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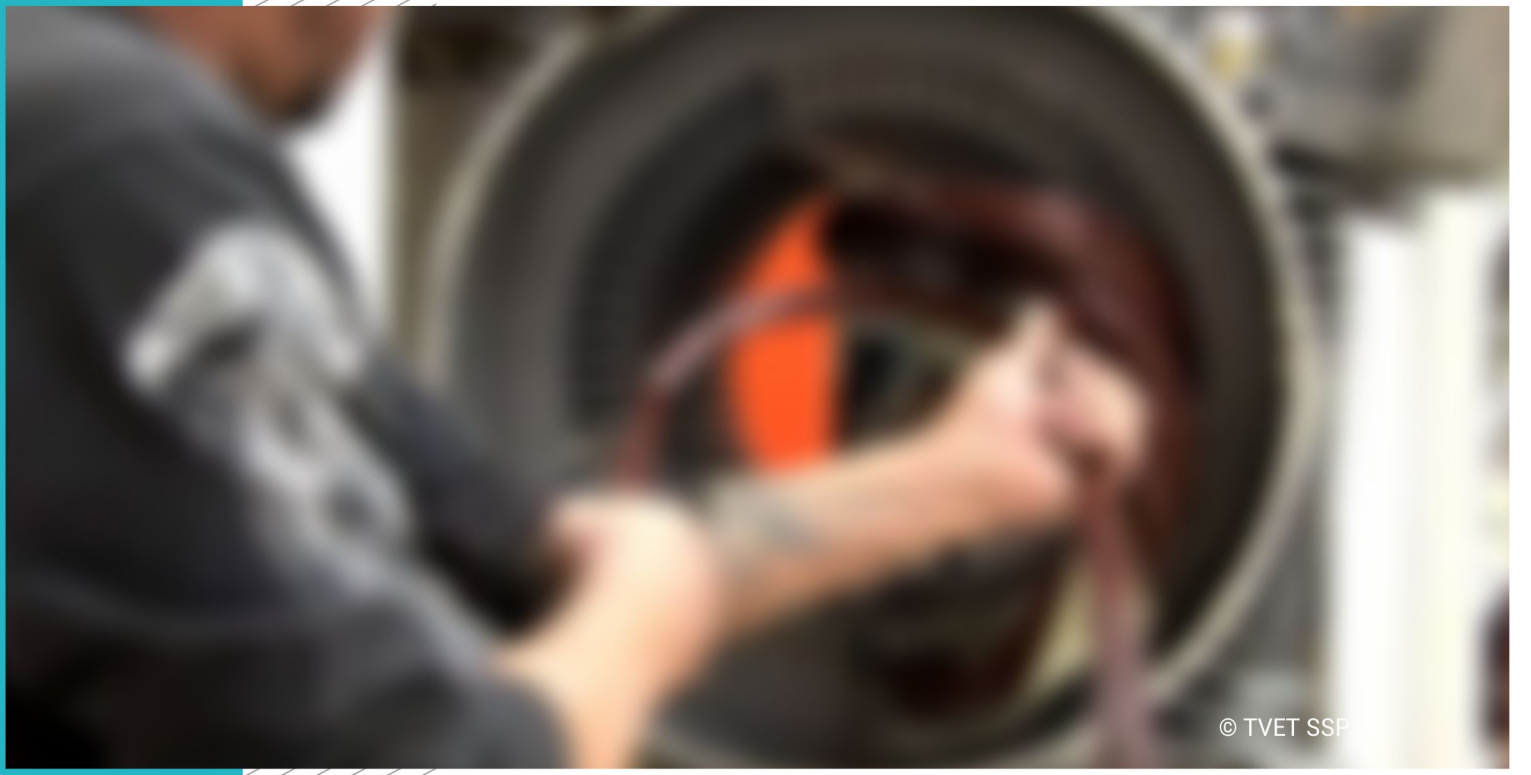
ELECTRICAL MACHINE WINDING TECHNICIAN



TRAINER GUIDE

National Vocational Certificate Level 4

Version 1 - September, 2018

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Contents

Introduction

In traditional approach there was a gap between the curricula and the market needs. While Competence-based training helps to bridge the gap between what is taught in training and what tasks will be performed on the job. Training trainees to perform actual job functions helps to ensure that future front-line workers have the skills, knowledge and abilities required to perform their jobs properly, safely and effectively. In addition to competence-based training, assessment based on the performance of actual work competencies helps to ensure that:

- trainees are performing their work tasks as safely as possible
- performance gaps are recognized prior to serious incidents
- training can be implemented to improve competence.

There are significant benefits to competence-based training:

1. Cost effectiveness

Since training activities and assessments in a competence-based approach are goal-oriented, trainers focus on clearly defined areas of skills, knowledge and understanding that their own industry has defined in the competence standards. At the same time, trainees are more motivated to learn when they realize the benefits of improved performance.

2. Efficiency

The transfer gap between the training environment and working on the job is reduced substantially in a competence-based approach. This is because training and assessment are relevant to what needs to be done on the job. As a result, it takes less time for trainees to become competent in the required areas. This, in turn, contributes to improved efficiency where training and assessment are concerned.

