SWITCH GEAR AND PROTECTIVE DEVICES (Th. 02)

Date of Commencement of classes: 02.01.2024 **Date of Closing of classes: 23.04.2024**

TOPIC-WISE DISTRIBUTION OF PERIODS

Sl. No.	Name of the Chapter	Periods as per Syllabus	Required period	Expected Marks
01	Introduction to switchgear	06	07	10
02	Fault calculation	10	09	15
03	Fuses	06	06	10
04	Circuit breakers	10	14	15
05	Protective relays	08	08	15
06	Protection of electrical power equipment and lines	06	10	15
07	Protection against over voltage and lighting	08	06	10
08	Static relay	06	04	10
TOTAL		**60**	**64**	**100**

Lesson Plan By -MADHUBRATA DASH

LESSON PLAN

Class day	Art. No.	Theory Topics
1st	1.0	**Chapter No.- 01 (INTRODUCTION TO SWITCHGEAR)** Introduction
2nd	1.1	Essential Features of switch gear
3rd	1.2 1.3	Switchgear Equipment. Bus-Bar Arrangement.
4th	1.3	Bus-Bar Arrangement.
5th	1.4	Switchgear Accommodation.
1st	1.5	Short Circuit
2nd	1.6	Faults in a power system.
3rd	2.1 2.2	**Chapter No.-02 (FAULT CALCULATION)** Symmetrical faults on 3-phase system. Limitation of fault current.
4th	2.3 2.4	Percentage Reactance. Percentage Reactance and Base KVA.
5th	2.5 2.6	Short – circuit KVA Reactor control of short circuit currents.
6th	**2.7**	Location of reactors.
7th	2.8	Steps for symmetrical Fault calculations.
1st	2.9	Solve numerical problems on symmetrical fault.
2nd		Problem1
3rd		Problem2
1st		Problem3
2nd	3.1 3.2	**Chapter No.-03 (FUSES)** Desirable characteristics of fuse element. Fuse Element materials.
1st	3.3	Types of Fuses and important terms used for fuses
2nd	3.4	Low voltage fuses.
3rd		High voltage fuses
4th		Continue.
5th	3.5 3.6	Current carrying capacity of fuse element. Difference Between a Fuse and Circuit Breaker
6th	4.1	**Chapter No.-04 (CIRCUIT BREAKERS)** Definition and principle of Circuit Breaker.
1st	4.2	Arc phenomenon and principle of Arc Extinction.
	4.3	Methods of Arc Extinction.
2nd	4.4	Definitions of Arc voltage, Re-striking voltage and Recovery voltage.
3rd	4.5	Classification of circuit Breakers.

	4.6	Oil circuit Breaker and its classification.
4th	4.7	Plain brake oil circuit breaker.
5th	4.8	Arc control oil circuit breaker
1st	4.9	Low oil circuit breaker
2nd	4.10	Maintenance of oil circuit breaker.
3rd	4.11	Air-Blast circuit breaker and its classification.
4th	4.12	Sulphur Hexa-fluoride (SF6) circuit breaker
5th	4.13	Vacuum circuit breakers.
1st	4.14 4.15	Switchgear component. Problems of circuit interruption.
2nd	4.16	Resistance switching.
3rd	4.17	Circuit Breaker Rating.
4th	5.1 5.2	**Chapter No.-05 (PROTECTIVE RELAYS)** Definition of Protective Relay. Fundamental requirement of protective relay
5th	5.3	Basic Relay operation Electromagnetic Attraction Type Induction Type
6th	5.4	Definition of following important terms Pick-up current. Current setting
7th	5.5	Definition of following important terms. Plug setting Multiplier. Time setting Multiplier
1st	5.6	Classification of functional relays
	5.7	Induction type over current relay (non-directional)
2nd	5.8	Induction type directional power relay.
	5.9	Induction type directional over current relay.
3rd	5.10	Differential relay
		5.10.1. Current differential relay
		5.10.2. Voltage balance differential relay.
4th	5.11	Types of protection

5th	6.1	**Chapter No.-06 (PROTECTION OF ELECTRICAL POWER EQUIPMENT AND LINES)** Protection of alternator.
6th	6.2	Differential protection of alternators
1st	6.3	Balanced earth fault protection.
2nd	6.4	Protection systems for transformer.
3rd	6.5	Buchholz relay
4th	6.6	Protection of Bus bar.
	6.7	Protection of Transmission line.
5th	6.8	Different pilot wire protection (Merz-price voltage Balance system)
1st		Continue.
2nd	6.9	Explain protection of feeder by over current
3rd		and earth fault relay.
4th	7.1	**Chapter No.-07 (PROTECTION AGAINST OVER VOLTAGE AND LIGHTING)** Voltage surge and causes of over voltage.
	7.2	Internal cause of over voltage.
	7.3	External cause of over voltage (lighting)
5th	7.4	Mechanism of lightning discharge.
	7.5.	Types of lightning strokes.
1st	7.6	Harmful effect of lightning.
	7.7	Lightning arresters and Type of lightning Arresters.
2nd		7.7.1. Rod-gap lightning arrester
3rd		7.7.2. Horn-gap arrester.
		7.7.3. Valve type arrester.
4th	7.8	Surge Absorber
5th	8. 1	**Chapter No.-08 (STATIC RELAY)** Advantage of static relay.
6th		Cont.
1st	8. 2	Instantaneous over current relay.

2nd	8. 3	Principle of IDMT relay.
1st	Chapter1	Revision & Practice
2nd	Chapter2	Revision & practice of Numerical problems
3rd		Revision & practice of Numerical problems
1st	Chapter3,4	Revision & Practice
2nd	Chapter5	Revision & Practice
3rd	Chapter6	Revision & Practice
4th	Chapter7	Revision & Practice
5th	Chapter8	Revision & Practice
6th		Previous Year Question Answer Discussion
7th		Previous Year Question Answer Discussion

Learning Resources:

Sl. No.	Name of the Book	Author Name	Publisher
01	Principle of power system	V. K. Mehta	S Chand
02	Protection and Swwitchgear	Bhavesh Bhalja R.P Maheshwari Nilesh G. Chothani	OXFORD
03	Electrical power	Soni, Gupta and Bhatnagar	Dhanpat Rai & Sons
04	Power system protection & switch gear	Bhuvanesh Oza	TMH
05	Electrical Power	S. L. Uppal	Khanna Publisher
06	Protection and Switchgear	Raghuraman	SCITECH