for the deficient parts/materials • Collect the required parts/materials from the store	• Describe method of issuing purchase order • Fill in documents of purchase order	**Th.** **2 Hrs.** **Pr.** **7 Hrs.**	**Consumable Material** • Lead Pencil • Eraser • Paper / Performa of estimation • Calculator	

Critical Evidence(s)

The candidate needs to produce any or all of the following documents/evidences:

1. **Portfolio**
2. **Assignment(s)/Project(s)**
3. **Relevant Certification(s)**
4. **Relevant Job/Experience Letter**

Furthermore, the candidate must execute **demonstration(s)**, which may include but are not limited to, the following:

- Estimate quantity of materials/faulty parts of machine
- Estimate cost of the required material/parts
- Estimate transportation charges
- Estimate working hours cost / labour cost
- Calculate the accumulative cost

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-D
CBT Curriculum
National Vocational Certificate Level 3

Version 1 - September, 2018

Module D: 0713001132 Perform Motor Rewinding

Objective: This Modulecovers the knowledge & skills required to Perform Motor Rewinding throughPrepare for work , Shift Faulty part of Motor to work Bench , Remove the Winding Coils , Collect the required Materials for Rewinding , Prepare Core for Rewinding , Interpret Wiring Diagram , Make a Former for Coil Winding , Prepare Coil Winding Machine for Rewinding , Set the Coils in the Core slots , Interlink Coils as per number of Poles , Perform Winding Tests , Perform Binding of Coils , Conduct Baking of Winding , Verify Winding Tests ,

Duration: 110 Hours **Theory: 22 Hours** **Practice: 88 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for work to perform motor rewinding	**The trainee is able to:** • Identify the required PPE's • Collect the required PPE's • Identify the required tools and equipment • Collect the required tools and equipment • Ensure functional condition of PPE's/Tools and equipment • Ensure safe	• Prepare list&Recognition of required Tools, Equipment and PPEs for mechanical De-Installation of Machine • Importance of functional conditions of required Tools, Equipment and PPEs and their use • Importance of safe working condition regarding • Clear passage • Cleanliness • Adequate light • Ventilation • Define insulator and types of insulating material used in motor for insulations	**Th. 1 Hrs.** **Pr. 3 Hrs.**	**Tools** • Spanner Set Screw Driver Set • Allen key Set • Clamp Meter • Safety Belt • Ladder **Consumables Items** • Hand Gloves • Safety Shoes	Class room / workshop / labs

	working conditions ➢ Clear Passage ➢ Cleanliness ➢ Adequate light ➢ Ventilation			• Safety Goggles	
LU2. Shift Faulty part of Motor to work Bench	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Locate faulty parts of motor • Perform shifting of faulty parts of motor to work bench	• Demonstration regarding selection & use of required Tools, equipment & PPEs • State method of safe shifting of faulty parts of motor to work bench	**Th.** **1 Hrs.** **Pr.** **3 Hrs.**	**Tools** • Use Appropriate means of shifting **Consumable Material** • Hand gloves • Cotton waste	Class room
LU3. Remove the Winding Coils	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Perform marking at	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe methods and advantages of exact marking at motor body • Explain dis assembling procedure of motor • State importance of tagging • Describe the procedure to remove	**Th.** **2 Hrs.** **Pr.** **10Hrs.**	**Tools** • Spanner set • Screw driver set • Combination plier • Wire cutter	Class room/Lab/Workshop

	motor body for correct re-fitting at both ends • Dis-assemble motor • Store rotor and statorafter appropriate tagging • Cut fastening threads • Record the connection details of stator coils • Locate faulty winding coils • Cut faulty winding coils from both ends of stator core • Remove faulty coils from stator core • Count / measure and record: ➢ Number of	the faulty coils/windings: ➢ Cutting of coil fastening threads ➢ Recording of connection details of stator coils ➢ Locating of faulty winding coils ➢ Cutting of faulty winding coils from both ends of stator core ➢ Removing faulty coils from stator core • Counting / measuring and recording ➢ Number of turns of each coil ➢ Number of poles ➢ Pole pitch ➢ Coil span ➢ Weight of each coil ➢ Measurement of size of winding wire of each coil		• Scissor • Sheet cutter • Standard wire gauge • Micro meter • Weight scale • Wooden Hammer • Hacksaw • Heat Gun • Iron Tray **Consumable Material** • Hand gloves • Cotton waste • Pencil • Paper	

	turns of each coil ➢ Pole pitch ➢ Coil span ➢ Weight of each coil ➢ Size of winding wire of each coil				
LU4. Collect the required Materials for Rewinding	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Estimate total weight of wire required for rewinding • Verify size of winding wire • Estimate length of required latheroid paper • Prepare list of	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe importance of estimation of winding wire and other required related winding materials • State importance of verification of winding wire size • State method of arranging required winding materials	**Th.1Hrs.** **Pr.** **3 Hrs.**	**Tools** • Standard wire gauge • Micro meter • Weight scale • Iron Tray **Consumable Material** • Hand gloves • Cotton waste • Pencil • Paper • Motor stator	Class room/Lab/Workshop

	material required for rewinding • Collect the required material for rewinding • Update record			having burnt winding	
LU5. Prepare Core for Rewinding	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Clean laminations of the core • Set laminations of the core • Perform marking on latheroid paper according to size of core slots • Perform	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe importance and method of cleaning laminations of stator core • State method of setting laminations of stator core • Describe method of Laying latheroid paper in stator slots: ➢ Measuring size of stator slot ➢ Marking on Latheroid paper sheet as per slot size ➢ Cutting of latheroid paper ➢ Inserting procedure of latheroid paper in stator slots	**Th.** **3 Hrs.** **Pr.** **10 Hrs.**	**Tools** • Steel Rule • Scissor • Motor stator core without winding **Consumable Material** • Hand gloves • Latheroid paper sheet (Size & measurement) as per requirem	Class room/Lab/Workshop

	cutting of latheroid paper according to marking • Insert latheroid paper into core slots			ent • Pencil	
LU6. Interpret Winding Diagram	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect winding data • Interpret winding diagram	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe importance of winding diagram: ➢ Winding symbols ➢ Types of winding ➢ Types of connections	**Th.** **1 Hrs.** **Pr.** **3 Hrs.**	**Tools** • Different types Motor windingdiagrams **Consumable Material**	Class room
LU7. Make a Former for Coil Winding	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect winding data	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe importance of : ➢ Winding data ➢ Coil span ➢ Former size ➢ Types of formers ➢ Methods of preparation of	**Th.** **3 Hrs.** **Pr.** **10 Hrs.**	**Tools** • Different types adjustable formers • Wooden saw • Rasp cut file	Class room/Lab/Workshop

