


SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR

Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : Switch Gear and Protection (19EE0224) **Course & Branch: B.Tech-EEE**
Year & Sem: III-B.Tech & II-Sem **Regulation: R19**

UNIT –I
CIRCUIT BREAKERS

1. (a) Explain the principle of ARC extinction. [L1][CO1][6M]
 (b) Discuss the different methods of “ARC” extinction [L1][CO1][6M]
2. Explain Sliepian’s theory and energy balance theory [L1][CO1][12M]
3. What is resistance switching and derive the expression for critical resistance in terms of system inductance and capacitance which gives no transient oscillation ? [L1][CO1][12M]
4. For a 132kv system, the reactance and capacitance up to the location of a C.B is $3\ \Omega$. And $0.015\ \mu\text{F}$ respectively. Calculate the following
 a) The frequency of transient oscillations.
 b) The Maximum value of restriking voltage. C) The max value of RRRV. [L3][CO1][12M]
5. Explain the terms recovery voltage, restriking voltage and RRRV. Derive an expression for restriking voltage in terms of system capacitance and inductance. [L3][CO1][12M]
6. Write short notes on the following. [L1][CO1][12M]
 - (i) Resistance switching
 - (ii) Current chopping.
 - (iii) Circuit breaker? Explain its function
7. Explain the operation of Minimum oil Circuit Breaker with diagram. [L1][CO2][12M]
8. With neat sketch, describe the working principle of an axial air blast type circuit breaker [L2][CO2][12M]
9. Discuss the operating principle of SF6 circuit breaker, what are its advantages over other types of circuit breakers and for what voltage range it is recommended. [L1][CO2][12M]
10. Explain the principle and operation of Vacuum Breaker with diagram. [L1][CO2][12M]

UNIT –II
RELAYS

1. (a) What is protective relay? Discuss the basic requirements of relay. [L1][CO3][6M]
(b) Explain the constructional details and operation of attracted armatures relay [L1][CO3][6M]
2. (a) Explain the significance of primary and back up protection. [L1][CO3][6M]
(b) Classify the various types of the over current relays and give their applications along With characteristics [L2][CO3][6M]
3. Describe the principle of Reactance relay and explain its characteristics on R-X planes [L1][CO3][12M]
4. Describe the principle of Impedance relay and explain its characteristics on R-X- planes. [L2][CO3][12M]
5. (a) What are the advantages of induction cup relays over induction disc relays? What is the purpose of shading in an induction disc-relay? [L2][CO3][6M]
(b) Explain differential relay in detail [L2][CO3][6M]
6. Explain the need for static relays. Explain the basic units in a static relay. Enumerate the advantages and disadvantages of static relays . [L2][CO3][12M]
7. (a) List the advantages and disadvantages of microprocessor based relays. [L1][CO3][6M]
(b) Explain the working of a static over current relay. [L1][CO3][6M]
8. (a) What are the different types of distance relays? Compare their merits and demerits. [L1][CO3][6M]
(b) Discuss the principle of operation of induction cup relay with relevant diagram. [L1][CO3][6M]
9. (a) Derive the expression for torque developed in induction relay [L1][CO3][6M]
(b) What is universal torque equation? Using this equation derive the following
(i) Impedance relay (ii) reactance relay (iii) Mho relay [L1][CO3][6M]
10. Explain working of microprocessor based over current relay with suitable diagram. [L2][CO3][12M]

UNIT –III

PROTECTION OF GENERATORS & TRANSFORMERS

1. (a) Describe the protection of the stator windings of 3-phase alternator against turn-to-turn faults. [L1][CO4][6M]
 (b) Calculate the required value of neutral resistance for a 3-phase 11kV alternator so as to protect 70% of the winding against earth-fault by a relay with pick-up current of 1A. The neutral CT has a ratio of 250/5. [L3][CO4][6M]
2. (a) Explain protection of generators in abnormal conditions [L2][CO4][6M]
 (b) Explain internal faults inside the transformer [L2][CO4][6M]
3. (a) Enumerate the relaying schemes, which are employed for the protection of a modern alternator? [L1][CO3][6M]
 (b) An 11kV, 1000 MVA generator is provided with differential scheme of protection. The percentage of generator winding to be protected against phase to ground fault is 80%, the relay is set to be operate when there is a 15% out of balance current determine the value of resistance to be placed in neutral to ground connection? [L3][CO4][6M]
4. (a) Explain a scheme of protection for failure of alternator excitation. [L1][CO4][6M]
 (b) Discuss the different types of transformer faults. What are various protective schemes available for transformers? [L1][CO4][6M]
5. (a) Describe the protection of the stator windings of 3-phase alternator against turn-to-turn faults. [L1][CO4][6M]
 (b) Calculate the required value of neutral resistance for a 3-phase 11kV alternator so as to protect 70% of the winding against earth-fault by a relay with pick-up current of 1 A. The neutral CT has a ratio of 250/5. [L3][CO4][6M]
6. A 6.6 kV, 4000 kVA star connected alternator with a transient reactance of 2Ω /phase And negligible resistance, is protected by a circulating current protective system. The alternator neutral is earthed through a resistor of 7.5Ω . The relays are set to operate when there is an out of balance current of 1 A in the secondary windings of the 500/5 current Transformers. what percentage of each phase winding is protected against an earth fault? [L3][CO4][6M]
7. (a) Discuss the percentage differential protection scheme of a transformer? [L1][CO3][6M]
 (b) Explain the working principle of buch-holtz relay with neat diagram? [L1][CO3][6M]
8. (a) Discuss earth fault protection for transformers. [L3][CO4][6M]
 (b) A 3-phase transformer rated for 33kV/6.6kV is connected star-delta and the Protecting current transformer on the low voltage side have a ratio of 400/5. Determine the ratio of the current transformer on the HV side. [L2][CO4][6M]
9. The neutral point of a 3-phase, 20MVA, 11kV alternator is earthed through a resistance of 5Ω , the relay is set to operate when there is an out of balance current of 1.5 A. The C.T.s has a ratio of 1000/5. What percentage of winding is protected against an earth fault and what should be the Minimum value of earthing resistance to protect 90% of the winding. [L3][CO4][6M]
10. Explain the significance for the protection of transformers and explain the Buchholz relay protection with neat block diagram. [L1][CO4][12M]