3. Increased productivity

When trainees become competent in the competence standards that their own industry has defined, when they know what the performance expectations are and receive recognition for their abilities through successful assessments, they are likely to be more motivated and experience higher job satisfaction. The result is improved productivity for organizations. The communication and constructive feedback between future employers and employees will improve as a result of a competence-based approach, which can also increase productivity.

4. Reduced risk

Using a competence-based approach to training, development, and assessment, employers are able to create project teams of people with complementary skills. A trainee’s record of the skills, knowledge and understanding relating to the competence standards they have achieved can be used by a future employer to identify and provide further relevant training and assessment for new skills areas. Competence standards can shape employee development and promotional paths within an organization and give employees the opportunity to learn more competencies beyond their roles. It can also provide organizations with greater ability to scale and flex as needed, thereby reducing the risk they face.

5. Increased customer satisfaction

Employees who have been trained and assessed using a competence-based approach are, by the definition of the relevant competence standards, able to perform the required tasks associated with a job. The knock-on effect is that, in service-related industries, they are able to provide high service levels, thereby increasing customer satisfaction. In production or manufacturing industries, they are able to work closely to industry standards in a more effective and efficient way.

Lesson plans

This manual provides a series of lesson plans that will guide delivery of each module for the **Electrical Machine Winding Technician** *qualification*. It is important for trainers to be flexible and be ready to adapt lesson plans to suit the context of the subject and the needs of their trainees. A simple lesson plan format is given below for your guidance .the Trainer will make it for very learning unit.

Good teachers acknowledge that CBT means each and every trainee in the class learns at a different speed. The good teacher is prepared to throw aside the day's lesson plan and do something different (and unplanned) for the class even if it means 'writing' a lesson plan for each trainee to match their learning pace for that day or week.

Learning by doing is different from learning theory and then applying it. To learn to do something, trainees need someone looking over their shoulder saying 'it's not quite like that, it's like this', 'you do it like this because …', or even 'tell me why you chose to do it like this?'.

In this way, trainees learn that theoretical knowledge is meaningless if it is not seen in the context of what they are doing. In other words, if a trainee doesn't know why they do something, they will not do it competently (skills underpinned by knowledge = competent performer).

This is how an **Electrical Machine Winding Technician** *acquires* a practical grasp of the standards expected. It's not by learning it in theory, but because those standards are acquired through correction by people who show what the standards are, and correct the trainee where they do not meet those standards, and where they repeat it correction until they have internalized those standards.

Demonstration of skill

Demonstration or modeling a skill is a powerful tool, which is used, in vocational training. The instructions for trainers for demonstration are as under:

a) Read the procedure mentioned in the Trainer Guide for the relevant Learning Unit before demonstration.
b) Arrange all tools, equipment and consumable material, which are required for demonstration of a skill.
c) Practice the skill before demonstration to trainees, if possible.
d) Introduce the skill to trainees clearly at the commencement of demonstration.
e) Explain how the skill relates to the skill(s) already acquired and describe the expected results or show the objects to trainees.
f) Carry out demonstration in a way that can be seen by all trainees.
g) Use the same tools and materials that the learner will be using.
h) Go through EACH of the steps involved in performing the skill.

i) Go SLOWLY - describe each step as it is completed.
j) Encourage the learners to move around and watch what you are doing from a number of different angles.
k) Identify critical or complex steps, or steps that involve safety precautions to be followed.
l) Explain theoretical knowledge where applicable and ask questions to trainees to test their understanding.
m) Try to involve the learners: Ask them questions about why they think the process may work that way.
n) Repeat critical steps in demonstration, if required.
o) Summarize the demonstration by asking questions to trainees.

Involvement in the process (actively seeing) is important at this stage. When you work on getting involved, getting people to participate, you make them a part of what is happening. Questions for clarification or explanation are important throughout the demonstration. It is up to the learners to ask questions about things they do not understand, but it is also important for trainers to seek out and elicit questions from learners. A trainer may need to do repeated demonstrations of difficult or complex skills.

Remember that the learner will learn a lot from your demonstration - and not just the demonstration itself. Learners will learn about how to perform the skills, but they will also learn from watching demonstrations how trainers treat the tools or materials and how they follow safety procedures.

After the demonstration, it is important to again seek out questions - be sure all questions are answered. The trainer should ask the learner if they are ready to try the skill. If not, there may be a need for recycling the demonstration (or part of it), and clarifying some of the information.

Overview of the program

Course: NVQ Certificate Level 4: **Electrical Machine Winding Technician**	**Total Course Duration:** 39 Credit hours
Course Overview:	
The purpose of the training (level 1-4) in **Electrical Machine Winding Technician**" is to provide skilled manpower to improve the existing capacity of Electrical sector. This training will provide the requisite skills, knowledge and ability to the trainees to Contribute Work Related Health and Safety (WHS) Initiatives, Analyse Workplace Policy and Procedures, Perform Advanced Communication, Develop Advance Computer Application Skills , Manage Human Resource Services , Develop Entrepreneurial Skills and Repair/replace allied parts of Motor and Transformer.It will enable the participants to meet the challenges in the field as "**Electrical Machine Winding Technician**" in the industry. Furthermore, it would improve the skill level of the technician and will prepare such a competitive skilled workforce who will be globally acceptable.	