	• Collect the former of appropriate size • Make / adjust former according to coil span • Verify adjustment of former according to coil span • Fix and adjust former according to coil span	former ➢ Methods of adjustment of formers		• Wooden chisel **Consumable Material** • Wooden piece • Pencil • Sand paper	
LU8. Prepare Coil Winding Machine for Rewinding	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect the already adjusted former • Collect	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe procedure of preparation of coil: ➢ With manual winding machine ➢ With motor operated winding machine • State importance of calculating total weight of winding coils • State importance of updating	**Th.** **1 Hrs.** **Pr.** **9 Hrs.**	**Tools** • Relevant former • Relevant winding data • Relevant winding machine **Consumable Material** •	Class room/Lab/Workshop

	relevant size winding wire • Prepare required number of coil sets • Calculate the total weight of winding coils • Update record	record		• Pencil • Sand paper	
LU9. Set the Coils in the Core slots	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect core and the sets of coils to be inserted in core • Insert coils one by one in the core slots according to winding diagram • Set the coils in	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe procedure of insertion / setting of coil in core slots sequentially • State importance & method of insertion of wedges.	**Th.** **1 Hrs.** **Pr.** **9 Hrs.**	**Tools** • Mallet/ Rubber Hammer **Consumable Material** • Relevant winding coils • Latheroid paper • Bamboo wedges	Class room/Lab/Workshop

	core slots • Verify the sequence of coil insertion • Insert latheroid paper or bamboo wedge to prevent coils from slipping out from the core slots				
LU10. Interlink Coils as per number of Poles	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect Core having coils inserted in it • Insert appropriate size sleeves on one side of coils ends • Remove varnish	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe procedure of sleeving the coils inserted in the core slots & make demonstration of the sleeve insertion process • State method of jointing: ➢ Technique of Enamel / Varnish removing from coil ends ➢ Interlinking coils ➢ Connecting supply leads with coils ➢ Soldering the joints ➢ Insulating joint with sleeve • State Importance of verification of	**Th.** **1 Hrs.** **Pr.** **10Hrs.**	**Tools** • Mallet/ Rubber Hammer • Soldering Iron • Soldering gun • Series Test Board • AVO metre • Megger (insulation	Class room/Lab/Workshop

	insulation from ends of coils • Interlink coils end as per number of poles and winding diagram • Connect supply leads according winding diagram with coils • Check that the coils have sound: ➢ Continuity ➢ Insulation between over lapping coils ➢ Insulation between coils and core • Verify the connections • Solder the joints • Slide sleeves	continuity before and after soldering the joints • State method of strengthening insulation between over lapped coils • State importance of pressing the winding coils • Describe method of testing insulation resistance between coils and core		tester) **Consumable Material** • Relevant winding coils • Latheroid paper • Bamboo wedges	

	over the joints to insulate the joint • Press the winding coils to ward outer edge of core				
LU11. Perform Winding Tests	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect newly wound core • Perform winding test to verify ➢ Continuity ➢ Insulation between overlapping coils ➢ Insulation between coil and core ➢ Megger Test	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe techniques to Perform the following winding tests ➢ Continuity ➢ Insulation between overlapping coils ➢ Insulation between coil and core • Describe types and use of electrical measuring instruments	**Th.** **1 Hrs.** **Pr.** **8 Hrs.**	**Tools** • Series Test Board • AVO metre • Megger (insulation tester) **Consumable Material** • Testing leads for test board and Megg	Class room/Lab/Workshop

				er	
LU12. Perform Binding of Coils	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Put latheroid paper between two coils to strengthen insulation on both sides of core ends • Perform binding of coil with binding thread or cotton tape on both sides of core ends • Press the coil ends toward outer side of core • Verify that the	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe the steps of coil binding • Importance of following tests after insertion and binding of coils : ➢ Continuity ➢ Insulation between each other(coils) ➢ Insulation between coil and core	**Th. 2Hrs.** **Pr. 3 Hrs.**		

	coils have sound: ➢ Continuity ➢ Insulation between each other ➢ Insulation between coil and core				
LU13. Conduct Baking of Winding	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Varnish the winding • Verify that the coils have sound: ➢ Continuity ➢ Insulation between each other ➢ Insulation between coil and core	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe purpose of Varnishing and baking of winding coil of stator • Importance of following tests after varnishing and baking of winding of the stator : ➢ Continuity ➢ Insulation between each other(coils) ➢ Insulation between coil and core • Perform baking of winding	**Th.** **3 Hrs.** **Pr.** **3 Hrs.**	**Tools** • Baking oven • Series Test Board • AVO metre • Megger (insulation tester) **Consumable Material** • Relevant winding coils • Latheroid	Class room/Lab/Workshop

	• Perform baking of winding			paper • Bamboo wedges	
LU14. Verify Winding Tests	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Perform winding tests to verify that the coils have: ➢ Continuity ➢ Insulation between each other ➢ Insulation between coil and core	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe techniques to Perform the following winding tests ➢ Continuity ➢ Insulation between overlapping coils ➢ Insulation between coil and core	**Th.** **1 Hrs.** **Pr.** **4 Hrs.**	**Tools** • Series Test Board • AVO metre • Megger (insulation tester) **Consumable Material** • Testing leads for test board and Megger	Class room/Lab/Workshop

Critical Evidence(s)

The candidate needs to produce any or all of the following documents/evidences:

