SYLLABUS FOR

WINDER (~~ELECTRICAL~~) ARMATURE

UNDER

APPRENTICESHIP TRAINING SCHEME

As approved by
GOVERNMENT OF INDIA

In consultation with
THE NATIONAL COUNCIL FOR
VOCATIONAL TRAINING
&
CENTRAL APPRENTICESHIP COUNCIL

Issued by
GOVERNMENT OF INDIA
MINISTRY OF LABOUR
DIRECTORATE GENERAL OF
EMPLOYMENT & TRAINING
NEW DELHI

1997 (Revised)

NAME OF MEMBERS OF THE TRADE COMMITTEE FOR TH TRADE OF "WINDER (ARMATURE) (ATS)"

MEMBERS S/Shri	REPRESENTATING
1. D. Authiappan Regional Director	R.D.A.T., Chennai-32
2. S.M. Khannaji Commissioner of Labour,	Pondicherry State.
3. Ravichandran Senior Executive Engineer	Neyveli Lignite Corporation Lt Neyveli, 607 803
4. Siva Sankaran Asstt. Executive Engineer	Chennai Port Trust
5. R. Jeyabalan Astt. Elec. Engi./Rolling Slock	Arakonam, Southern Railway, Chennai.
6. D. Thomas Sellaraj Deputy Director	CIMI, Chennai-32
7. V. Krishnaraj Deputy Director	R.D.A.T., Chennai-32
8. G.O.R. Nambiar Principal	CTI, Chennai-32
9. Mathivanan Asstt. Director	ATI, Chennai-32
10. S. Pitchaimani Asstt. Director	R.D.A.T., Chennai-32
11. K. Pannerselvam Special Officer	C.D. Cell, D.E. & T Chennai-5
12. Prem Kumar Gabriel Senior Instructor,	Railway Electrical Workshop, Perambur, Chennai-23
13. R. Parasuraman Asstt. Training Officer	ITI, Ambattur, Chennai.
14. M. Prakash Asstt. Training Officer	ITI, Vellore
15. R. Kandaswamy Surveyor	RDAT, Chennai-32

General Information

1. **Name of the Trade** : **WINDER (ELECTRICAL)**
2. **N.C.O. Code No.** : 859.50
3. **Job description as per N.C.O.** :
3. **Duration of Apprentice-ship Training** : 3 Years including 2 years of Electrician.
4. **Entry Qualification** : Passed 10th class examination under 10 + 2 system of education with Science and Mathematics or its equivalent.
5. **Rebate to Ex. ITI Training** : 2 years (Electrician)
6. **Ratio of Apprentices to Workers** : 1 : 7

NOTE : Winder is a person who is able to do winding of Transformers and all types of electrical rotating machines. However the winding work is limited to LT & HT voltages.

SYLLABUS FOR THE TRADE OF WINDER (ARMATURE) UNDER APPRENTICESHIP TRAINING SCHEME

Period of Training : 3 Years, the first 2 years syllabus is same as p the Electrician Trade syllabus under Craftsm Training Scheme.

Trade Theory : 3rd Year

1.A **Introduction to the electrical works carried out by t industry.**
Over all view of the electrical rotating machines and transfor ers used in the industry, their parts and their function.

2.A **Job documentation procedure :**
Job order procedure for rewinding the machine, recording name plate details, history of failure, visual inspection, a assessment of fault, initial tests, dismantling and collecti winding data.

3.A **Electro-Mechanical Assemblies :**
(1) Complete component identification. Knowledge of vario mechanical and magnetic parts such as stampings, housing keys, shafts, commutators, slipring assemblies, cooli fans, poles, etc.
(2) Job instruction on handling and storing of the assemblie
(3) Concept of jigs and fixtures as applicable in the windi job.
(4) Details of shrink fit, welding as applicable in the windi job.