Module	Learning Unit	Duration
Module A: Repair / Replace Allied parts of Machine (Motor). **Aim:** The aim of this module is to develop basic knowledge, skills and understanding required for Repair / Replacement of Allied parts like Bearing, Bush ,Carbon Brushes, Commutator / Slip rings, Rotor ant its Shaft, Centrifugal Switch (Clutch), Capacitor and terminals of Motor	**LU1. Prepare for work to repair / replace allied parts of machine (Motor)** **LU2.** Replace Bearing **LU3.** Replace Bush **LU4.** Replace Carbon Brushes **LU5.** Repair/Replace Commutator / Slip rings **LU6.** Check Rotor ant its Shaft **LU7.** Repair/Replace Centrifugal Switch (Clutch) of Motor **LU8.** Replace Capacitor of Motor **LU9.** Repair/Replace terminals of Motor	120

Module	Learning Unit	Duration
Module B: Repair / replace allied parts of machine (Transformer) **Aim:** The aim of this module is to develop basic knowledge, skills and understanding required for Repair / Replacement of Allied parts like filtration & de-hydration of Transformer oil , De- Hydration of Silica Gel, Transformer Bushings, Tap Changer and Buchholz Relay of transformer.	**LU1.** **Prepare for work** to repair / replace allied parts of machine (Transformer) **LU2.** Collect the required materials/parts **LU3.** Perform filtration & de-hydration of Transformer oil **LU4.** Replace Transformer Oil **LU5.** Perform De- Hydration of Silica Gel **LU6.** Repair / Replace Transformer Bushings **LU7.** Repair/ Replace Tap Changer **LU8.** Check main Tank body of Transformer for leakage **LU9.** Repair/Replace Buchholz Relay	90

Module	Learning Unit	Duration
Module C: Contribute to Work Related Health and Safety (WHS) Initiatives **Aim:** The aim of this module is to develop basic knowledge, skills and understanding to contribute towards initiation, establishment and ensuring work related health and safety measures and evaluation of the organization's WHS System as well.	**LU1. Contribute to initiate work-related health and safety measures** **LU2. Contribute to establish work-related health and safety measures** **LU3. Contribute to ensure legal requirements of WHS measures** **LU4. Contribute to review WHS measures** **LU5. Evaluate the organization's WHS system**	30 hours
Module D: Analyse Workplace Policy and Procedures **Aim:** The aim of this module is to develop basic knowledge, skills and understanding to Manage work timeframes, convene meeting, Set and meet own work priorities, Develop and maintain professional competence and Follow and implement work safety requirements	**LU1. Manage work timeframes** **LU2. Manage to convene meeting** **LU3. Decision making at workplace** **LU4. Set and meet own work priorities at instent** **LU5. Develop and maintain professional competence** **LU6. Follow and implement work safety requirements**	30 hours
Module E: Perform Advanced Communication **Aim:** The aim of this module is to develop basic knowledge, skills and understanding to perform advanced communication	**LU1. Demonstrate professional skills** **LU2. Plan and Organize work** **LU3. Provide trainings at workplace**	30 hours

Module	Learning Unit	Duration
Module F: Develop Advance Computer Application **Aim:** The aim of this module is to develop basic knowledge, skills and understanding required to Manage Information System, Prepare Presentation, manage database and Develop graphics for Design.	**LU1. Manage Information System to complete a task** **LU2. Prepare Presentation using computers** **LU3. Use Microsoft Access to manage database** **LU4. Develop graphics for Design**	40
Module G: Manage Human Resource **Aim:** The aim of this module is to develop basic knowledge, skills and understanding to Manage Human Resource through Determine strategies for delivery of human resource services, manage delivery , evaluation and integration of business ethics in human resource services.	**LU1. Determine strategies for delivery of human resource services** **LU2. Manage the delivery of human resource services** **LU3. Evaluate human resource service delivery** **LU4. Manage integration of business ethics in human resource practices**	20

Module	Learning Unit	Duration
Module H: Develop Entrepreneurial Skills **Aim:** The aim of this module is to develop basic knowledge, skills and understanding to Develop Entrepreneurial Skills which are essential for seeking self employment.	**LU1. Develop a business plan** **LU2. Collect information regarding funding sources** **LU3. Develop a marketing plan** **LU4. Develop basic business communication skills**	30

Lesson Plan Template - Example

Module			
Learning unit			
Learning outcome			
Methods	**Key Notes**	**Media**	**Time**
Introduction			
Introduce the topic and its daily applications to motivate the learner to attain his/her full consideration towards the topic. Recall the previous lesson and then connect with new topic.			
Main Body			
Present the new information .divide the topic into small section like define, describe To make learning as well as delivering easy .demonstrate the skill relevant to the learning unit.			
Conclusion			
Summarize the complete lesson to memorize the learners the key notes.			
ASSESSMENT			
How this lesson will be assessed? Feedback from students and for students.			
Total time			

SAMPLE FOR LESSON PLAN

Module A: Repair / Replace Allied parts of Machine (Motor).