1. **Portfolio**
2. **Assignment(s)/Project(s)**
3. **Relevant Certification(s)**
4. **Relevant Job/Experience Letter**

Furthermore, the candidate must execute **demonstration(s)**, which may include but are not limited to, the following:

- Locate faulty parts of motor
- Dis-assemble rotor and stator of Motor
- Locate faulty winding coils

- Cut faulty winding coils from both ends of stator core
- Remove faulty coils from stator core
- Count / measure and record (Number of turns of each coil, Pole pitch, Coil span, Weight of each coil, Size of winding wire of each coil)
- Perform marking on latheroid paper according to size of core slots
- Interpret winding diagram
- Make / adjust former according to coil span
- Fix and adjust former according to coil span
- Prepare required number of coil sets
- Insert coils one by one in the core slots according to winding diagram
- Set the coils in core slots
- Insert latheroid paper or bamboo wedge to prevent coils from slipping out from the core slots
- Remove varnish insulation from ends of coils
- Interlink coils end as per number of poles and winding diagram
- Connect supply leads according winding diagram with coils
- Check that the coils have sound (Continuity, Insulation between overlapping coils, Insulation between coil and core)
- Solder the joints
- Perform winding test to verify (Continuity, Insulation between overlapping coils, Insulation between coil and core, Megger Test)
- Put latheroid paper between two coils to strengthen insulation on both sides of core ends
- Perform binding of coil with binding thread or cotton tape on both sides of core ends
- Varnish the winding
- Perform baking of winding
- Perform winding tests to verify that the coils have (Continuity, Insulation between each other, Insulation between coil and core)

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-E
CBT Curriculum
National Vocational Certificate Level 3

Version 1 - September, 2018

Module E: 0713001133 Perform Transformer Rewinding

Objective: This Module covers the knowledge & skills required to Perform Transformer Rewinding through Prepare for work , Collect Faulty Coil of Transformer , Compile data of Faulty Transformer , Collect the Materials required for Winding , Prepare a Former for Coil Winding , Prepare Coil on Winding Machine , Re- Assemble the Coil on Core , Make Connections as per rating plate of Transformer , Calculate Total Turn Ratio of Transformer , Conduct Baking of live part of Transformer ,

Duration: 110 Hours **Theory: 22 Hours** **Practice: 88 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1.Prepare for work to perform transformer rewinding	**The trainee is able to:** • Identify the required PPE's • Collect the required PPE's • Identify the required tools and equipment • Collect the required tools and equipment • Ensure functional condition of PPE's/Tools and equipment • Ensure safe working conditions ➢ Clear Passage ➢ Cleanliness	• Prepare list&Recognition of required Tools, Equipment and PPEs for mechanical De-Installation of Machine • Importance of functional conditions of required Tools, Equipment and PPEs and their use • Importance of safe working condition regarding • Clear passage • Cleanliness • Adequate light • Ventilation • Define insulator and	**Th. 1Hrs.** **Pr. 3 Hrs.**	**Tools** • Spanner set • Screw driver set • Combination plier • Wire cutter • Tri pod and chain block • U bold shackle **Consumable Material** • Hand gloves • Cotton waste • Ball pen and paper	**Class room/workshop**

	➢ Adequate light ➢ Ventilation	types of insulating material used in Transformer for insulations			
LU2. Collect Faulty Coil of Transformer	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Remove cover of transformer • Identify faulty coil • Disconnect connections of faulty coil • Disassemble the channel of core • Remove the required part of core • Remove the faulty coil / coils from the limb of core • Ensure proper placing of removed coils • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Concept of working principle of transformer, Parts, core, HT /LT windings • Describe procedure for identification and safe removal of faulty coils from transformer limb of the core / coil assembly • State Importance of proper placing of faulty coils • State importance of updating record	**Th. 3Hrs.** **Pr. 7 Hrs.**	**Tools** • Spanner set • Screw driver set • Combination plier • Wire cutter • Tri pod and chain block • U bold shackle **Consumable Material** • Hand gloves • Cotton waste • Ball pen and paper	**Class room/workshop**

LU3. Compile data of Faulty Transformer Coil / Coils	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect the faulty coil • Measure / calculate: ➢ Dimensions (Height, inner & outer diameter) of coil / coils ➢ Size of winding wire ➢ No of turns of coil • Collect data from name plate of transformer • Compile data of faulty coil / coils of transformer • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe method of taking dimensions (Height, inner & outer diameter) of coil / coils ➢ Size of winding wire ➢ No of turns of coil • Describe method of collecting the data from name plate of transformer • Procedure of compiling data of faulty coil / coils of transformer • State importance of updating record	**Th. 3Hrs.** **Pr. 6Hrs.**	**Tools** • Steel rule • Vernier calliper • Standard wire gauge • Weigh Scale • Micro meter **Consumable Material** • Hand gloves • Cotton waste • Ball pen and paper • Magnifying glass • Sand paper zero size • Kerosene oil	**Class room/workshop**
LU4. Collect the required Materials for	**The trainee is able to:** • Wear the required PPE's • Pick the required	• Demonstration regarding selection & use of required Tools, equipment & PPEs	**Th. 2Hrs.** **Pr. 3Hrs.**	**Tools** • Calculator • Computer • Printer	**Class room**

Re-winding	tools and equipment • Prepare estimate of the required material for rewinding • Collect material required for rewinding • Update record	• Procedure for preparation of estimate of required material for rewinding and its collection • State importance of updating record		**Consumable Material** • Hand gloves • Cotton waste • Ball pen and paper • Estimating Performa	
LU5. Prepare Former for Coil Winding	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect winding data • Collect/Prepare former as per required dimensions(Volume) • Verify the size of former according to the coil	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe method of preparing coil former and its size verification as per coil size	**Th. 2Hrs.** **Pr. 10 Hrs.**	**Tools** • Steel rule • Vernier Calliper • Wooden Saw • Rasp Cut file • Wooden Chisel • Hammer • Wooden lathe machine **Consumable Material** • Hand gloves • Cotton waste • Ball pen and paper • Wooden	**Class room/ Lab/ Workshop**

