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Code No. : 16302 AS N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
B.E. (EEE: CBCS) VI-Semester Advanced Supplementary Examinations, July-2019

Switchgear and Protection

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Differentiate between primary and backup protection.
2. Determine the plug setting multiplier for a fault current of 2000 A. The over current relay is set at 50% and CT ratio is 400:5.
3. What are Phase Comparators?
4. Enumerate the necessity of numerical relays.
5. What are the problems associated with differential protection in power transformer and how they are eliminated?
6. Name the relay used to detect the loss of excitation condition in the alternator.
7. Define Breaking & Making capacity of a circuit breaker.
8. Discuss the phenomenon of resistance switching in a circuit breaker.
9. Define the term Basic Impulse insulation Level.
10. Discuss the function of surge absorber.

Part-B (5 × 10 = 50 Marks)

- 11.a) Explain the construction and working of induction disc type over current relay and derive the torque equation. [5]
- b) Compare the working of Directional Relays and Differential Relays. Give their applications. [5]
- 12.a) Explain the merits and demerits of static relays. [5]
- b) Discuss the concept of 3 step distance relays. [5]
- 13.a) What type of protective scheme is employed for protection of large power transformer against internal short circuits? With neat sketch discuss its working principle. [5]
- b) An 11 kV, 100 MVA alternator is provided with differential protection. The percentage of winding to be protected against phase to ground fault is 85%. The relay is set to operate when there is 20% out of balance current. Determine the value of resistance to be placed in the neutral ground connection. [5]

- 14.a) Explain the phenomenon of current chopping and its effect on circuit interruption. [6]
- b) In a 220 kV system, the reactance & capacitance up to the location of the circuit breaker B is 8Ω & $0.025 \mu\text{f}$ respectively. A resistance of 600Ω is connected across the contacts of the circuit breaker. Determine: [4]
- Natural frequency of oscillations
 - Damped frequency of oscillations,
 - Critical value of resistance which will give no transient oscillations and
 - The value of resistance which will give damped frequency of oscillation, $1/4$ of the natural frequency of oscillations.
- 15.a) What is a horn gap arrester? Explain its working. [5]
- b) In a 50 Hz, overhead line the capacitance of line to earth was $1.5 \mu\text{f}$. It was decided to use an earth fault neutralizer. Calculate the reactance that neutralizes the capacitance of: [5]
- 100% of the length of the line.
 - 90% of the length of line.
 - 85% of the length of the line.
- 16.a) Explain briefly about the induction cup type electromagnetic relays. [5]
- b) Illustrate the implementation of microprocessor based distance relay with block diagram. [5]
17. Answer any *two* of the following:
- Describe with a neat sketch the working of Buchholz relay. [5]
 - Explain the principle of resistance switching. [5]
 - What are the protective measures taken against lightning over voltages? [5]