LU6. Check Rotor & its Shaft

Learning Outcomes>Trainee will be able to:

- **Wear the required PPE's**
- **Pick the required tools and equipment**
- **Check smoothness of the surface of the rotor shaft**
- **Check size of shaft according to inner diameter of bearing**
- **Perform welding of shaft for sizing if required**
- **Perform surfacing of rotor shaft to acquire correct bearing size**
- **Check balance of rotor shaft**
- **Perform balancing of rotor shaft if required**
- **Perform cleaning of rotor shaft**
- **Update record**

Methods :Presentation/Lecture(Theory),Demonstration(practical**)** **Key Notes: Check Rotor & its Shaft** **Media:** Multimedia presentation Time: 03 hrs.

Introduction Time: 30 Minute

Introduce the topic and its daily applications to motivate the learner by videos/quotes/or through brain storming and then connect the topic with previous one to establish connection with previous lesson/unit and new one to attain his/her full consideration towards the topic.

Objectives. After completing the Learning unit you will be able how **Check Rotor & its Shaft**

Main Body Time: 2:00 hrs.

- Explain why do we use PPE, s
- Discuss why do we Check smoothness of the surface of the rotor shaft
- Explain why do we Perform welding of shaft for sizing if required
- Why it is important to Perform surfacing of rotor shaft to acquire correct bearing size
- Describe importance of Checking balance of the rotor shaft
- Group Activity: what will happen if we don't **Perform surfacing of rotor shaft to acquire correct bearing size**
- **Group Discussion**

Conclusion Time: 15 Minute.

Summarize the topic and discussion

Assessment Time :15 Minute

Questions Answering Session

Total time:03 hrs

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Module-A

TRAINER GUIDE

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Trainer's guidelines

Module A: 0713001135 Repair / replace allied parts of machine (Motor)			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU1. Prepare for work to repair / replace allied parts of machine (motor)	**Description/Demonstration:** ○ Give a brief description on the importance of Preparation for work to repair / replace allied parts of machine (Motor) ○ Perform demonstration of the following 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	Classroom/ lab with Multi media	○ Learner guide ○ All PPE ready available ○ Handouts Regarding to personal protective Equipment.

	➢ Cleanliness ➢ Adequate light Ventilation • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use		

	these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Replace Bearing	**Description/Demonstration:** ○ Define Bearing and Explain the procedure for replacement of Bearing of Electrical machine (Motor). ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Remove the faulty bearing • Collect the relevant number bearing from store	Classroom/lab	Learner guide Handout illustrating examples of: • Medicines • Tools like seizer • Antiseptic • Cottons • Polyfex skin ointment • Iodine

	• Replace the bearing • Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the		

	learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Replace Bush	**Description/Demonstration:** ○ Define Bush and Explain the procedure for replacement of Bearing of Electrical machine (Motor). ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Remove the faulty bush • Collect the relevant size of bush from store • Replace the bush • Update record	Classroom	Learner guide Handouts illustrating: • Standard Operating procedures for FIRE extinguisher • Job descriptions for associates • Organizational quality standards for food and other items

	• **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners.		

- **Assessment:**

	Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Replace Carbon Brushes	**Description/Demonstration:** ○ *Define Carbon Brushes and Explain the procedure for replacement of* Carbon Brushes of Electrical machine (Motor). ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Remove the faulty carbon brush • Collect the relevant size and material of carbon brush from store • Replace the carbon brush • Update record		

	• **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners.		

	• **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU5. Repair / Replace commutator / Sliprings	**Description/Demonstration:** ○ *Define* Commutator /slip rings *and Explain the procedure for Repai/replacement of* Carbon Brushes of Electrical machine (Motor). ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Check smoothness of the surface of the commutator/slip rings • Perform required surfacing of commutator/slip rings • Perform undercutting of		

	mica between segments of commutator with hacksaw blade • Perform cleaning of commutator/slip rings • Remove short circuited commutator/slip rings from the motor shaft • Collect the relevant size of commutator/slip ring from store • Replace the commutator/slip rings • Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main		

	points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU6. Check Rotor Shaft	**Description/Demonstration:** ○ *Define Rotor shaft. Describe the procedure for checking/inspection of Rotor shaft's smoothness of surface, size of shaft according to inner diameter of bearing, perform*		

	its balancing and cleaning. ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Check smoothness of the surface of the rotor shaft • Check size of shaft according to inner diameter of bearing • Perform welding of shaft for sizing if required • Perform surfacing of rotor shaft to acquire correct bearing size • Check balance of rotor shaft • Perform balancing of rotor shaft if required • Perform cleaning of rotor shaft • Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip		

	chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and		

	skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU7. Repair / Replace centrifugal switch (clutch) of Motor.	**Description/Demonstration:** ○ *Define* Centrifugal Switch (Clutch) of Motor*. Describe the procedure for checking/ repai/replacement of its contact points. chec* ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Check working of centrifugal switch • Set working of centrifugal switch • Check contact points of centrifugal switch • Perform surfacing of contact points of centrifugal switch • Perform cleaning of contact points of centrifugal switch • Update record		

- **Activity:**

	Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners.		

