

# **SWITCHGEAR AND PROTECTION**

## **UNIT-I:**

### **Circuit Breakers**

Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restrike Voltage and Recovery voltages– Restrike phenomenon– Average and Max. RRRV– Current chopping and Resistance switching– Introduction to oil circuit breakers– Description and operation of Air Blast– Vacuum and SF6 circuit breakers– CB ratings and specifications– Auto reclosing.

## **UNIT-II:**

### **Electromagnetic Protection**

Principle of operation and construction of attracted armature– Balanced beam– induction disc and induction cup relays– Relays classification– Instantaneous– DMT and IDMT types– Applications of relays: Over current/under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays: Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.

## **UNIT-III:**

### **Generator Protection**

Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples.

### **Transformer Protection**

Protection of transformers: Percentage differential protection– Design of CT's ratio– Buchholz relay protection– Numerical examples.

## **UNIT-IV:**

### **Feeder and Bus bar Protection**

Protection of lines: Over current– Carrier current and three zone distance relay using impedance relays– Translay relay– Protection of bus bars– Differential protection.

## **UNIT-V:**

### **Static and Digital Relays**

Static relays: Static relay components– Static over current relay– Static distance relay– Micro processor based digital relays.

## **UNIT-VI:**

### **Protection against over voltage and grounding**

Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc–Oxide lightning arresters– Insulation coordination– BIL– impulse ratio– Standard impulse test wave– volt~time characteristics– Grounded and ungrounded neutral systems– Effects of ungrounded neutral on system performance– Methods of neutral grounding: Solid– resistance– Reactance– Arcing grounds and grounding Practices.