4.A **Coil winding and insulation preparation :**
(1) Insulating materials : Solid, liquid and gaseous insulati materials, thermal classification, properties, typical scheme of insulation used in the windings. Methods of test insulating materials. Reference to relevant Indian/Interna tional Standards.

(2) Conductors : Conductor materials such as copper, alu minium, brass etc. their shape, size and current carryin capacity. Insulation used on winding wires, their type size, voltage and temperature ratings. End connection lea cables. Specification of relevant to Indian / internationa standards.

(3) Windings : Different types of windings used in AC/DC rotating machines and transformers.

(4) Calculations for making formers for different types of windings.

(5) Different types of winding machines, their operation and application.

(6) Soldering welding and brazing materials, methods and techniques as applied to winding.

(7) Inspection requirement of winding and test equipment to winding used thereof–such as growler, Meggar, magnetic compass, kelvin, bridge, HV flash tester, etc.

5.A **Impregnation :**

Theoretical knowledge with reference to the process of preheating, impregnating and baking. Types of impregnating varnishers, thinners and solvents used. Types of air drying varnishers. Details of equipment used.

6.A **Balancing :**

Principles of static and dynamic balancing. Description of machines used.

7.A **Final Assembly test to be conducted after rewinding lubricants.**

Information on different types of bearings, lubrication systems, carbon brushes, brush holders, final connection, cable markers,fault finding charts. Method of assembly, important inspection points and equipment used thereof.

Procedure of repairs of common electrical machines such as 3-phase and single phase motors, alternators, welding generators and transformers DC machines.

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SYLLABUS FOR THE TRADE OF WINDER (~~ELECTRICAL~~)

(3rd Year)

MODULES	SHOP FLOOR/INPLANT TRAINING

1.B Introduction to the complete product shop floor observation fully completed products with special emphasis on assemb and disassembly of the machines with part identification there

2.B. Procedure of job order filling forms, entry of name plate deta Recording the findings of visual and test inspection. Dism tling and recording winding data.

3.B **Electro-Mechanical assembly**

Shop floor instruction in the manufacture of electro-mechani assemblies of rotating electrical machine and transformer w special emphasis on the following :

(1) Safety precautions

(2) Layout for good handling and storing

(3) Various equipment used such as hydraulic press, arm press, welding equipment shrunk fit procedures.

(4) Manufacture of special jigs and fixtures.

(5) Commutator and skinning under cutting.

(6) Reconditioning/replacing of the defective parts.

(7) Testing of magnetic core.

4.B **Coil and insulation preparation**

(1) Preparation of the core before winding.

(2) Manufacture of formers.

(3) Preparation of coils on different types of coil wind machines as applied.

(4) Cutting operations on various types of insulating materi used for slot liner, layer separator, slot wedge, pha separator etc. and shaping and binding of overhangs.

5.B **Winding**

Extensive shop floor practice on actual winding, consisting the following operations.

(1) Insertion of insulating materials in the slots.

(2) Insertion of coils and folding over the insulation and wed driving.

(3) End connections inclusive of commutator if involved.

(3) Windings : Different types of windings used in AC/DC rotating machines and transformers.

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BOOKS RECOMMENDED FOR FURTHER READING

Text Book

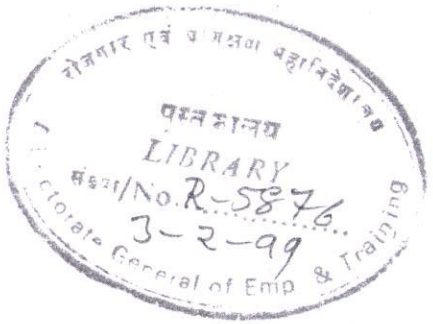
1. Electrician Trade Theory, Trade Practical and Assignment test books prepared by CIMI for 1st and 2nd year.