				Sand Paper • Nails • Latheroid paper • Wood Piece • Wooden Screw	
LU6. Prepare Coil on Winding Machine	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect former • Fix former on winding machine • Collect required winding material • Wrap two, three layers of insulation paper as per requirement (latheroid / impregnated/diamond dotted/ cable paper) on the former • Fasten one end of winding wire with	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe method of preparing coil on winding machine: ➢ Arrangement of relative winding material (Winding wire, insulation paper, cotton tape, varnish) ➢ Fixing of former on winding machine ➢ Wrapping process of winding wire layers to form coil up to required size	**Th.** **2 Hrs.** **Pr.** **18 Hrs.**	**Tools** • Steel rule • Vernier Calliper • Outside calliper • Inside calliper • Mallet / rubber hammer • Soldering iron • Copper brazing torch **Consumable Material** • Hand gloves • Cotton waste • Ball pen and paper • Insulation	**Class room/ Lab/ Workshop**

	former • Put small pieces of cotton tape on former for coil binding • Wind quarter length of coil • Pull the cotton tape to bind the wound turns • Complete winding of first layer of coil • Wrap latheroid paper over first layer of coil • Complete winding of all coil layers according to number of turns • Bind the coil with cotton tape • Apply varnish on last / end layer of coil • Remove the former from winding machine • Remove the former from the	➢ Tapping leads ➢ Soldering / brazing of tapping end joints ➢ Checking continuity of coil ➢ Binding of coil ➢ Removing former from winding machine ➢ Removing coil from former		paper (Latheroid / impregnated /diamond dotted / cable paper) • Cotton tape • Varnish& Paint brush • Winding wire / winding strip • Copper brazing rod • Soldering flux	

	coil • Update record				
LU7. Re-Assemble the Coil on Core	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Insert the wound coil over the limb of core • Assemble the opened layer of the core • Fit the channel on core • Fix the channel on core • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe method of inserting coil on core limb: ➢ Coil insertion on core limb ➢ Re-assemble of upper limb of core ➢ Fitting of channel of core ➢ Fixing of channel of core	**Th. 2Hrs.** **Pr. 12Hrs.**	**Tools** • Mallet / rubber hammer • Spanner set • Screw driver set • Combination plier • Knife cutter **Consumable Material** • Hand gloves • Cotton waste • Ball pen and paper	**Class room/ Lab/ Workshop**
LU8. Make Connections as per rating plate of Transformer	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Make connection as per data / rating	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe method of making connections as per data / rating plate of transformer	**Th. 3Hrs.** **Pr. 10 Hrs.**	**Tools** • Mallet / rubber hammer • Spanner set • Screw driver set • Knife cutter	**Class room/ Lab/ Workshop**

	plate of transformer • Perform joints soldering / brazing of coils connections • Update record	• State jointing / brazing method of coil connection with tap changer and transformer bushing		Soldering iron • Copper brazing torch **Consumable Material** • Hand gloves • Cotton waste • Ball pen and paper • Copper brazing rod • Soldering flux	
LU9. Calculate Turn Ratio of Transformer	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect specifications from data / rating plate of transformer • Calculate turn ratio of transformer • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Define transformer turn ratio (TTR) and its importance in transformer working, its method of calculation	**Th. 3Hrs. Pr. 10 Hrs.**	**Tools** • Calculator **Consumable Material** • Ball pen and paper	**Class room**

LU10. Conduct Baking of live part/Coil Assembly of Transformer	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Place the transformer's coil assembly / live part in baking oven • Set specific temperature of the baking oven • Perform baking of coil assembly / live part • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Define importance of baking of transformer winding and process of baking in oven	**Th. 1Hrs.** **Pr. 9 Hrs.**	**Tools** • Transformer baking oven **Consumable Material** • Ball pen and paper	**Class room / Lab / Workshop**

Critical Evidence(s) Required

The candidate needs to produce any or all of the following documents/evidences:

1. **Portfolio**
2. **Assignment(s)/Project(s)**
3. **Relevant Certification(s)**
4. **Relevant Job/Experience Letter**

Furthermore, the candidate must execute **demonstration(s)**, which may include but are not limited to, the following:

- Disconnect connections of faulty coil
- Disassemble the channel of core
- Remove the required part of core
- Remove the faulty coil / coils from the limb of core
- Measure / calculate Dimensions (Height, inner & outer diameter of coil / coils, Size of winding wire, No of turns of coil)
- Collect data from name plate of transformer
- Prepare estimate of the required material for rewinding
- Collect/Prepare former as per required dimensions (Volume)
- Fix former on winding machine
- Wrap two, three layers of latheroid paper on the former
- Complete winding of first layer of coil
- Wrap latheroid paper over first layer of coil
- Bind the coil with cotton tape
- Assemble the openedlayer of the core
- Fit the channel on core
- Fix the channel on core
- Make connection as per data / rating plate of transformer
- Perform joints soldering of coils connections
- Calculate turn ratio of transformer
- Set specific temperature of the baking oven
- Perform baking of coil assembly / live part

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-F
CBT Curriculum
National Vocational Certificate Level 3

Version 1 - September, 2018

Module F: 0713001134 Carry out Re- Assembly of Machine

Objective: This Modulecovers the knowledge & skills required to Carry out Re- Assembly of Machine throughPrepare for work , Arrange parts of the Machine , Re- Assemble the Machine , Ensure Quality of Repair Work , Ensure safe storing/placing of Machine , Tag the Machine ready for delivery ,

Duration: 70 Hours **Theory: 14 Hours** **Practice: 56 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Prepare for work to carryout re-assembly of machine**	**The trainee is able to:** • Identify the required PPE's • Collect the required PPE's • Identify the required tools and equipment • Collect the required tools and equipment • Ensure functional condition of PPE's/Tools and equipment • Ensure safe working conditions ➢ Clear Passage ➢ Cleanliness	• Prepare list&Recognition of required Tools, Equipment and PPEs for mechanical De-Installation of Machine • Importance of functional conditions of required Tools, Equipment and PPEs and their use • Importance of safe working condition regarding • Clear passage • Cleanliness • Adequate light • Ventilation	**Th. 2 Hrs.** **Pr. 3 Hrs.**	**Tools** • Spanner Set • Screw Driver Set • Allen key Set • Clamp Meter • Safety Belt **Consumables Items** • Hand Gloves • Safety Shoes • Safety Goggles	Class room / workshop / labs