UNIT –IV
PROTECTION OF FEEDERS & LINES

1. (a) Elaborate on various methods for protection of feeders. [L1][CO5][6M]
(b) What is the importance of bus-bar protection? What are the requirements of protection of lines? [L1][CO5][6M]
2. (a) Explain in detail about the time graded and current graded system. [L1][CO5][6M]
(b) Explain the construction and principle of operation of a translay relay [L1][CO5][6M]
3. (a) Explain in detail about the Merz price voltage balanced system with a neat single line diagram. [L1][CO5][6M]
(b) Describe in detail the protection of parallel feeder and ring mains. [L1][CO5][6M]
4. Draw the schematic diagram of the carrier current protection scheme of lines. Also explain its working principle. [L3][CO5][12M]
5. Explain about the over current protection of bus bars with relevant connection diagram [L1][CO5][12M]
6. Explain over-current protection of feeders. How is the protection system graded with respect to the time of operation of relays for a radial feeder [L1][CO5][12M]
7. With neat Diagram Explain the Three zone distance protection in 3-Phase transmission line. [L3][CO5][12M]
8. Write short notes on the following: [L1][CO5][12M]
(i) Fault bus protection
(ii) Translay scheme.
9. (a) Discuss the importance of Bus bar protection. [L1][CO5][6M]
(b) What is back-up protection of bus bar? [L1][CO5][6M]
10. Describe the principle of bus -bar protection based on voltage differential systems. How does it Overcome the problems of saturation of CT's? [L1][CO5][12M]

UNIT-V
Protection Against Over Voltages And Grounding

1. (a) Discuss the phenomena of a lightning stroke. [L1][CO6][6M]
(b) Explain the working of valve type lightning arrester. [L1][CO6][6M]
2. Write short notes on the following: [L1][CO6][12M]
(a) Causes of over voltages in power systems.
(b) Basic impulse level and its significance.
3. (a) What is lightening? Describe the mechanism of lighting discharge by drawing suitable diagrams [L1][CO6][6M]
(b) List out the types of lightning arresters and write its advantages in a protection system.
Explain, with a neat sketch, the working of Zinc-Oxide lightning arrester [L1][CO6][6M]
4. (a) Explain and sketch neat diagram of valve type lightning arrester. [L1][CO6][6M]
(b) Enumerate the basic concepts of insulation coordination. [L1][CO6][6M]
5. (a) Explain the differences between equipment grounding and system grounding? [L1][CO6][6M]
(b) Discuss the advantages and disadvantages of overhead ground wires [L1][CO6][6M]
6. (a) With a neat diagram explain the operation of any one type of lightning arrester. [L3][CO6][6M]
(b) Discuss and compare the various methods of neutral earthing explain. [L2][CO6][6M]
7. (a) Briefly explain the various methods of overvoltage protection of overhead transmission line. [L1][CO6][6M]
(b) What is horn gap arrester? Explain how it works. What is the purpose of inserting a Resistance between horn gap arrester and the line? [L1][CO6][6M]
8. Explain the term insulation coordination. Describe the construction of volt -time curve and terminology associated with impulse testing. [L1][CO6][12M]
9. (a) What is voltage surge? Draw typical lightning voltage surge. [L3][CO6][6M]
(b) Describe the construction & principle of operation of valve type lightning arrester. [L1][CO6][6M]
10. What are the causes of over voltages arising on power system? Why is it necessary to protect the lines and other equipment of the power system against over voltages ? [L1][CO6][12M]

Prepared by: **P MUNISEKHAR**