Engineering Drawing : 3rd Year

1. Revision of previous 2 year's work.
2. Advanced Blue print reading.
3. More advanced winding diagrams as per winding data.
4. Code of practice for General Engineering Drawing according to B.I.S. (I.S.I.) (IS : 696-1960).
5. Free hand sketching of actual parts of simple objects related to the trade.
6. Free hand sketching of electrical circuits and diagrams using standard symbols according to B.I.S. (ISI) (IS : 732-1958).
7. Drawing or sectional views of armatures, cores, switches, bearings, stators, transformers etc.

Social Studies

The syllabus has already been approved and is same for all the trades.



POPULAR POCKET-BOOK SERIES AND 10 + 2 SERIES

Fundamentals of Computers	R.C. Gupta
Computer Primer	R.C Gupta
Word Processing	R.C Gupta
Formulae & Definitions in Mathematics	C.Dass Chawla
Mathematics Guideline with Formulae & Definitions	R. Bhardwaj
Mathematics 2000 Series (2000 Solved Examples) *for classes—IX, X,XI, XII*	Vijay Kumar
Formulae & Definitions in Science	R.Bhardwaj
Formulae & Definitions in Chemistry (Simplified Chemistry)	R. Bhardwaj
Formulae & Definitions in Physics (Simplified Physics)	R. Bhardwaj
Formulae & Definitions in Biology	Kalra
Numerical Physics	R. Bhardwaj
Engineers' Pocket Data Book	Kapil Dev
Electrical Engineering Dictionary	C.R. Dargan
Electronics Dictionary (over 2000 terms defined)	A.K. Mittal
Physics Dictionary (over 2000 terms defined)	R. Bhardwaj
Chemistry Dictionary (over 2000 terms defined)	R. Bhardwaj

ENGINEERING BOOKS

Higher Engineering Mathematics	C. Dass Chawla
Engineering Mathematics *(for AMIE Latest Syllabus)*	C. Dass Chawla
A Text-book of Material Science	A. Kumar
Elements of Computer Science *(for AMIE Dip. St.)*	R. Gupta
Computer System and Data Analysis *(for AMIE Non-dip.)*	R.Gupta
Elements of Electronics and Instrumentation *(AMIE Dip. St.)*	R. Kumar
Fundamentals of Electronics and Instrumentation *(AMIE Non-dip.)*	R. Kumar
Material Science & Processes	A. Kumar
Electrical Engineering *"Pocket Refresher"*	R. Bhardwaj
Material Science *"Pocket Refresher"*	R. Bhardwaj
Mechanical Engineering Materials	R.C. Gupta
A Text-book of Refrigeration and Air Conditioning	K.J.Singh
Machine Drawing	Vijayvergiya
Steam Tables	R.C. Gupta
Workshop Technology 1000 Q-Ans.	Balbir Singh
Architectural Design	Moudgil
Civil Engineering Drawing	Malik & Meo
A Text-book of Draughtsman Civil (Theory & Practicals)	Malik & Meo
Electricians IMPs – Theory, Practical, Assignment/Test	CIMI
Electrical Engineering Drawing and Design	C.R.Dargan
Electrical Drawing & Estimating	C.R. Dargan
Electrical Installation Design & Drawing	C.R. Dargan
Electrical Engineering Theory	K. Mehta
Worked Examples in Electrical Engineering	S.K. Jain
Electrical Engineering 1000 Q-Ans.	K.Mehta
Radio, T.V. & Electronics Theory	A.K. Mittal
Electronics 1000 Q-Ans.	A.K. Mittal
Fitter Shop Theory	Kapil Dev
Fitter Shop 1000 Q-Ans.	Kapil Dev
Manual of Fitter Trade	D.G.E & T
Automobile Engineering 1000 Q & Ans.	Kapil Dev
Self-Employment and Entrepreneurship	C. Subhas
Engineering Drawing	B.G. Krishna, Kapil Dev
Training Methodology	S.S. Krishnan
Instructional Media for Eucation and Training	S.S. Krishnan
Motor Driving Manual and Road Safety in India	Dr C.S. Ahlawat

AP Asian publishers