

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(Autonomous Institution – UGC, Govt. of India)**  
**UG Model question paper – I**

**SWITCHGEAR & PROTECTION**  
**III YEAR I SEMESER**  
**EEE- MODEL PAPER-1**

**Time: 3 hours**

**Max Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**5\*14=70M**

**SECTION-I**

1. With a neat diagram, discuss the constructional details and operational features of a typical minimum oil circuit breaker. Also state its advantages and disadvantages over others. (14M)

**(OR)**

2. Derive an expression for Restriking voltage and rate of rise of restriking voltage in terms of system Voltage, inductance up to the fault location and bushings to earth capacitance of the circuit breaker (14M)

**SECTION-II**

3. Describe the construction and principle of operation of an induction type directional over current relay. Also explain its operational characteristics. (14M)

**(OR)**

4. Describe the operating principle, constructional features and area of applications of static relay. What are the merits and demerits of static relays over electromagnetic relays? (14M)

**SECTION-III**

5. Describe the construction and working of Buchholz relay (14M)

**(OR)**

6. (a) What are the causes of over speed and how alternators are protected from it? (6M)

(b) A star connected 3-phase, 20MVA, 11KV Alternator has a per phase reactance of 0.75 ohms/phase. It is protected by Merz price circulating current principle which is to operate for fault currents not less than 175A. Calculate the value of earthing resistance to be provided in order to ensure only 10% of the alternator winding remains unprotected. (8M)

**SECTION-IV**

7. Describe the differential pilot wire method of protection of feeder. (14M)

**(OR)**

8. Explain Mho relay characteristics on R-X diagram. Discuss the range settings of various distance relays placed on a particular location (14M)

**SECTION-V**

9. Explain the following (14M)

- i) Value type arrester
- ii) Rod Gap Arrester
- iii) Expulsion type arrester

**(OR)**

10. Describe the concepts and methods of overvoltage protection of power systems. (14M)

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**UG Model question paper – II**

**SWITCHGEAR & PROTECTION**  
**III YEAR I SEMESER**  
**EEE- MODEL PAPER-II**

**Time: 3 hours**

**Max Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**5\*14=70M**

**SECTION-I**

1. With a neat diagram, discuss the constructional details and operational features of a typical SF6 circuit breaker. Also state its advantages and disadvantages over others. (14M)

**(OR)**

2. Explain in detail about the arc interruption theories (14M)

**SECTION-II**

3. Describe the construction and principle of operation of a DMT & IDMT relay. Also explain its operational characteristics. (14M)

**(OR)**

4. Describe the operating principle, constructional features and area of applications of distance relay. What are the merits and demerits of static relays over electromagnetic relays? (14M)

**SECTION-III**

5. Describe the construction and working of Buchholz relay (14M)

**(OR)**

6. (a) Draw and explain the merz-price protection of alternator stator winding. (6M)  
(b) A generator is protected by restricted earth fault protection. The generator ratings are 13.2kv, 10MVA. The percentage of winding protected against phase to ground fault is 85%. The relay setting is such that it trips for 20% out of balance calculate the resistance to be added in the neutral to ground connection (8M)

**SECTION-IV**

7. With a neat sketch, explain the operation of carrier current protection scheme. (14M)

**(OR)**

8. Determine the inductance of Peterson coil to be connected between the neutral and ground to neutralize the charging current of overhead line having the line to ground capacitive of  $0.15\mu\text{f}$ . If the supply frequency is 50Hz and the operating voltage is 132 KV, find the KVA rating of the coil. (14M)

**SECTION-V**

9. a) What are the causes of over voltage on a power system? (6M)  
b) Why is it necessary to protect the lines and other equipment of the power system against over voltages? (8M)

**(OR)**

10. Write short notes on the following. (14M)
- i) klydonograph and magnetic link
  - ii) Rod gap
  - iii) Arcing horns
  - iv) Basic impulse insulation level

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**UG Model question paper – III**

**SWITCHGEAR & PROTECTION**  
**III YEAR I SEMESER**  
**EEE- MODEL PAPER-III**

**Time: 3 hours**

**Max Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**5\*14=70M**

**SECTION-I**

1. With a neat diagram, discuss the constructional details and operational features of a typical Vacuum circuit breaker. Also state its advantages and disadvantages over others. (14M)

**(OR)**

2. Discuss the problem associated with the interruption of (14M)
- i) Low inductive current
  - ii) Capacitive current and
  - iii) Fault current if the fault is very near the substation.

**SECTION-II**

3. Explain with sketches and their R-X diagrams for the following distance relays. (14M)
- i) Impedance relay
  - ii) Mho relay
  - iii) Reactance relay

**(OR)**

4. a) Explain the applications of microprocessors in power system protection. (7M)
- b) Explain microprocessor based inverse time over current relay. (7M)

**SECTION-III**

5. Describe the construction and working of Buchholz relay (14M)

**(OR)**

6. (a) Draw and explain the merz-price protection of alternator stator winding. (6M)
- (b) A generator is protected by restricted earth fault protection. The generator ratings are

13.2kV, 10MVA. The percentage of winding protected against phase to ground fault is 85%. The relay setting is such that it trips for 20% out of balance calculate the resistance to be added in the neutral to ground connection (8M)