	• **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU8. Replace Capacitor of Motor	**Description/Demonstration:** ○ *Define* Capacitor *and Explain the procedure for replacement of* Capacitor of Electrical machine (Motor). ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Check the capacitor • Select the required capacitor size. • Collect the capacitor from main store. • Replace the faulty capacitor • Update record		

	• **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners.		

	• **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		

LU9. Repair / Replace Terminal of Motor	**Description/Demonstration:** ○ *Define*) Terminals of Motor. *Describe the procedure for Rrepair/replacement of* Terminals of Motor ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Perform physical Checking of the terminal plate and terminals of motor • Perform cleaning of terminals and terminal plate to remove carbon dust • Check fixing of terminal plate • Check the terminal linking strips • Repair**/**Replace the faulty part • Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic**		

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Module-B

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Module B: 0713001136 Repair / replace allied parts of machine (Transformer)			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU1. Prepare for Work to repair / replace allied parts of machine (Transformer)	**Description/Demonstration:** ○ Give a brief description on the importance of Preparation for work to repair / replace allied parts of machine (Transformer) Perform demonstration of the following 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 Ventilation • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each	Classroom/ lab with Multi media	○ Learner guide ○ All PPE ready available ○ Handouts Regarding to personal protective Equipment.

	group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely.		

	Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Collect the required materials / parts	**Description/Demonstration:** ○ Enlist the steps and explain each of the step required for collection of material/parts to repair / replace allied parts of machine (Transformer) ○ Perform demonstration of the following 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 • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for	Classroom/lab	Learner guide Handout illustrating examples of: • Medicines • Tools like seizer • Antiseptic • Cottons • Polyfex skin ointment • Iodine

	discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and		

	skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Perform filtration & de-hydration of Transformer oil	**Description/Demonstration:** ○ Describe the procedure for filtration of Transformer Oil and brief the students/trainees on the importance of filtration of Transformer Oil) ○ Perform demonstration of the following to • Wear the required PPE's • Pick the required tools and equipment • Collect oil sample • Check the dielectric strength of the oil • Drain out oil from transformer tank • Perform filtration of transformer oil • Perform De-Hydration of transformer oil • Update record • **Activity:** Divide the Trainees into small	Classroom	Learner guide Handouts illustrating: • Standard Operating procedures for FIRE extinguisher • Job descriptions for associates • Organizational quality standards for food and other items

	groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners		

	must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Replace Transformer Oil (if needed)	**Description/Demonstration:** ○ *Explain the procedure for replacement (Draining out, arrangement for new oil and refilling)of* Transformer Oil. ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Drain out old transformer oil from tank • Arrange new transformer oil • Refill in new transformer oil in tank • Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip		

	chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the		

	opportunity to ask questions to support their understanding.		
LU5. Perform De-Hydration of Silica Gel.	**Description/Demonstration:** ○ *Explain the procedure for performing De-Hydration of silica Gel and its importance towards efficiency of transformer.* ○ Perform demonstration of the following to • Wear the required PPE's • Pick the required tools and equipment • Open breather of transformer • Remove silica gel from breather of transformer • Perform de-hydration of silica gel ➢ Spreading silica gel under sun light ➢ Heating up silica gel in oven up to 120Cº Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip		

	chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the		

	opportunity to ask questions to support their understanding.		
LU6. Repair / Replace Transformer Bushing	**Description/Demonstration:** ○ Define Transformer Bushing and describe the procedure for repair/replacement of the Transformer Bushing ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Perform physical Checking of transformer bushing • Perform cleaning of transformer bushing to remove carbon dust • Check fixing of transformer bushing • Replace the damaged transformer bushing • Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that		

	relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		

LU7. Repair / Replace Tap Changer	**Description/Demonstration:** Define Tap Changer of Transformer and describe the procedure for repair/replacement of the Tape changer ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Perform physical Checking of the tap changer • Perform cleaning of contact terminals of tap changer to remove carbon dust • Check fixing of tap changer • Check the connections of linking cables • Replace the faulty tap changer • Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main**		

	points from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to		

	support their understanding.		
LU8. Check main Tank body of Transformer for leakage	**Description/Demonstration:** ○ Describe the procedure for checking main Tank body of Transformer for leakage and inform the students about the causes and draw backs of leakage in the main tank body of transformer. ○ Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Perform physical Checking of the tank • Locate leakage point in main tank of transformer • Drain out oil from main tank • Refer for welding of the leakage point • Re-fill oil in main tank • Perform physical Checking of the tank • Update record		

	Divide the Trainees into small groups and allocate at least **one key topic** to each group for discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their		

	Knowledge and skill. Learners must be able to practice and develop their knowledge and skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU9. Repair / Replace Buchholz relay	**Description/Demonstration:** o *Define* Buchholz Relay *and Explain the procedure for repair/replacement* Buchholz Relay of Electrical machine (Motor). o Perform demonstration of the following to: • Wear the required PPE's • Pick the required tools and equipment • Check Buchholz relay • Remove Buchholz Relay from transformer • Repair/Replace Buchholz relay • Update record • **Activity:** Divide the Trainees into small groups and allocate at least **one key topic** to each group for		

	discussion on the topic. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic** After the discussion, begin the feedback session. Facilitate all the groups one by one to come to the front of class with their flipcharts, display their flipcharts visible to all the learners and ask them to share their main points they have recorded for their key points. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. End the group discussion activity with a summary. Photograph or scan of all the flipcharts and use these charts to create a handout for distribution amongst all the learners. • **Assessment:** Observe the students and give feedback to Improve their Knowledge and skill. Learners must be able to practice and develop their knowledge and		

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Module-C

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	skills relating to Work safely. Ensure that learners have the opportunity to ask questions to support their understanding.		

