

## QUESTION BANK

### PPAS

#### SHORT QUESTIONS

1. Define the term pick up value in a protective relay.
2. Identify the different types of faults occurring in power system?
3. Explain surge absorber? Differentiate it from surge diverter?
4. Summarize the role of protective relay in a modern power system.
5. What is Reach, under reach and over reach of relay?
6. What are the essential qualities of relay?
7. Classify the different types of earthing.
8. What is mean by unit protection and non unit protection? Give examples.
9. Differentiate between a short circuit and an overload.
10. Justify the importance of sequence components in fault analysis

#### LONG QUESTIONS

1. Explain the essential qualities of relay in detail.
2. Explain the overlapping of protective zones with neat sketch. 3.  
Explain in detail about primary and backup protection and its types?
4. Discuss the symmetrical components method to analyze an unbalanced system.
5. In a 3-phase 4 wire system, the current in R, Y and B under abnormal condition of loading are as under  $I_R = 100 \angle 30^\circ$  A,  $I_Y = 50 \angle 300^\circ$  A,  $I_B = 30 \angle 180^\circ$  A. Calculate the positive, negative and zero-sequence currents in R line and return current in the neutral wire.
6. (a) What are the causes of over voltage on a power system? (b) Why is it necessary to protect the lines and other equipment of the power system against over voltages?
7. Describe the phenomenon of lightning.
8. What protective measures are taken against lightning over voltages?
9. (a) What is tower-footing resistance? (b) Why is it required to have this resistance as low as economically possible? (c) What are the methods to reduce this resistance?

10. (a) What is necessity of protecting electrical equipment against traveling waves?  
 (b) Describe in brief the protective devices used for protection of equipment against such waves?
11. Describe the protection of stations and sub-stations against direct lightning stroke.
12. Describe the construction and principle of operation of (i) expulsion type lightning arrester, (ii) Valve type lightning arrester.
13. What is Peterson coil? What protective functions are performed by this device?
14. Write short notes on the following. (i) klydonograph and magnetic link (ii) Rod gap (iii) Arcing horns (iv) Basic impulse insulation level.
15. What are the requirements of a ground wire for protecting power conductors against direct lightning stroke? Explain how they are achieved in practice.
- (i) Explain different types of earthing the neutral point of the power system.  
 (ii) With a neat diagram, explain the operating principle of Peterson coil.
16. 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.

### **SHORT QUESTIONS**

1. What are the different types of electromagnetic relays?
2. Define time setting multiplier and plug setting multiplier in protective relays.
3. In what way a distance relay is superior than over current protection for protection of transmission line? Justify.
4. Explain directional relay.
5. Give the function of under frequency relay.
6. Write the universal torque equation.
7. Discuss the merits of Mho relay.
8. What is a differential relay?
9. What is meant by directional relay?

### **LONG QUESTIONS**

1. What are the different types of electromagnetic relays? Discuss their field of applications.
2. What are the various types of over current relays? Discuss their area of application.

3. Describe the operating principle, constructional features and area of applications of reverse power or directional relay.
4. Describe the construction and principle of operation of an induction type directional over current relay.
5. Explain the working principle of distance relays.
6. Write a detailed note on differential relays.
7. Discuss the construction and principle of operation of non-directional induction-disc relay.
8. Explain with sketches and their R-X diagrams for the following distance relays. (i) Impedance relay (ii) Mho relay (iii) Reactance relay.
9. (a) Explain the applications of microprocessors in power system protection. (b) Explain microprocessor based inverse time over current relay.
10. Describe the principle of (i) Negative Sequence Relay. (ii) Under Frequency relay.

### **SHORT QUESTION**

1. What are mechanical abnormal conditions of induction motor?
2. What is transverse differential protection?
3. What is loss of excitation and loss of prime mover in generator?
4. What are rotor faults?
5. Why is bus bar protection needed?
6. What is a harmonic restraint relay? Explain its purpose.
7. What is an incipient relay? How is the transformer protected?
8. What are the different types of faults in transformer?
9. What is a restricted earth fault relay?
10. Discuss the protection schemes for transmission lines.
11. Show the duality between amplitude and phase comparators.
12. Define amplitude comparator and phase comparator.
13. Define the over current protection.
14. Define the definite time over-current relay.
15. Define the Instantaneous OC relay.

