

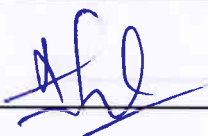

Dicipline: EE	Semester: 6th	Name of the Teaching Faculty: Divya Das.	
Subject: Switch Gear & Protective Devices.	No of Days/Week Class Allotted: 5	Semester From date: 13.9.23 To date: 23.5.23	No. of Weeks: 13

WEEK	Class Day	Theory Topics
	1st	Introduction to Switchgear, Faults, Short Circuit, Fuse, Circuit Breaker, Relay & Essential Features.
	2nd	Concept of Switchgear Equipment: Air Break Switch, Isolator, Oil switches Etc. Concept of fuse, CB & Relay.
	3rd	Concept of Bus Bar Arrangement :- Single Busbar System, Single Bus Bar System with Sectionalization
	4th	Duplicate Bus Bar System, Advantages and Disadvantages Switchgear Accommodation, Indoor Type & Outdoor Type.
	5th	Concept of Short Circuit and Over Voltage, Effect of Short Circuit, Need of Short Circuit Current Calculation.
	1st	Different types of faults in a power system such as symmetrical fault L-L-L, unsymmetrical fault L-L, L-L-G, L-G
	2nd	Concept of symmetrical faults on 3-phase system, short circuit current, L-L-L fault limitation of fault current
	3rd	concept of % reactance - Definition, %X expression Derivation, Isc Expression Derivation.
	4th	Percentage Reactance and Base KVA Derivation Definition and Problems Solved.
	5th	Concept of Short circuit KVA - Definition, Expression of short circuit KVA of 3 phase short circuit in terms of Base KVA
	1st	Definition of Reactor, Advantages of Reactors, Location of Reactors (Ring System, Tie-Bar System)
	2nd	Steps for symmetrical fault calculations. (Short circuit current & Short circuit KVA)
	3rd	Problems Discussion on Symmetrical fault calculation (find the short circuit current & Short circuit KVA)
	4th	Problem Discussion on Symmetrical fault calculation (find the external reactance)
	5th	find the short circuit KVA at Load End of Transmission line and at the high voltage terminals of the transformer.

WEEK	Class Day	Theory Topics
	1st	Revision and Problems Solved.
	2nd	Definition of fuse, Working of fuse in Normal & Abnormal Condition, Advantage & Disadvantages of fuse & Desirable Characteristics of fuse Element.
	3rd	Important terms used for fuses:- Current Rating, fusing current, fusing factor, prospective current, cut-off current, pre-arcing time, arcing time etc.
	4th	Total opening time, Breaking Capacity. Concept of fuse Element Materials: Like-Silver, Cu, lead, Tin & Zinc.
	5th	Concept of low voltage fuses (semi enclosed, Rewirable, HRC cartridge fuse with Advantages & Disadvantages).
	1st	Concept of high voltage fuses like Cartridge fuse. Liquid type, Metal Clad type with Advantages & Disadvantages.
	2nd	Current Carrying Capacity of fuse Element and Difference bet ⁿ a fuse and Circuit Breaker.
	3rd	Definition and principle of Circuit Breaker, operating at Normal & Abnormal Condition. Arc phenomenon. & principle of Arc Extinction.
	4th	Methods of Arc Extinction with High Resistance Method and Low Resistance Method.
	5th	Important terms Like - Arc voltage, Restriking Voltage and Recovery Voltage.
	1st	Classification of CB:- Oil CB, Air Blast CB, SF6 CB, Vacuum CB, Concept of Oil Circuit Breaker & its Classification.
	2nd	Concept of plain Breaker oil Circuit Breaker.
	3rd	Concept of Arc Control oil circuit Breaker - Self Blast CB and forced Blast CB & its working principle at Normal & Abnormal Condition.
	4th	Low oil circuit Breaker & Maintenance of Oil CB.
	5th	Concept of Air Blast circuit Breaker and its Classification.

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WEEK	Class Day	Theory Topics		
	1st	Concept of SF6 Circuit Breaker.		
	2nd	Concept of Vacuum Circuit Breaker.		
	3rd	Switchgear Components:- Brushings, Circuit Breaker Contacts, Insulation Transformer Bushing & Conductors.		
	4th	Concept of Resistance Switching, Concept of Circuit Breaker Rating.		
	5th	Revision & Discussion.		
	1st	Protective Relay:- Definition, Relay Circuit Components & fundamental Requirement of Protective Relay.		
	2nd	Basic Relay operation of Electromagnetic Attraction type and with Attracted Armature Type.		
	3rd	Basic Relay operation of Electromagnetic Attraction type with Balanced Beam type.		
	4th	Basic Relay operation of Induction Type. Such as Shaded Pole Structure.		
	5th	Basic Relay operation of Induction Type such as Watt hour Meter structure, Induction Cap structure.		
	1st	Important terms:- Pickup current, Current Setting, Plug Setting Multiplier, Time Setting Multiplier		
	2nd	Concept of Time PSM Curve, Calculation of Relay operating time with problems discussion.		
	3rd	Induction type over current Relay (Non-Directional Type)		
	4th	Induction type over current Relay (Directional type)		
	5th	Induction type Directional Power Relay.		

WEEK	Class Day	Theory Topics
	1st	Concept of Current Differential Relay.
	2nd	Concept of Voltage of Differential Relay.
	3rd	Primary Protection & Backup Protection Concept.
	4th	Discussion & Distribution of Evaluated Answers Introduction of Different faults in Alternator.
	5th	Menz Price Circulating Current Scheme Concept for Differential Protection of Alternator.
	1st	Concept of Balanced Earth Fault Protection of Alternator.
	2nd	Introduction about different Protection Scheme of Transformer.
	3rd	Concept of Busbar Protection and Transmission Line Protection
	4th	Different pilot wire protection (Menz Price Voltage Balance System)
	5th	Protection of feeder by over current and Earth fault Relay.
	1st	Concept of Voltage Surge, causes of over Voltage and Transient Voltage.
	2nd	Internal Cause of over voltage such as Switching Surges, Insulation failure, Arching Ground & Resonance.
	3rd	External Cause of over voltage such as lightning.
	4th	Mechanism of lightning discharge, Concept of Leader streamer, Return Streamer.
	5th	Different types of lightning strokes, Harmful effects of lightning, Protection Against lightning.

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WEEK	Class Day	Theory Topics			
	1st	Concept of Lightning Arrestors - Like Rod Gap Lightning Arrestor and Horn Gap Lightning Arrestor			
	2nd	Surge Absorber Concept. & Revision & Discussion.			
	3rd	Concept of Static Relay & it's advantages.			
	4th	Concept of Instantaneous Over Current Relay. & it's working Principle.			
	5th	Working Principle of IDMT Relay.			
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WEEK	Class Day	Theory Topics
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	4th	
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