Module C: Contribute to Work Related Health and Safety (WHS) Initiatives			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU1. Contribute to initiate work-related health and safety measures	**Description/Demonstration:** **Activity:** **Assessment:**		
LU2. Contribute to establish work-related health and safety measures	**Description/Demonstration:** **Activity:** **Assessment:**		
LU3. Contribute to ensure legal requirements of WHS measures	**Description/Demonstration:** **Activity:** **Assessment:**		

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LU4. Contribute to review WHS measures	**Description/Demonstration:** **Activity:** **Assessment:**		
LU5. Evaluate the organization's WHS system	**Description/Demonstration:** **Activity:** **Assessment:**		

Module D: Analyze Workplace Policy and Procedures			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU1. Manage work timeframes	**Description/Demonstration:** **Activity:** **Assessment:**		
LU2. Manage to convene meeting	**Description/Demonstration:** **Activity:** **Assessment:**		

LU3. Decision making at workplace	**Description/Demonstration:** **Activity:** **Assessment:**		
LU4. Set and meet own work priorities at instent	**Description/Demonstration:** **Activity:** **Assessment:**		
LU5. Develop and maintain professional competence	**Description/Demonstration:** **Activity:** **Assessment:**		
LU6. Follow and implement work safety requirements	**Description/Demonstration:** **Activity:** **Assessment:**		

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Module-E

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Module E: Perform Advanced Communication			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU1. Demonstrate professional skills	**Description/Demonstration:** **Activity:** **Assessment:**		
LU2. Plan and Organize work	**Description/Demonstration:** **Activity:** **Assessment:**		
LU3. Provide trainings at workplace	**Description/Demonstration:** **Activity:** **Assessment:**		

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Module-F

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Module F: Develop Advance Computer Application Skills			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU1. Manage Information System to complete a task	**Description/Demonstration:** **Activity:** **Assessment:**		
LU2. Prepare Presentation using computers	**Description/Demonstration:** **Activity:** **Assessment:**		
LU3. Use Microsoft Access to manage database	**Description/Demonstration:** **Activity:** **Assessment:**		
LU4. Develop graphics for Design	**Description/Demonstration:** **Activity:** **Assessment:**		

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Module-G

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Module G: Manage Human Resources Services			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU1. Determine strategies for delivery of human resource services	**Description/Demonstration:** **Activity:** **Assessment:**		
LU2. Manage the delivery of human resource services	**Description/Demonstration:** **Activity:** **Assessment:**		
LU3. Evaluate human resource service delivery	**Description/Demonstration:** **Activity:** **Assessment:**		
LU4. Manage integration of business ethics in human resource practices	**Description/Demonstration:** **Activity:** **Assessment:**		

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Module-H

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Module H: Develop Entrepreneurial Skills			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU1. Develop a business plan	**Description/Demonstration:** **Activity:** **Assessment:**		
LU2. Collect information regarding funding sources	**Description/Demonstration:** **Activity:** **Assessment:**		
LU3. Develop a marketing plan	**Description/Demonstration:** **Activity:** **Assessment:**		
LU4. Develop basic business communication skills	**Description/Demonstration:** **Activity:** **Assessment:**		

Frequently Asked Questions

1. What is Competency Based Training (CBT) and how is it different from currently offered trainings in institutes?	Competency-based training (CBT) is an approach to vocational education and training that places emphasis on what a person can do in the workplace as a result of completing a program of training. Compared to conventional programs, the competency based training is not primarily content based; it rather focuses on the competence requirement of the envisaged job role. The whole qualification refers to certain industry standard criterion and is modularized in nature rather than being course oriented.
2. What is the passing criterion for CBT certificate?	You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
3. What are the entry requirements for this course?	The entry requirement for this course is level-3 qualification in Electrical Machine Winding Technician or equivalent..
4. How can I progress in my educational career after attaining this certificate?	You shall be eligible to take admission in a level-5/DAE or equivalent course. In certain case, you may be required to attain an equivalence certificate from the Inter Board Committee of Chairmen (IBCC).
5. If I have the experience and skills mentioned in the competency standards, do I still need to attend the course to attain this certificate?	You can opt to take part in the Recognition of Prior Learning (RPL) program by contacting the relevant training institute and getting assessed by providing the required evidences.
6. What is the entry requirement for Recognition of Prior Learning program (RPL)?	There is no general entry requirement. The institute shall assess you, identify your competence gaps and offer you courses to cover the gaps; after which you can take up the final assessment.
7. Is there any age restriction for entry in this course or Recognition of Prior Learning program (RPL)?	There are no age restrictions to enter this course or take up the Recognition of Prior Learning program
8. What is the duration of this course?	The duration of the course work is 39 Credit hrs(390 Contact Hrs).