## LONG QUESTION

1. Enumerate the relaying schemes which are employed for the protection of a modern alternator.
2. (a) What is transverse or split phase protection of an alternator? (b) What type of fault is this scheme of protection employed? (c) With a neat sketch discuss the working principle of this scheme.
3. What type of a protective device is used for the protection of an alternator against overheating of its (i) stator (ii) rotor? Discuss them in brief.
4. What type of a protective scheme is employed for the protection of the field winding of the alternator against ground faults?
5. Discuss the protection employed against loss of excitation of an alternator.
6. (a) What do you understand by field suppression of an alternator? (b) How is it achieved?
7. Briefly discuss the protection of an alternator against. (i) Vibration of distortion of motor (ii) Bearing overheating (iii) Auxiliary failure (iv) Voltage regulator failure
8. What type of pilot protection is used for EHV and UHV transmission lines.
9. (a) What is carrier protection? (b) For what voltage range is it used for the protection of transmission line?(c) What are its merits and demerits?
10. (a) What is carrier aided distance protection. (b) What are its different types? (c) Discuss the permissive under-reach transfer tripping scheme of protection.
11. (a) Draw and explain the merz-price protection of alternator stator winding.  
(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.
12. Classify different protection schemes normally used for protection of a power transformer from internal faults? Discuss one of them in brief.
13. Compare CT & PT. What are the applications of CT & PT?
14. i) Explain the Merz-price circulation current scheme of protection used for power transformer.  
ii) A three phase transformer of 220/11000 line volts is connected in star/delta. The protective transformers on 220V side have a current ratio of 600/5 . Calculate the current transformer ratio on 11000V side.
15. i) Describe the construction and working of Buchholz relay.  
ii) Show the protective scheme employed for the bus bar.

16. Show the different types of feeders and the protective schemes employed for the protection of feeders.
17. Explain the types of protective schemes employed for the protection of Transmission line.
18. Explain the different protective schemes employed for motor?

### **SHORT QUESTIONS**

1. What is an arc?
2. What is RRRV?
3. What is capacitive current chopping?
4. What is current zero method? And discuss the theory about it.
5. What is making and breaking of circuit breaker?
6. Discuss the advantages of SF6 circuit breaker.
7. What are the different testing methods of circuit breaker?
8. What are the merits of oil circuit breaker?
9. What are the different types of air circuit breaker?

### **LONG QUESTIONS**

1. Draw the block diagram of a static relay.
2. Explain the different types of static relays.
3. Explain with neat block diagram of the function of synthesis of Mho relay using static phase comparator.
4. i) Explain the concept of duality in static comparators.(8)  
ii) Write short notes on the types of amplitude and phase comparators.
5. Explain with neat block diagram of the function of synthesis of simple Impedance relay using amplitude comparator.
6. Explain with neat block diagram of the function of synthesis of simple reactance relay using phase comparator.
7. Illustrate with neat block diagram of numerical over-current Protection.
8. List the different methods of numerical distant protection of transmission lines.
9. Illustrate with neat Block diagram of numerical transformer differential protection.
10. Discuss the operation of numerical differential protection scheme used for the

transformers.

11. What are the limitations of numerical relay?

12. Give the advantage of numerical relays over electromechanical relays.

13. Explain the physics of arc phenomena on what factor does the arc phenomenon depends.

14. Explain the arc phenomena for initiation of arc, maintenance of arc and the methods used for interrupting the arc.

15. Explain the resistance switching for arc extinction in circuit breakers.

16. A circuit breaker is connected with 100MVA transformer at 220kV. The magnetizing current of a transformer is 5% of the full load current . Determine the maximum voltage which may appear across the gap of the breaker when the magnetizing current is interrupted at 53% of its peak value. The stray capacitance is 2500  $\mu$ F. The inductance is 30H.

17. (a) Explain the phenomenon of current chopping in a circuit breaker.

(b) What measures are taken to reduce it?

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

19. Explain the phenomenon of interruption of capacitive current in a circuit breaker.

20. Explain in detail about RRRV.

(i) Derive an expression for restriking voltage and RRRV. (8)

(ii) For a 132 kV system, the reactance and capacitance up to the location of a circuit breaker is 3 $\Omega$  and 0.015  $\mu$ F, respectively. Calculate the following:

a. The frequency of transient oscillation. (3)

b. The maximum value of restriking voltage across the contacts of CB. (2)

c. The maximum value of RRRV. (3)

21. With neat sketch explain the principle of low oil circuit breakers.

22. What are the different types of air blast circuit breaker? Discuss their operating principle and area of applications.

23. Describe the working principle of SF<sub>6</sub> circuit breaker and discuss the advantages and disadvantages.

24. With neat sketch explain the principle of vacuum circuit breakers.

25..Describe dc circuit breaking