#### SECTION-IV

7. With a neat sketch, explain the operation of carrier current protection scheme. (14M)

(OR)

8. Determine the inductance of Peterson coil to be connected between the neutral and ground to neutralize the charging current of overhead line having the line to ground capacitive of  $0.15\mu\text{f}$ . If the supply frequency is 50Hz and the operating voltage is 132 KV, find the KVA rating of the coil. (14M)

#### SECTION-V

9. a) What are the causes of over voltage on a power system? (6M)

b) Why is it necessary to protect the lines and other equipment of the power system against the over voltages? (8M)

(OR)

10. Write short notes on the following. (14M)

- i) klydonograph and magnetic link
- ii) Rod gap
- iii) Arcing horns
- iv) Basic impulse insulation level

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**UG Model question paper – IV**

**SWITCHGEAR & PROTECTION**  
**III YEAR I SEMESER**  
**EEE- MODEL PAPER-IV**

**Time: 3 hours**

**Max Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

**5\*14=70M**

**SECTION-I**

1. With a neat diagram, discuss the constructional details and operational features of a typical SF6 circuit breaker. Also state its advantages and disadvantages over others. (14M)

**(OR)**

2. Explain terms:

- i) Restriking voltage (2M)
- ii) Recovery voltage (2M)
- iii) RRRV (2M)
- iv) Derive expressions for restriking voltage and RRRV (4M)
- v) What measures are taken to reduce them? (4M)

**SECTION-II**

3. Explain with sketches and their R-X diagrams for the following distance relays. (14M)
- i) Impedance relay
  - ii) Mho relay
  - iii) Reactance relay

**(OR)**

4. a) Explain the operation of under voltage and over voltage relay. (7M)
- b) Explain microprocessor based inverse time over current relay. (7M)

**SECTION-III**

5. Describe the construction and working of Buchholz relay with suitable sketches (14M)

**(OR)**

6. (a) Draw and explain the merz-price protection of alternator stator winding. (6M)  
(b) Draw and explain the Translay scheme of protection (8M)

**SECTION-IV**

7. With a neat sketch, explain the operation of Frame Leakage protection scheme. (14M)

**(OR)**

8. Classify Grounding. Explain the various methods of grounding in power system with suitable sketches (14M)

**SECTION-V**

9. a) Describe the phenomenon of lightning (6M)  
1. b) Describe the construction and principle of operation of  
(i) expulsion type lightning arrester  
(ii) Valve type lightning arrester (8M)

**(OR)**

10. Write short notes on the following. (14M)
- i) Magnetic link
  - ii) Rod gap
  - iii) Arcing horns
  - iv) Basic impulse insulation level
  - v) Insulation Co-ordination



## SWITCH GEAR PROTECTION (SGP) QUESTION BANK

- 1 a) Give the classification of different circuit breakers used and their features and mention its advantages  
b) Explain the operation of a sulphur hexafluoride (SF<sub>6</sub>) circuit breaker
- 2 a) Explain terms: restriking voltage, recovery voltage and RRRV  
b) Derive expression for restriking voltage and RRRV in terms of the system voltage, inductance and capacitance
- 3 a) What is meant by 'directional feature' of a directional overcurrent relay?  
b) Describe the construction, principle of operation and application of directional overcurrent relay
- 4 What is Distance relay? Explain the operation of impedance relay with its characteristics.
- 5 a) Explain the protection of generators against stator faults  
b) Explain the protection of generators against rotor faults
- 6 With neat sketch explain the operation of Bucholtz relay used for protection of transformer.
- 7 a) Explain various schemes of protection of feeders  
b) Explain the protection of bus bars
- 8 a) What are the causes of over voltage in a transmission line and explain?  
b) Describe the mechanism of lightning discharge

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- 1 Explain the construction and working of a SF6 circuit breaker with a neat diagram.
  - 2 (a) Discuss the rate of rise of restriking voltage and explain its importance in arc extinction.  
b) Explain the concept of current chopping
  - 3 (a) Explain the characteristics of distance relays.  
b) Explain the importance of under voltage/ over voltage relays with an example for each.
  - 4 Discuss the construction and operation of directional over current relay. Also state its merits and demerits.
  - 5 Describe the construction and working of a relay in order to protect the transformer from internal faults.
  - 6 (a) Draw and explain the merz-price protection of alternator stator winding.  
(b) Draw and explain the Translay scheme of protection
  - 7 Describe the differential pilot wire method of protection of feeder.
  - 8 Explain the following
    - i) Valve type
    - ii) Zinc-Oxide Lighting Arresters
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- 1 Classify the different Protective relays and briefly explain their features.
- 2 Discuss the various Protection Schemes available to protect against lightning in transmission systems in detail.
- 3 Derive expression for restriking voltage and RRRV from the fundamentals.
- 4 Explain the Following in detail.
  - (i) Current Chopping
  - (ii) Resistance Switching
- 5 Explain the Principle of operation and Construction of
  - (i) Attracted Armature type Relay
  - (ii) Solenoid type Relay
  - (iii) Balanced Beam type Relay.
- 6 Classify and briefly Explain the Electromagnetic Induction type Relays with neat diagrams.
- 7 Explain Buchholtz relay Protection with neat diagram
- 8 Explain Merz-Price voltage balance system and Carrier current protection for

Feeder Protection.

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