	➢ Adequate light ➢ Ventilation				
LU2:Arrange parts of the Machine	**The trainee is able to:** • Identify the required parts of machine • Collect the required parts • Count total number of parts for deficiency • Arrange parts of the machine in sequential order	• Demonstration regarding selection & use of required Tools, equipment & PPEs • State importance of arranging parts in sequential order to reassemble machine	**Th.** **2 Hrs.** **Pr.** **3 Hrs.**	**Tools** • **Consumable Material** • Ball pen and paper	**Class room/ Lab / Workshop**
Lu3:Re-assemble the Machine	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect parts of machine in sequential order • Perform Re-assembling of machine as per numbering of parts: • Adjust/Align parts	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe process of re-assembling of machine: ➢ Matching numbering of parts ➢ Putting parts in sequential order ➢ Adjusting / aligning parts of machine ➢ Final checking of tightening of bolts	**Th.** **2 Hrs.** **Pr.** **30 Hrs.**	**Tools** • Spanner set • Screw driver set • Allen Key set • Hammer • Mallet / rubber hammer • Grease gun • Bearing puller **Consumable Material** • Ball pen and paper • Grease • Cotton Waste • Cotton gloves	**Class room**

	of machine as per marking • Verify tightening of nut bolts with torque Wrench				
LU4: Ensure Quality of Repair Work	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Perform physical inspection of the Re-Assembled Machine • Perform Megger test of machine • Energize/Power Up the machine • Perform test run of machine ➢ Observe vibration ➢ Observe sound ➢ Measure Input current ➢ Observe Heat ➢ Check output	• Demonstration regarding selection & use of required Tools, equipment & PPEs • State importance of physical inspection of re- assembled machine • Describe Megger testing of machine • State advantages of test run of machine • Describe observations observed during test run of machine: ➢ Vibration ➢ Sound ➢ Heating ➢ Measurement of input current ➢ Checking of output	**Th. 3Hrs.** **Pr. 10 Hrs.**	**Tools** • AVO meter • Megger • Clamp on meter • Thermometer • Tachometer • Series test board **Consumable Material** • Ball pen and paper	**Class room**

LU5. Ensure safe storing/placing of Machine	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Prepare site for safe storage of machine • Collect machine from workbench • Shift machine to the safe storing site • Ensure safe storing/placing of machine**is**	• Demonstration regarding selection & use of required Tools, equipment & PPEs • State importance of safe shifting of machine from workbench to store • State importance of safe storing / placing of machine in store	**Th.** **3 Hrs.** **Pr.** **7 Hrs.**	**Tools** • Use proper mean of transportation for safe shifting **Consumable Material** • Plastic sheet to cover the machine • Wooden wedges • Old used tyres	**Class room**
LU6. Tag the Machine ready for delivery	**The trainee is able to:** • Prepare delivery tags • Identify the machine to be tagged • Tag the machine • Update record • Prepare final bill of repair • Communicate client/customer	• State importance of delivery tag • Describe process of making final bill after communication with the client	**Th.** **2 Hrs.** **Pr.** **3 Hrs.**	**Tools** **Consumable Material** • Tag • Ball point • Permanent ink marker	**Lab / Workshop**
	regarding readiness of machine				

Critical Evidence(s) Required

The candidate needs to produce any or all of the following documents/evidences:

1. **Portfolio**
2. **Assignment(s)/Project(s)**
3. **Relevant Certification(s)**
4. **Relevant Job/Experience Letter**

Furthermore, the candidate must execute **demonstration(s)**, which may include but are not limited to, the following:

- Perform Re-assembling of machine as per numbering of parts:
- Adjust/Align parts of machine as per marking
- Perform test run of machine (Observe vibration, Observe sound, Measure Input current, Observe Heat, Check output)
- Prepare final bill of repair
- Communicate client/customer regarding readiness of machine

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-G
CBT Curriculum
National Vocational Certificate Level 3

Version 1 - September, 2018

Part-II Generic Competencies / Modules

Module G: Apply Work Health and Safety Practices (WHS)

Objective: This unit describes the skills to work with safety and participate in hazard assessment activities, follow emergency procedures and participate OHS practices in process.

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Implement safe work practices at work place	**The trainee is able to:** • Implement relevant rules and procedures of WHS at work place. • Comply with duty of care requirements • Use personal protective equipment according to safe work practices • Contribute to WHS				

	consultative activities • Raise WHS issues with relevant personnel				
LU2. Participate in hazard assessment activities a work place	**The trainee is able to:** • Identify hazards or WHS issues in the workplace to relevant personnel • Assess and control risks according to own level of responsibility, in line with workplace procedures • Report hazards or WHS issues in the workplace to relevant personnel • Document risk control actions as required				
LU3. Follow emergency procedures at workplace	**The trainee is able to:** • Report emergencies or incidents promptly to				

	relevant personnel • Deal with emergencies in line with own level of responsibility • Implement evacuation procedures as required				
LU4. Participate in OHS consultative processes	**The trainee is able to:** • Contribute to workplace meetings, inspections or other consultative activities • Raise OHS (Occupational Health and Safety) issues with designated persons in accordance with organizational procedures • Take actions to eliminate workplace hazards or to reduce risks				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Outline the WHS rights and responsibilities that apply to own role
K2: Explain the term duty of care
K3: Describe typical health and safety roles in the workplace
K4: List and describe common safety signs and symbols
K5: Explain procedures for reporting hazards, risks, incidents and accidents
K6: Identify and describe common hazards and major causes of accidents relevant to the workplace
K7: Explain what the term risk control means
K8: List and describe potential emergency situations and how to respond to them

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Demonstrate evidences of the Health and safety Processes to avoid any incident.

