

## SHORT QUESTIONS AND ANSWERS

### UNIT I PART A

- 1.What is an importance of protective scheme.
- 2.What are the types of faults.
- 3.What are the causes of faults in power system.
4. What are functions of protective relaying?
- 5.What is meant by switchgear.
- 6.What is backup protection
- 7.What are factors affecting the choice of protection.
- 8.What are essential qualities of protective relaying.
- 9.What is surge absorber.
- 10.Define surge diverter.
- 11.What is meant by neutral earthing
- 12.What is insulation coordination.

#### **1] What is the need for protection zones in the power system?**

Any fault occurring within the given zone will provide necessary tripping of relays or disconnecting or opening of circuit breakers and thus the healthy section is safe guarded.

If a fault occurs in the overlapping zone in a proper protected scheme , more circuit breakers than the minimum necessary to isolate the faulty part of the system would trip.

#### **2] what is surge absorber? How do they differ from surge diverter?**

Surge Absorber: it is a protective device used to reduce the steepness of the wave front of a surge and absorbs energy contained in the travelling wave.

Surge Diverter

It will divert excess voltages from an electrical surge to earth. It measures the volts coming in and once it gets above a set amount (normally 260 volts), will divert the excess volts to earth equipment. Unlike the more common Surge Protector Powerboards that simply switch off if there is spike in volts, a Surge Diverter will just divert the excess volts away. It is also installed on your main switchboard, thereby protecting all powerpoints.

### **3] Define the term “Insulation Coordination”.**

Insulation Coordination is the process of determining the proper insulation levels of various components in a power system as well as their arrangements. It is the selection of an insulation structure that will withstand voltage stresses to which the system, or equipment will be subjected to, together with the proper surge arrester. The process is determined from the known characteristics of voltage surges and the characteristics of surge arresters.

### **4] Write any two functions of protective relaying?**

(i) The function of a protective relay is to detect and locate a fault and issue a command to the circuit breaker to disconnect the faulty element.

(ii) It is a device which senses abnormal conditions on a power system by constantly monitoring electrical quantities of the system which differ under normal and abnormal conditions.

### **5] What are the desirable qualities of protective relaying? Or Mention the essential features of the power system protection. Or List the essential features of switchgear.**

- |                |                 |                |
|----------------|-----------------|----------------|
| 1. Selectivity | 2. Speed & time | 3. Sensitivity |
| 4. Reliability | 5. Simplicity   | 6. Economy     |

### **6] What is meant by switchgear?**

The apparatus used for switching, controlling and protecting the electrical circuits and equipment is known as switchgear.

### **07] What are the different types of fault in power system transmission lines?**

1. Symmetrical faults    3 phase faults
2. Unsymmetrical faults    Single phase to ground, single phase to open circuit, Two phase to ground fault; phase to phase short circuit.

### **08] List out the types of faults in power system**

A]. Single phase to ground B] phase to phase faults C] Two phase to ground fault and D] Three phase short circuit faults.

### **09] Explain the need for overlapping the zones of protection.**

1. The circuit breakers are located in the connection to each power element.
2. This provision makes it possible to disconnect only the faulty element from the system.

### **10] Differentiate between primary and back - up protection.**

No	Primary protection	Back - Up Protection
1	It is designed to protect the components of the power system. [main	It is second line of protection in case main protection fails.
2	It is for instantaneous protection	It is designed to operate with enough time delay
3	Only faulty element will be removed.	Larger part of the power system is removed.

### **11] What are the causes of faults in power system?**

1. Internal causes of the equipment.
2. Heavy short circuit current may cause s damage the equipment or other element of the system due to overheating and high mechanical forces set up due to heavy current.
3. Deterioration of insulation.

### **12] What are the functions of protective relays**

To detect the fault and initiate the operation of the circuit breaker to isolate the defective element from the rest of the system, thereby protecting the system from damages consequent to the fault.

### **13. Give the consequences of short circuit.**

Whenever a short-circuit occurs, the current flowing through the coil increases to an enormous value. If protective relays are present , a heavy current also flows through the relay coil, causing it to operate by closing its contacts. The trip circuit is then closed , the circuit breaker opens and the fault is isolated from the rest of the system. Also, a low voltage may be created which may damage systems connected to the supply.

### **14. Define protected zone.**

Are those which are directly protected by a protective system such as relays, fuses or switchgears. If a fault occurring in a zone can be immediately detected and or isolated by a protection scheme dedicated to that particular zone.