9. What are the class timings?	The classes are normally offered for 5 days a week (08:00 A.M to 01:00 PM) These may vary according to the practices of certain institutes
10. What is equivalence of this certificate with other qualifications?	As per the national vocational qualifications framework, the level-4 certificate is equivalent to Matriculation. The equivalence certificate can be obtained from The Inter Board Committee of Chairmen (IBCC).
11. What is the importance of this certificate in National and International job market?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTC). These standards are also recognized worldwide as all the standards are coded using international methodology and are accessible to the employers worldwide through NAVTTC website.
12. Which jobs can I get after attaining this certificate? Are there job for this certificate in public sector as well?	You shall be able to take up jobs in Electrical Machine Winding Technician industries/workshops or you can start your own business in the field of Electrical Machine Winding.
13. What are possible career progressions in industry after attaining this certificate?	You shall be able to progress up to the level of supervisor after attaining sufficient experience, knowledge and skills during the job. Attaining additional relevant qualifications may aid your career advancement to even higher levels.
14. Is this certificate recognized by any competent authority in Pakistan?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTC). The official certificates shall be awarded by the relevant certificate awarding body.
15. Is on-the-job training mandatory for this certificate? If yes, what is the duration of on-the-job training?	On-the-job training is not a requirement for final / summative assessment of this certificate. However, taking up on-the-job training after or during the course work may add your chances to get a job afterwards.
16. How much salary can I get on job after attaining this certificate?	The minimum wages announced by the Government of Pakistan in 2019 are PKR 17,500. This may vary in subsequent years and different regions of the country. Progressive employers may pay more than the mentioned amount.
17. Are there any alternative certificates which I can take up?	There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field.

18. What is the teaching language of this course?	The leaching language of this course is Local language and Urdu.
19. Is it possible to switch to other certificate programs during the course?	Yes, you can switch to other training courses after completion of certain levels in the field and can attain other qualifications in other courses.
20. What is the examination / assessment system in this program?	Competency based assessments are organized by training institutes during the course which serve the purpose of assessing the progress and preparedness of each student. Final / summative assessments are organized by the relevant qualification awarding bodies at the end of the certificate program. You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
21. Does this certificate enable me to work as freelancer?	You can start your small business in the form of services delivery for winding of Electrical Machines (Motor and Transformer).You may need additional skills on entrepreneurship to support your initiative

Test Yourself (Multiple Choice Questions)

MODULE Level 4

MOTOR PARTS REPLACEMENT

Q 1: Which device is used to reverse current after every half turn in DC motor?

a. Carbon brush
b. Commutator
c. Slip-ring
d. Carbon spring

Q 2: A magnet may attract or repel:

a. Another magnet
b. Electric current
c. Resistor
d. Capacitor

Q 3: Electric motor changes electrical energy into:

a. Potential energy
b. Thermal energy
c. Heat energy
d. Kinetic energy

Q 4: Many machines we use, are powered by:

a. Thermal energy
b. Sound energy
c. Electric motors
d. Dynamos

Q 5: Magnetic field of coil is controlled with?

a. Adding variable Resistance in parallel
b. Adding variable Capacitance in parallel
c. Adding variable Resistance in series
d. Adding variable Capacitance in series

Q6: The frame of an induction motor is usually made of:

a. Silicon steel
b. Cast iron
c. Aluminium
d. Bronze

Q7:The shaft of an induction motor is made up of:

a. Stainless steel
b. Cast iron
c. Aluminium
d. Carbon steel

Q8: What will be the equivalent capacitance (in mF) of three capacitors connected in a series having the capacitance of 0.04 mF, 0.08 mF, and 0.02 mF respectively?

a. 0.026 **mF**
b. 0.032 **mF**
c. 0.065 **mF**
d. 0.011 **mF**

Q9: Which one of the following is the mathematical expression of the Ohm's Law?

a. V = I……
b. 0.00
c. V = I.R
d. V = R/I
e. V = R

Q10: A 50 Hz, 3-phase induction motor has a full load speed of 1440 r.p.m. The number of poles in the motor are:

a. 2 pole
b. 4 pole
c. 6 pole
d. 8 pole

Q11: What will happen If any two phases for an induction motor are interchanged?

a. The motor will stop
b. The motor will continue to run in the same direction
c. The motor will Burn
d. The motor will run in reverse direction

Q12: In three-phase squirrel-cage induction motors:

a. Rotor conductors are short-circuited through end rings
b. Rotor conductors are kept open
c. Rotor conductor ends are short-circuited through slip rings
d. Rotor conductors are connected to insulation

Q13: In a three-phase induction motor, the number of poles in the rotor winding is always:

a. Equal to number of poles in stator
b. More than the number of poles in stator
c. Zero
d. Less than the number of poles in stator

Q14: As compared to DOL starting method, the star delta starting method should have:

a. High torque
b. Low starting current
c. High starting current
d. Smooth acceleration

Q15: In a split phase motor, the running winding should have:

a. High resistance and low inductance
b. High resistance and High inductance
c. Low resistance and high inductance
d. Low resistance and Low inductance