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-H
CBT Curriculum

National Vocational Certificate Level 3

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Module H: Identify and Implement Workplace Policy and Procedures

Objective: This unit describes the skills and knowledge required to develop and implement a workplace policy & procedures and to modify the policy to suit changed circumstances. It applies to individuals with managerial responsibilities who undertake work developing approaches to create, monitor and improve strategies and policies within workplaces and engage with a range of relevant stakeholders and specialists.

Duration: 20 Hours **Theory: 04 Hours** **Practice: 16 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify workplace policy & procedures	**The trainee is able to:** • Identify the workplace policy & procedures • Apply appropriate strategies that can be used to measure whether your workplace health and safety obligations are being met. • Assure the policies are realistic, resources and personnel to implement • Implement the policy & procedures that reflects the				

	organizations commitments • Ensure the appropriate methods of implementation, outcomes and performance indicators				
LU2. Implement workplace policy & procedures	**The trainee is able to:** • Apply and assign responsibility for recording systems to track continuous improvements in policy & procedures • Implement strategies for continuous improvement in effective and efficient information				
LU3. Communicate workplace policy& procedures	**The trainee is able to:** • Communicate procedures to help implement workplace policy • Inform those involved in implementing the policy about expected outcomes, activities to be undertaken and assigned responsibilities				

LU4. Review the implementation of workplace policy & procedures	**The trainee is able to:** • Identify the trends that may require remedial actions • Record the trends that may require remedial actions. • Ensure policy and procedures as required are made for continuous improvement of performance				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Legislation, regulations and codes of practice applicable to the organization

K2: internal and external sources of information and organizational policy & procedures

K3: Typical barriers to implementing policies and procedures in an organization.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Identify evidences of the ability to implement work place policy and procedures. briefly identify work place procedures to avoid incident.

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-I
CBT Curriculum
National Vocational Certificate Level 3

Version 1 - September, 2018

Module I: Communicate at Workplace

Objective: This unit describes the performance outcomes, skills and knowledge required to develop communication skills in the workplace. It covers gathering, conveying and receiving information, along with completing assigned written information under direct supervision.

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Communicate within the organization	**The trainee is able to:** • Communicate within a department • Communicate with other departments. • Use various media to communicate effectively • Communicate orally and written				
LU2. Communicate outside the organization	**The trainee is able to:** • Deal with vendors • Deal with clients/customers • Interact with other				

	organisations • Use various media to communicate effectively • Work with people of different cultures / backgrounds				
LU3. Communicate effectively in workgroup	**The trainee is able to:** • Assess the issues to provide relevant suggestion to group members • Resolve the issues/ problems /conflicts within the group • Arrange group working sessions to increase the level of participation in the group processes • Communicate messages to group members clearly to ensure interpretation is valid • Communicate style /manner to reflect professional standards/ awareness of appropriate cultural practices • Act upon constructive				

	feedback				
LU4. Communicate in writing	**The trainee is able to:** • Identify relevant procedures for written information • Use strategies to ensure correct communication in writing .i.e. a. correct composition b. clarity c. comprehensiveness d. accuracy e. appropriateness • Draft assigned written information for approval, ensuring it is written within designated timeframes • Ensure written information meets required standards of style, format and detail • Seek assistance / feedback to aid communication skills development				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

K1: Importance of intra and inter organizational communication

K2: Basics of business communication

K3: Defining Modes of communication

K4: Effective communication in workgroup

K5: Communicating through writing

K6: The importance of teamwork

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

In your current position, what types of written communication do you use most often? (List them all).

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Module-J
CBT Curriculum
National Vocational Certificate Level 3

Version 1 - September, 2018

Module J: Perform Computer Application Skills

Objective: This unit describes the skills and knowledge required to use spreadsheet applications, prepare in page documents, develops familiarity with Word, Excel, Access, PowerPoint, email, and computer graphics basics.

It applies to individuals who perform a range of routine tasks in the workplace using a fundamental knowledge of spreadsheets, Microsoft office and computer graphics in under direct supervision or with limited responsibility.

Duration: 40 Hours **Theory: 08 Hours** **Practice: 32 Hours**

Learning Units	Learning out comes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare In-page documents as per required information	**The trainee is able to:** • Set keyboard preferences according to information requirements • Layout Page according to information requirements • Toggle				

	between Languages • Identify the usage of tool bar • Insert Columns as per requirement • Print the document				
LU2. Prepare Spreadsheets as per required information	**The trainee is able to:** • Create workbook according to information requirements • Insert sheet according to information requirements • Enter basic formulae /				

	functions using cell referencing when required • Correct formulas when error messages occur • Use a range of common tools during spreadsheet development • Edit columns and rows within the spreadsheet Filter data • Save the spreadsheet to a folder on a storage device • Format				

	spreadsheet using formatting features as required • Incorporate object and chart in spreadsheet • Print spreadsheet				
LU3. Use MS Office as per required information	**The trainee is able to:** • *Use Microsoft Word for documentation* • *Use Microsoft Excel for documentation* • *Use Microsoft PowerPoint for presentation* • *Perform OneNote* • *Perform*				

	Outlook for emails • *Perform Publisher applications*				
LU4. Perform computer graphics in basic applications	**The trainee is able to:** • Perform graphic fundamentals in basic applications • Draw Points and lines to make images • Draw Dots in space to make images • Draw lightening blot Shapes to make images • Enlarge circles and rectangles to block in				

	forms				
LU5. Create Email account for communications	**The trainee is able to:** • Make email account for communications • Compose text of an email message according to organizational guidelines as required • Create an automatic signature for the user • Attach files to email message where required • Send email				

	message • Reply to / forward a received message using available features • Save an attachment to the relevant folder • Save email message using available settings • Adjust email accounts to restrict and quarantine possible email security problems • Print email message as per requirements				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

K1: List basic technical terminology related to reading help files and prompts

K2: Explain the effect of formatting and appearance on the readability and usability of spreadsheets

K3: Outline log-in procedures relating to accessing a personal computer (PC)

K4: Describe the purpose, use and function of spreadsheet applications.

