

Reg.No.:

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.



Question Paper Code: 8002

B.E. / B.Tech. DEGREE SUPPLEMENTARY EXAMINATIONS – FEB. / MAR. 2020

Seventh Semester

Electrical and Electronics Engineering

U15EE730 - POWER SYSTEM PROTECTION

(Regulations 2015)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

PART – A

(10 x 2 = 20 Marks)

1. List out the types of protective scheme?
2. Calculate the reactance of Peterson coil suitable for a 33 kV, 3-phase transmission line having a capacitance to earth of each conductor as $4.5 \mu\text{F}$.
3. Classify the types of static relays.
4. What are the advantages of electromagnetic relays?
5. Define potential transformer?
6. What is the need for protection zones in power system?
7. How to protect the circuit breakers from the recovery voltages?
8. What is resistance switching?
9. State the difference between switch, isolator and circuit breaker?
10. Discuss the difference between type and routine tests in circuit breaker?

PART – B

(5 x 13 = 65 Marks)

11. a) Derive an expression for the reactance of the Peterson coil in terms of capacitance of the protection line.

(OR)

- b) i. A 132KV, 3 phase, 50 cycles, OHT line, 50 km long as a capacitance to earth for each line of $0.0157\mu\text{F}/\text{Km}$. Determine the inductance and KVA rating of the arc suppression coil? (6)
ii. Explain the essential qualities of protection and explain them in detail. (7)

12. a) Discuss the construction details and principle of operation of induction type directional over current relay.

(OR)

- b) Briefly explain the MHO relay characteristics on the R-X diagram. Discuss the range setting of various distance relays placed on a particular location.
13. a) What is a Buchholz Relay? Explain with a neat sketch Buchholz relay used for transformer protection and list out the applications, limitations and advantages.

(OR)

- b) Evaluate the Star connected, 3 phase, 10 MVA, 6.6 KV alternator has a per phase reactance of 10%. It is protected by Merz price circulating current principle which is set to operate for fault currents not less than 175 A. Calculate the value of earthing resistance to be provided in order to ensure that only 10% of the alternator winding remains unprotected.
14. a) Give shot notes on:
i. Current Chopping. (6)
ii. D.C Circuit Breaking. (7)

(OR)

- b) Derive an expression for restriking rate of rise of recovery voltage?

15. a) Briefly explain the constructional details and operation of a SF6 circuit breaker with neat diagram. Mention its advantages and disadvantages.

(OR)

- b) Discuss the principle of operation of an double air blast circuit breaker. What are the advantages and disadvantages of using air as the arc quenching medium?

PART – C

(1 x 15 = 15Marks)

16. a) i. Discuss the Selection of Circuit Breaker for Different Ranges of System Voltage and Give the reasons for using SF6 in circuit breakers. (8)
- ii. In a short circuit test, with earthed neutral, on a **132kV**3 phase circuit breaker, the p.f. of the fault was **0.3**, the recovery voltage was 0.95 of full line value, the breaking current was symmetrical and the re-striking transient had a natural frequency of 16000Hz, Estimate the rate of rise of the restriking voltage. (7)

(OR)

- b) i. A 3 phase, **20MVA, 11kV**, star connected generator is protected by the current balancing system of protection. If the ratio of the current transformer is **1200/5**, the minimum operating current of the relay is 0.75ampere and the neutral point earthing resistance is 6 ohms, calculate the percentage of each phase of the stator winding which is unprotected against earth faults when the machine is operating at normal voltage. Show quantitatively, the effect of varying the neutral earthing resistance. (8)
- ii. Explain with neat diagram of interruption of capacitive current. (7)