### **15. What are unit system and non-unit system?**

A unit protective system is one in which only faults occurring within its protected zone are isolated. Faults occurring elsewhere in the system have no influence on the operation of a unit system.

A non-unit system is a protective system which is activated even when the faults are external to its protected zone.

**16. What is back up protection?**

Is the second line of defence, which operates if the primary protection fails to activate within a definite time delay.

**17. Name the different kinds of over current relays.**

Induction type non-directional over current relay, Induction type directional over current relay & current differential relay.

**18. Define energizing quantity.**

It refers to the current or voltage which is used to activate the relay into operation.

**19. Define operating time of a relay.**

It is defined as the time period extending from the occurrence of the fault through the relay detecting the fault to the operation of the relay.

**20. Define resetting time of a relay.**

It is defined as the time taken by the relay from the instant of isolating the fault to the moment when the fault is removed and the relay can be reset.

**21. What are over and under current relays?**

Overcurrent relays are those that operate when the current in a line exceeds a predetermined value. (eg: Induction type non-directional/directional overcurrent relay, differential overcurrent relay) whereas undercurrent relays are those which operate whenever the current in a circuit/line drops below a predetermined value. (eg: differential over-voltage relay)

**22. Mention any two applications of differential relay.**

Protection of generator & generator transformer unit; protection of large motors and busbars .

**23. What is biased differential bus zone reduction?**

The biased beam relay is designed to respond to the differential current in terms of its fractional relation to the current flowing through the protected zone. It is essentially an over-current balanced beam relay type with an additional restraining coil. The restraining coil produces a bias force in the opposite direction to the operating force.

## 16 Marks Questions

### PART B

- \*11.a.(i) What are the essential qualities of a protective relay and explain them in detail  
(ii). Explain in detail the different types of faults in power system
- 11.b.(i) Explain primary and backup protection in detail with neat diagram? (8)  
(ii). List the causes of fault in different equipment in a sample power system (8)
- 11.a.(i) Draw the protective zone diagram for a sample power system network and explain its rules  
(ii) What are the nature and causes of fault in different equipment in a sample power system
- 11.b.(i) Explain Arc Suppression coil (Peterson Coil) earthing with diagram  
(ii) Explain how fault current is calculated using symmetrical components in 3-phase circuits?
11. (a) Discuss and compare the various methods of neutral earthing. (16)  
(b) (i) Describe the essential qualities of a protective relaying. (8)  
(ii) Briefly explain the various methods of overvoltage protection of overhead transmission line. (8)
11. (a) Write short notes on the following:  
(i) Various principles of power system protection (6)  
(ii) Power system earthing (6)  
(iii) Insulation co-ordination. (5)
- (b) What are the causes of over voltages? Explain the protection against over voltages due to lightning and switching surges.

1. Explain the different types faults in power system.
2. Explain how fault current is calculated using symmetrical components.
3. What are the basic requirement of protective relaying explain.
4. Describe the essential qualities of a protective relay.
5. Explain with neat diagram of different types of earthing made in power system.
6. Explain Arc suppression coil earthing with diagram.
7. Explain surge absorber and diverters.
8. Explain about neutral earthing and list their advantages.
  1. (a) What are the causes of over voltage on a power system? (8)
  - (b) Why is it necessary to protect the lines and other equipment of the power system against over voltages? (8)
  2. Describe the phenomenon of lightning. (16)
  3. What protective measures are taken against lightning over voltages? (16)
  4. (a) What is tower-footing resistance? (4) (b)
  - Why is it required to have this resistance as low as economically possible? (4) (c)
  - What are the methods to reduce this resistance? (8)
  5. (a) What is necessity of protecting electrical equipment against traveling waves?(6)
  - (b) Describe in brief the protective devices used for protection of equipment against such waves? (10)
  6. Describe the protection of stations and sub-stations against direct lightning stroke. (16)
  7. Describe the construction and principle of operation of
    - (i) expulsion type lightning arrester, (8) (ii)
    - Value type lightning arrester. (8)
  8. What is Peterson coil? What protective functions are performed by this device? (16)
  9. Write short notes on the following.
    - (i) klydonograph and magnetic link (4) (ii)
    - Rod gap (4) (iii) Arcing
    - horns (4) (iv) Basic impulse
    - insulation level (4)
  10. What are the requirements of a ground wire for protecting power conductors against direct lightning stroke? Explain how they are achieved in practice.
  11. 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. (16)

12. (a) Explain the term insulation coordination. (8) (b)

Describe the construction of volt-time curve and the terminology associated with impulse-testing. (8)

13. Explain the operation of various types of surge absorbers (16)