K5: Understand **MS Word** to create documents, flyers, publications

K6: Understand **MS PowerPoint** to create presentations

K7: Understand **MS Excel** to store, organize, and manipulate data

K8: Understand **OneNote** to organize data you collect including handwritten notes, drawings, screen captures, audio clips, and more

K9: Understand of **Publisher** to create extensive publications, posters, flyers, menus

K10: Understand **Outlook** to manage email and calendars, to do lists, and contacts

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Create spreadsheets
- Customize basic settings
- Format spreadsheets
- Apply basic formulas

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-K
CBT Curriculum
National Vocational Certificate Level 3

Version 1 - September, 2018

- Insert objects and charts in spreadsheets

Save and print spreadsheets.

Module K: Manage Personal Finances

Objective: This unit of competency describes the outcomes required to manage develop, implement and monitor a personal budget in order to plan regular savings and manage debt effectively.

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Develop a personal budget	**The trainee is able to:** • Calculate current living expenses using available information to prepare a personal budget. • Keep a record of all income and expenses for a short period of time to help estimate ongoing expenses. • Subtract total				

	expenses from total income to determine a surplus or deficit budget for the specified period. • Find reasons for a deficit budget and ways to reduce expenditure identified. • Identify ways to increase income				
LU2. Develop long term personal budget	**The trainee is able to:** • Analyze income and expenditure and set long term personal financial goals. • Develop a long-term budget based on the outcomes of short-term budgeting. • Identify obstacles that might affect the business • Formulate a regular				

	savings plan based on budget				
LU3. Identify ways to maximize future finances	**The trainee is able to:** • Determine sources to maximize personal income, • Get further education or training to maintain or improve future income. • Identify the need for debt to finance living and other expenses, • Determine the appropriate levels of debt and repayment. • Consolidate existing debt, where possible, to minimize interest costs and fees. • Seek professional money management services.				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Explain the abilities to plan and organize to keep records and monitor a personal budget

K2: Describe abilities to set and review goals

K3: Explain basic financial management and record keeping to enable development and management of a personal budget

K4: Describe benefits of financial goal setting and personal budgeting to enable effective management of personal finances

K5: Outline numeracy skills to compare income and expenditure

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

Demonstrates competency to provide evidence of the ability to manage personal finances. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

5. Complete List of Tools, Equipment, Machines and Consumables

Worker traits	Entry Requirements	Duration of training required	Career paths
• Able-Bodied • Strong • Devoted • Motivated • Hard Working • Honest • Punctual • Knowledgeable • Friendly • Interpersonal Skills	• Minimum Primary and Preferably Middle / Matric **Trainer** • Transformer and Motor Winding Technician	Total contact Hrs 1800 Or Credit hours. 180	• Motor Winding Technician • Transformer Winding Technician • Self-Owned Workshop/Entrepreneur • Trainer • Assessor • Electrical Machine Winding Expert

• Creative • Team Worker • Collaborative • Confident • Competent • Innovative • Cooperative	(Level 4) with 5 Years relevant field Experience • DAE Electrical with 3 Years relevant field Experience • BS Tech Electrical with 2 Years relevant field Experience • BSc Engineering Electrical with 1 Year relevant field Experience		**Future Trends** The paradigm shift of life style from simple to mechanized one is witnessing immense increase in the demand of electrical machines. The subsequent repair/rewinding work of the machines has been creating more opportunities /jobs prospects for the skilled workers in the trade of Electrical Machines Winding Technicians.

Related Knowledge	Tools / Equipment
• Basic Concept of Electricity and Magnetism • Define Voltage, Current, Resistance, Power& Energy • Define DC and AC (Single Phase,Three Phase) • Define Ohm's Law, calculation using basic ohm's law formula • Knowledge of Basic Electric Circuits(Series, Parallel, Open, Close, Ground, Short) • Define Conductors, Insulators, Semiconductors • Understanding Laws of Resistance • Concept of Voltage Drop • Define frequency, conductance, inductance, capacitance, impedance, power factor • State disadvantages of low power factor and methods of improvement of	• Combination Pliers 8" • Long Nose Pliers 6" • Flat Nose Pliers 6" • Round Nose Pliers 6" • Screw Driver Set (Flat & Phillips) Size 4", 6",8",10",12" • Tweezers of different shapes & sizes 4", 6" • Hammer (200,500,1000) grams • Mallet / Rubber Hammer (200,500) grams • Cold Chisel 8",12" • Gas Welding Plant • Winding Machine ➢ Manual (Small and Large size) ➢ Motorized ➢ Automatic • Elenkey Set size 1 – 10 mm • Bench Vice size 4", 6" • Digital Weight Balance up to 500 KG • Oven 0- 300ºC, 3 Cubic Ft inner chamber size, 230 V 50 Hz (For Drying purpose of

Related Knowledge	Tools / Equipment
power factor • Define self and mutual induction • Knowledge of Star Delta Connections and relation between phase and line quantities • Define Electrical measuring Units • Use of Measuring Instruments (Voltmeter, Ampere-meter, Ohm meter, wattmeter, multi-meter, Insulation Tester (Megger), TTR Meter, Clamp on Meter, Tachometer, Growler, Phase sequence meter Energy meter, Power factor meter, LCR meter, Frequency meter etc.) • Use of CT and PT in measurements • Know about Tagging , Padlocking and Coupling Techniques • Define motor, Working principle and types • Define starting and running current / torque of motor	Winding) • Scriber 6” • Center Punch 4”,6” • Vernier Caliper size 8”(Digital / Analog) • Standard Wire Gauge • Micrometer 0-25 mm , 1” (Digital/Analog) • Steel rule (300mm & 1M) • Steel Measuring Tape 10M • Try Square (8”,12”) • Bearing Puller (4”,6”,12”) • Grease Gun (12”) • Oil Can (6”) • Ratchet Type Spanner Set 4mm – 36mm • Adjustable screw wrench (6”,8”,12”) • Pedestal Drill Machine ½″ Chuck, 4 Ft • Portable Electric Drill Machine ½″ Chuck • Hi Carbon Steel Drill Bit Set (1mm-12mm) • Tap & Die Set (3mm-12mm) • Stators Iron core of motor without winding (24,30,32,36,48 Slots) • Pedestal Fan Motor (Assorted No of Slots)

