BHAGALPUR COLLEGE OF ENGINEERING

Mid Term Examination Nov'2019

Branch: Electrical Engineering, **Time: 02 hrs.**

Subject: SG&P **Semester: VII**

Subject Code: (31733) **Total Marks: 40**

A. All questions are compulsory (2x5=10 marks)

1. Describe Primary & Backup protection.
2. Draw the characteristics of Impedance & MHO Relay on R-X plane.
3. Calculate the value of Rated Symmetrical Breaking Current and Making Capacity for a 3 phase oil circuit breaker having the following data: Operating Voltage- 11 kV, Breaking Capacity- 1100 MVA, Normal current- 500 A.
4. Explain the following terms in context with protective relay:
   (i) Pick Up Current
   (ii) Relay operating time
5. A relay is connected to 400/5 CT and set at 125% and if the fault current on the primary side is 1250 A, calculate PSM.

B. Attempt any 3 (three) question of 10 marks (3x10=30 marks)

6. (a) Explain the principle of attracted armature type relay. **(5 marks)**
   (b) Discuss various zone of protection for a modern power system with diagram. Why adjacent protective zones must overlap each other? **(5 marks)**

   OR

   (c) Describe with a neat sketch, the percentage differential protection of a modern alternator against internal fault. **(6 marks)**
   (d) Explain why a reactance relay is preferred for the protection of short lines against both, phase fault as well as ground fault? **(4 marks)**

7. (a) Explain the Merz-Price protective system for the protection of Star-Delta connected transformer. **(6 marks)**
   (b) Explain the working principle of Buchholz relay. **(4 marks)**

   OR

   (c) Describe the construction and operating principle of percentage differential relay. How the percentage differential relay overcomes the drawbacks of the simple differential relay? **(6 marks)**
   (d) What are the various time current characteristics of an over current relay? **(4 marks)**

8. (a) Discuss the properties of SF6 which makes it most suitable to be used in circuit breakers? Also mentioned their advantages and disadvantages of SF6 circuit breaker. **(5 marks)**
   (b) What are the different methods of testing of circuit breakers? Discuss their merits and demerits. **(5 marks)**

   OR

   (c) Discuss symmetrical and asymmetrical breaking capacity, making capacity and short-time current rating. **(4 marks)**
   (d) A 50 Hz, 11kV, 3-phase alternator with earthed neutral has a reactance of 5 ohms per phase and is connected to a bus- bar through a circuit breaker. The distributed capacitance upto circuit breaker between phase & neutral in 0.01 μF. Determine **(2+2+2 marks)**
   (i) Peak re-striking voltage across the contacts of the breaker.
   (ii) Frequency of oscillations
   (iii) The average rate of rise of re-striking voltage upto the first peak.

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A. All questions are compulsory (2x5=10 marks)

1. How the voltage and current values of transmission lines are supplied to relays for their operation?
2. Explain why the connection of CTs on primary and secondary sides should be opposite to connections of 3 phase transformer windings?
3. Calculate the value of Rated Symmetrical Breaking Current and Making Capacity for a 3 phase oil circuit breaker having the following data: Operating Voltage- 11 kV, Breaking Capacity- 1100 MVA, Normal current- 500 A.
4. Define the terms (i) Seal-in-relay (ii) Under-reach
5. What are the demerits of static relay?

B. Attempt any 3 (three) question of 10 marks (3x10=30 marks)

6. (a) Explain the operating principle of percentage differential relay. **(6 marks)**

   (b) Draw and explain the basic relay circuit diagram. **(4 marks)**

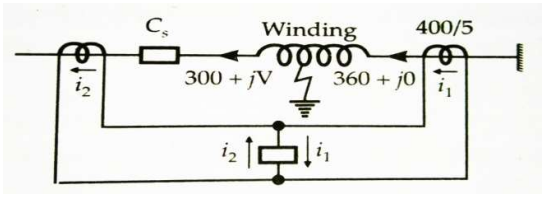
   OR

   (c) Discuss a protective method for ring feeders. **(4 marks)**

   (d) Discuss the effects of arc resistance on impedance relay, reactance relay and mho relay by drawing the characteristics on R-X plane. **(6 marks)**

7. (a) Discuss the protection employed against loss of excitation of an alternator. **(5 marks)**

   (b) An alternator stator winding protected by a percentage differential relay as shown in fig. The relay has a 0.15 amp minimum pick-up and a 12% slope. A high resistance ground fault has occurred as shown in fig near the grounded end of the generator winding while the generator is carrying load. The currents flowing at each end of the generator winding are shown in figure. Assuming that a CT has a 400/5 amp ratio and no inaccuracies, will the relay trip the generator CB under this fault condition? **(5 marks)**



   OR

   (c) Explain restricted earth fault protection for transformer. **(5 marks)**

   (d) Explain the working principle of Buchholz relay. **(5 marks)**

8. (a) What is resistance switching? Derive the expression for critical resistance in terms of system inductance and capacitance, which gives no transient oscillation. **(5 marks)**

   (b) Explain the working principle of puffer type SF6 circuit breaker. **(5 marks)**

   OR

   (c) Explain the working principle of vacuum circuit breaker. **(6 marks)**

   (d) Explain the phenomenon of current chopping in circuit breaker. **(4 marks)**

BHAGALPUR COLLEGE OF ENGINEERING

Mid Semester Examination (2017-18)

Branch: Electrical Engineering,

Subject: Switchgear & Protection (031733) **Semester: VII**

Total Marks: 20 **Time: 02 hrs.**

Answer any 04 (four) questions.

Q.1. (i) Explain the essential qualities of a protective relay. **(2.5 marks)**

(ii) Define over current relay. Give the name of various types of over current relays and draw their approximate time- current characteristics. **(2.5 marks)**

Q.2. Discuss the effect of Arc Resistance & Power Surge on Impedance, Reactance & Mho type distance relay. Also explain which type of distance relay is commonly used for short, medium & long transmission lines and why? **(3+2 marks)**

Q.3. What is Circuit Breaker? Explain the phenomenon of arc formation and also discuss current zero interruption method for arc extinction in circuit breaker. **(1+4 marks)**

Q.4. Draw a neat sketch of Shaded Pole Type Induction Disc Relay and explain its operating principle. **(5 marks)**

Q.5. A 50 Hz, 11kV, 3-phase alternator with earthed neutral has a reactance of 5 ohms per phase and is connected to a bus- bar through a circuit breaker. The distributed capacitance upto circuit breaker between phase & neutral in 0.01 μF. Determine

(i) Peak re-striking voltage across the contacts of the breaker. **(2 marks)**

(ii) Frequency of oscillations. **(1 marks)**

(iii) The average rate of rise of re-striking voltage upto the first peak. **(2 marks)**

Q.6. Explain percentage differential protection for star-delta connected transformer. **(5 marks)**