

## Power Systems Protection

### Unit 1

1. Explain in short different plants associated with thermal power plant.
2. Explain in short different parts associated with a typical hydro power plant.
3. State advantages of hydro power plant over thermal power plant.
4. State disadvantages of thermal power plant.
5. S.N.: Pumped storage plant
6. Explain with diagram the significance of 'Surge Tank' in a typical hydro power plant.
7. Elaborate advantages of interconnected power plants.
8. State the necessary requirements of line supports used in overhead system.
9. Explain in short different types of poles.
10. S.N.: Sag in overhead T.L.
11. State the necessary requirements of insulators used in overhead system.
12. Explain in short different types of materials mainly used as insulators.
13. State types of line insulators. Explain any one in detail.
14. S.N.: Pin type insulator
15. S.N.: Suspension type insulator
16. Define: Connected load, maximum demand, demand factor, load factor, load curve, load duration curve, etc.
17. Numericals based on Q. No. 16
18. Explain what information can be obtained from load curve.
19. Explain what information can be obtained from load duration curve.
20. Define all types of powers in A.C. system. State its unit and formulae.
21. Explain significance of reactive power in power system.
22. Why ACSR conductors are preferred in power systems?

### Unit 2

1. Explain need of transposition of conductors.
2. What is the impedance diagram? What are the assumptions made while drawing it?
3. What is a single line diagram? Draw a single line diagram of basic power system and explain it.
4. Write the formula to calculate inductance of composite conductor and explain terms GMR and GMD from it.
5. Derive formula to calculate inductance of a three-phase line with conductors spaced equilaterally.
6. What is skin effect? What are the factors causing skin effect?
7. Explain proximity effect.
8. Write down formulae to calculate capacitance of three phase lines with equilateral spacing and unsymmetrical spacing.
9. Explain how transmission lines are classified.
10. Derive formulae to calculate A, B, C, D parameters for short T.L.
11. Derive formulae to calculate A, B, C, D parameters for nominal T connected medium T.L.
12. Derive formulae to calculate A, B, C, D parameters for nominal  $\pi$  connected medium T.L.
13. Derive formulae to calculate A, B, C, D parameters for long T.L.

14. Draw basic circuits of nominal  $\pi$  and nominal T connections, indicating all values on it.
15. A three phase transmission line has conductors having diameter 2.2 cm each, conductors being spaced at 12 cm, 15 cm and 10 cm from one another. The loads are balanced and lines are fully transposed. Calculate inductance of line per phase per km.

### Unit 3

1. Write a note on “Surge Impedance Loading.”
2. Explain Ferranti effect with phasor diagram.
3. Explain Ferranti effect mathematically for nominal pi network.
4. Explain in detail “Tuned Power Lines.”
5. Write down equations for receiving end side real power ( $P_R$ ) and reactive power ( $Q_R$ ) in the transmission line. Also list out conclusions from these equations.
6. Explain step by step procedure to form a Bus Admittance Matrix for a 4-bus system.
7. What is a Bus Admittance Matrix. Write down properties of the same.
8. What is Corona? Explain factors responsible for Corona loss.
9. What is Corona? Explain methods to reduce Corona loss.
10. What is meant by power system stability? Give its classification.
11. What is meant by power system stability? Explain voltage stability.
12. What is meant by power system stability? Explain rotor angle stability.

### Unit 4

1. Explain “Transient phenomena” in the current and indicate its different states on the waveform.
2. State the harmful effects of the faults and measures to minimize the faults.
3. What is protection zone in the power systems? Explain with diagram.
4. Explain primary and secondary protection zones.
5. Explain different types of backup protections.
6. Explain any five desirable qualities of protection relays.
7. With neat circuit diagram explain basic trip circuit of protection.
8. Explain basic operation principle of electromagnetic relays.
9. With neat diagram explain working of balanced beam relay.
10. With neat diagram explain working of plunger type relay.
11. With neat diagram explain working of induction disc relay.
12. With neat diagram explain working of induction cup relay.
13. With neat diagram explain working of Watthour meter type induction relay.
14. With neat, labelled diagram of directional overcurrent relay.
15. With neat diagram explain basic differential relay.
16. With neat diagram explain percent biased differential relay.
17. With neat diagram explain working of basic distance relay.

### Unit 5

1. What are different techniques adopted for arc extinction? Explain any one in detail.
2. Explain process of lengthening the arc in current interruption process.
3. With diagram explain the operation of resistance switching.
4. Draw a neat diagram of air break circuit breaker.
5. Explain resistance switching in air blast circuit breaker.

6. Draw a neat, labelled diagram of arc extinction chamber in air blast circuit breaker.
7. State advantages and disadvantages of minimum oil circuit breakers.
8. State chemical and dielectric properties of SF<sub>6</sub>.
9. State advantages and disadvantages of SF<sub>6</sub> circuit breaker.
10. Explain construction and working of vacuum circuit breakers.
11. State merits and demerits of vacuum circuit breakers.
12. Write short note on “current chopping”.
13. Explain static relays with the help of block diagram.
14. Compare static and electromagnetic relays.
15. State advantages and disadvantages of static relays.
16. Write a short note on numerical relays.

## Unit 6

1. Explain any three possible faults in transformers.
2. Explain points to be considered while using differential protection in transformer circuits.
3. Draw a neat diagram of Merz – Price protection for a three phase delta – star transformer.
4. Write a short note on “Buchholz Relay.”
5. Write advantages and disadvantages of Buchholz relay.
6. Explain possible stator faults in the alternator circuit.
7. Explain possible abnormal running conditions in the alternator circuit.
8. Explain with diagram Merz – Price protection for stator of alternator.

\*\* with all types of numerical similar to covered in class, based on above topics.