Q16: What will happen If the capacitor of a single-phase motor is short-circuited?

a. The motor will not start
b. The motor will run in the same direction at reduced speed
c. The motor will run in reverse direction
d. None of the above

Q17: In a split phase motor:

a. Both starting and running windings are connected through a centrifugal switch
b. Centrifugal switch is used to control supply voltage
c. The running winding is connected through a centrifugal switch
d. The starting winding is connected through a centrifugal switch

Q18: In a capacitor start and run motors the function of the running capacitor in series with the auxiliary winding is to:

a. Improve torque
b. Improve power factor
c. Reduce fluctuations in torque
d. Increase overload capacity

Q19: A centrifugal switch is used to disconnect 'starting winding when motor has:

a. Picked up 50 – 70% speed
b. Picked up 10% speed
c. Picked up 20% speed
d. Picked up 5 – 10% speed

Q20: **Which of the following motor is used in the mixer?**

a. Repulsion Motor
b. Reluctance Motor
c. Hysteresis Motor
d. Universal Motor

Answer Key	
Number	**Correct Answer**
1	**b**
2	**a**
3	**d**
4	**c**
5	**c**
6	**b**
7	**d**
8	**b**
9	**b**
10	**c**
11	**d**
12	**a**
13	**c**
14	**b**
15	**c**
16	**a**
17	**d**
18	**b**
19	**a**
20	**d**

Transformer Parts Replacement

Please mark the correct one from the given options.

Q 1: What is the function of Transformer oil used in transformer?

a) Insulation and cooling
b)Cooling and lubrication
c) Lubrication and insulation
d) Insulation, cooling and lubrication

Q2: Which should not be present in transformer oil?

a)Sulphur
b)Odor
c)moisture
d)both(a) and (c)

Q3:Transformer core is made up of :

a) Alumimium
b) Silicon steel
c) Copper
d) Cast Iron

Q4: Which of the following is minimized by laminating the core of a transformer?

a) Hysteresis loss
b) Eddy current loss
c) Heat loss
d) All of these

Q5:What is the size of thickness of laminations of transformer core?

a) 0.35 mm to 0.5 mm
b) 3.5 mm to 5 mm
c) 35 mm to 50 mm
d) 5mm to 10 mm

Q6:What factors determine the size of transformer core?

a) Area of the core
b) Flux density of core material
c) Frequency
d) Both (b) and (c)

Q7:What is the function of breather In power transformers?

a) Provide insulation to the windings
b) Provide cooling to the windings
c) Take insulating oil from the conservator
d) Extract moisture from the air

Q8:What is meant by conservator in a transformer?

a) Drum placed at the bottom of the tank
b) An air tight metal drum fixed at the top of the tank
c) Overload protection circuit
d) None of these

Q9:What should be the value of resistance between primary and secondary winding of transformer?

a) Infinite
b) Zero
c) About 1 MΩ
d) About 100 MΩ

Q10:What type of core section is best for utilization of available core space in power transformer?

a) Square core section
b) Stepped core section
c) Rectangular core section
d) Triangular core section

Q11:What is the advantage of Five limb core construction over three limb core construction of transformer?

a) Hysteresis loss is less
b) Permeability is higher
c) Magnetic reluctance of the three phases can be balanced
d) Eddy current loss is less

Q12:What is reduced in a transformer, when low voltage windings are placed nearer to the core in concentric winding?

a) Eddy current loss
b) Insulation requirement
c) Leakage fluxes
d) Hysteresis loss

Q13: Why Transformer windings are tapped in the middle?

a) It eliminates axial forces on the windings
b) It eliminates radial forces on the windings
c) It reduces insulation requirement
d) None of these

Q14: Which of the following materials is used to absorb moisture from air entering the transformer?

a) Silica sand
b) Silica gel
c) Felt pad
d) Sodium chloride

Q15: Which of the following acts as a protection against high voltage surges due to lightening and switching?

a) Horn gaps
b) Thermal overload relays
c) Conservator
d) Breather

Q16: What is the function of tap changer in a transformer?

a) Adjustment in power factor
b) Adjustment in secondary voltage
c) Adjustment in primary voltage
d) Adjustments in both primary and secondary voltage

Q17:What is the effect of over current in a transformer?

a) Insulation life
b) Temperature rise
c) Mechanical stress
d) All of these

Q18:Highest rating transformers are likely to be used in:

a) Generation
b) Transmission
c) Distribution
d) Substation

Q19: Transformer ratings are usually expressed in terms of:

a) Voltage
b) KVA
c) KWh
d) KW

Q20:What is the name of noise in transformer due to vibration of laminations set by magnetic forces?

a) Flicker noise
b) Transit-time noise
c) Agitation noise
d) Humming noise

Answer Key	
Number	**Correct Answer**
1	**a**
2	**d**
3	**b**
4	**b**
5	**a**
6	**d**
7	**d**
8	**b**
9	**a**
10	**b**
11	**c**
12	**b**
13	**a**
14	**b**
15	**a**
16	**b**
17	**d**
18	**a**
19	**b**
20	**d**

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