



DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

**OPERATION AND MAINTENANCE OF ELECTRICAL
EQUIPMENT**

CURRICULUM DEVELOPMENT CENTRE

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

M - SCHEME

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 33062

Semester : VI Semester

Subject Title : **OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT**

TEACHING AND SCHEME OF EXAMINATION:

No. of weeks per Semester: 15 Weeks

Subject	Instruction		Examination			Duration
	Hours/Week	Hours/Semester	Internal Assessment	Board Examination	Total	
OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT	5	75	25	75	100	3 hrs

TOPICS AND ALLOCATION OF HOURS

Unit	Topic	Time (Hrs)
I	Earthing Arrangements, Safe Working Of Electrical Equipment, Building Electrical Installations	13
II	Operation & Maintenance Of Transformer	13
III	Operation & Maintenance Of Generators, Sub-Stations And Circuit Breakers	13
IV	Operation & Maintenance Ac Motors And Starters	12
V	Operation & Maintenance Of Lighting, Transmission And Distribution	12
	Revision And Tests	12
	Total	75

Rationale

- Electricity is generated in power station transmitted through transformer lines and Distributed through Distribution systems.
- The various activities concerning operation and maintenance of electrical equipments are dealt in this subject.

Objective

- Understand building electrical installation and electrical safety.
- Understand operation and maintenance of transformer.
- Understand operation and maintenance of Generators, substations and circuit breakers.
- Understand operation and maintenance of AC motors and Starters.
- Understand operation and maintenance of Lighting transmission and distributions.

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	<p>EARTHING ARRANGEMENTS, SAFE WORKING ON ELECTRICAL EQUIPMENT, BUILDING ELECTRICAL INSTALLATIONS:</p> <p>Earthing Arrangements- Points to be earthed, Earthing Procedure, Earth resistance measurement, Action to be taken to reduce earthing resistance, Earth Leakage Protection(ELCB)</p> <p>Safe Working on Electrical Equipment- Authorized Person, Procedure for Shutdown, and Testing device for Electricity, Special shutdown precautions in substations and Power House.</p> <p>Building Electrical Installations- Points to be inspected, Insulation Resistance Measurement Procedure, Points to be checked in switches and fuses, Points to be inspected in Potable equipment, Action to be taken if an electrical equipment catches fire, Different types of Fire extinguishers & its applications</p>	13
II	<p>OPERATION & MAINTENANCE OF TRANSFORMER</p> <p>Forces generated in transformer during short circuit - Noise in operation – Reason for temperature rise- -insulation resistance-Drying out- precaution for paralleling transformer-inrush current and remedy- insulation co-ordination-effect on insulation during star point earthing –transformer maintenance schedule – action to be taken while transformer oil, temperature rises unduly – points to be checked by oil level tends to fall down – attention required for bushing and insulator.</p>	13
III	<p>OPERATION & MAINTENANCE OF GENERATORS, SUB-STATIONS AND CIRCUIT BREAKER</p> <p>Generators- Parallel operation of Alternators, Real power and Reactive power adjustment between alternator running in parallel, AVR role, Causes for Alternator fails to buildup, Instability in Alternator, Cyclic speed irregularity, Protective & Indicative equipments for Alternator, Causes for overheating of armature &</p>	13

	<p>field winding of Alternators, Causes for circulating current between Alternators running in parallel, Causes for pitting of Alternator bearings, Reverse current protection & its necessity,</p> <p>Sub-stations and Circuit Breaker- Difference between Isolator & Circuit breaker, Rupturing capacity of Circuit breaker, Short-circuit calculations, Conditions can a circuit breaker arranged to trip, Auto reclose breaker, Fault clearance time, Inverse time overload relay, Procedure to ensure proper operation of Circuit breaker in the event of a fault, Maintenance requirement for Oil Circuit Breakers, Attention required for the contacts of Contactors, Maintenance requirement of SF6 Circuit breakers</p>	
IV	<p>OPERATION & MAINTENANCE AC MOTORS AND STARTERS</p> <p>Change the direction of Rotation, Role of Single phase preventer, Types of enclosures, Permissible overload, effect of ambient temperature, Insulation classification, Indicating & Protecting devices for Large Size Motors, If overload mechanism trips frequently what action to be taken, Control devices for motors, role of relays in motor, Points to be attended during periodical maintenance, Air gap measurement, Ball & Roller bearing usage, precautions in fitting bearings, bearing problems, Alignment of directly coupled motors, Static and Dynamic balancing of rotor, Causes of low insulation resistance, rectification of low insulation resistance problem, drying out of motors, Step to be taken if a motor is unduly hot, Vacuum impregnation, Selection of starters for High/Low starting torque applications.</p>	12
V	<p>OPERATION & MAINTENANCE OF LIGHTING, TRANSMISSION AND DISTRIBUTION</p> <p>LIGHTING Glare reduction, Stroboscopic Effect and methods to reduce, Steps in Designing Lighting Installation, Troubleshooting in Fluorescent Lamp and Discharge Lighting, Street Light Control methods, Fluorescent Lamp Disposal, precautions in Erecting Lighting Installations. Symptoms to identify the end of the useful life of Lamp, Causes for lowering of Illumination level</p> <p>Transmission and Distribution permissible limit for variation of voltage/frequency as per IS Standard, Factor of Safety, Safety devices for overhead Transmission lines, Minimum clearance of between conductors & building, Advantages & Limitations of Steel Cored Aluminium</p>	12

	Conductors (ACSR), Purpose of continuous earth wire, Points to be checked when carrying out inspection in overhead transmission line, Prevent rusting of Steel post, Protection requirements for Transmission line, Insulation level & Co-ordination, Precautions in erecting UG Cable, Causes for failure of UG Cable, Cable fault locations, Fall of potential method, Murray loop test method, Locating cable discontinuity.	
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Text Book

Sl.No	Name of the Book	Author	Publisher	Edition
1	Operation and Maintenance of Electrical Equipment – Volume I & II	B.V.S.Rao	Media Promoters & Publishers Private Limited, Mumbai	1 st Edition, 1 st Reprint 2011

Reference Book

Sl.No	Name of the Book	Author	Publisher	Edition
1	Testing, Commissioning, Operation and Maintenance of Electrical Equipments	S.Rao	Khanna Publishers, New Delhi	Sixth Edition, 2010