Related Knowledge	Tools / Equipment
• Define cork screw rule, Lenz law, Fleming left and right hand rules • Define transformer, Its working principle and types • Define transformer turn ratio (TTR) and nominal transformation voltage ratio • Define vector group of transformer winding • Define different types of motor winding diagrams (Lap, Wave, Chain and set) • Draw different types of motor winding diagrams (Lap, Wave, Chain and set) • Importance of Machine Inventory at workplace • Importance of preventive maintenance of machines • Use of Tri Pod and Chain Block • Adjustment / fasten techniques of tri pod and chain block • Describe Safe transportation techniques of Machines through loader	• Ceiling Fan Motor (Assorted No of Slots) • Soldering Iron (60watt,100watt,200watt) • Soldering Gun 100 Watt or above • Blow Lamp • Regulator Core Laminations • Transformer Core (Core Type, Shell Type)1KVA,5KVA • Transformer Single Phase 1KVA • Transformer Three Phase 10KVA • Single Phase Variable Transformer (Variac 0-250V,2KVA) • Three Phase Variable Transformer (Variac 0-500V,5KVA) • Tri Pod 10 feet with Chain Block1 Ton • Single Phase TTR Meter • Transformer Testing Module • Digital Insulation Tester (Megger), (Multi Range) • Transformer Oil Testing Equipment • Welding Plant (5KVA) • Digital Clamp on Meter • Digital Multi Meter • Pipe Wrench (8”,12”,18”) • Grip Pliers (8”) • Pliers for locking / unlocking Spring washer

Related Knowledge	Tools / Equipment
/ fork lifter • Importance of Numbering for position of machine parts • Importance of marking for adjustment / alignment of Machine Parts • Estimation and Costing of repair / replacement work • Importance of Safe storage of Machines and Materials • Filtration techniques of Transformer oil • Know about quality standards of transformer oil • Testing techniques of Transformer oil • De-hydration of transformer oil • De Hydration of Silica Gel • Importance of Tap Changer of Transformer • State procedure of Removing Faulty Winding Coils • State Procedure of Preparing Winding Coils	(Inner / Outer) • Air Compressor with Pneumatic Gun • Dust Blower • Coil Former Adjustable (6”,8”,10”,12”,18”) Equal and Unequal size • Hacksaw 12” • Flat File 12” • Half Round File 12” • Round File 8” • Triangular File 8” • Tachometer (0-5000 rpm) Digital / Analog • Temperature laser gun • Pressure Gauge • Power Analyzer • Testing Bench • Growler • Portable Voltmeter 0- 500V AC/DC Digital / Analog • Portable Ammeter 0- 30A AC/DC Digital / Analog • Portable Wattmeter 0- 500W AC/DC Digital / Analog • Portable Frequency meter 0- 100Hz Digital / Analog • Portable Power Factor meter 0.5-0- 0.5 Lead / Lag Digital / Analog • Phase Sequence Meter 500 V

Related Knowledge	Tools / Equipment
• Importance and use of latheroid Paper, varnish, Coil binding, Sleeving • Understanding of Jointing, soldering and taping techniques of coils • Importance of coils baking • Importance of Winding Test at different stages • Understanding of Coil fastening, assembling and disassembling Techniques • Use of Winding Machine (Manual and Automatic) • Understand Preparation and Setting of Coil Former • Know about adjustment techniques for insertion of coils in core slots, core limb • Importance of Wedges • Understand construction features of Motors and Transformer • Importance of Data plate reading of machines	• High Voltage Probe • Digital Energy Meter Single and Three Phase • LCR Meter • Electrician Knife Cutter • Thimble Press 1.5mm^2 to 16mm^2 • Thimble Press (Hydraulic) 16mm^2 to 300mm^2 • Phase Tester • Wire / Cable Cutter 8” • Wire Stripper 6”

Related Knowledge	Tools / Equipment
• Importance of using PPE’S	

6. List of Consumables

	➢ Handbooks ➢ Design books ➢ Pencils ➢ Rubber ➢ Sharpeners ➢ Paper Cutter ➢ Seizers ➢ Colours ➢ White charts ➢ Brown sheets ➢ White board markers ➢ Permanent markers ➢ File cover and files ➢ Latheroid Paper Size 7, 10 & 12 No. ➢ Milinex Paper Size 7, 10 & 12 No. ➢ Nomex Paper Size 7, 10 & 12 No. ➢ Sleeve Size 1 to 14 No. ➢ Soldering Wire ➢ Soldering Flux ➢ Soldering Paste ➢ Cotton Tape ½" – 2" ➢ Glass Tape ½"- 2" ➢ Binding Thread ➢ Varnish (Non Conductive) ➢ Lugs ➢ Thimble ➢ Cable Paper 0.06mm

	➢ Press Pan Paper 0.1mm - 0.7mm ➢ Press Pan Sheet 1mm – 4mm ➢ Grease ➢ Kerosene oil ➢ Mobil Oil ➢ Transformer Oil ➢ Silica Gel ➢ Glue ➢ Wedges ➢ Cork Sheet ➢ Copper Winding Wire 18 to 34 SWG ➢ Sand Paper 1, 1.5 No. ➢ Electronic Contact Cleaner ➢ W D 40 Spray Tin ➢ Safety Goggles ➢ Electrical Safety Gloves ➢ Heat Resistance Gloves ➢ Washing Gloves ➢ Working Gloves ➢ Cotton Gloves ➢ Safety Shoes (Antistatic) ➢ Working Apron ➢ Dust Mask

	➢ Safety Helmet ➢ Safety Ladder ➢ Safety Belt ➢ Safety Rubber Mat 10- 20mm ➢ PVC Flexible Cable 23/0.0076”&40/0.0076” ➢ PVC 3/0.029”Cable ➢ PVC 7/0.029” to 7/0.064” Cable

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