Code No: **R41023**

R10

Set No. 1

IV B.Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2015
SWITCH GEAR AND PROTECTION
(Electrical and Electronics Engineering)

Time: 3 hours   **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1   a)   Discuss why the arc should be interrupted between the two contacts of a circuit breaker?   [8]
   b)   What are the advantages and disadvantages of circuit breakers?   [7]

2   a)   Explain how the arc extinction is done in the SF_6 circuit breaker.   [8]
   b)   Discuss the merits and demerits of SF_6 circuit breaker.   [7]

3   a)   Explain the difference between induction disc and induction cup relays.   [8]
   b)   Draw the R-X characteristics and explain about MHO and offset MHO relays.   [7]

4   a)   Discuss why some percentage of winding is unprotected in the restricted earth fault protection of an alternator.   [8]
   b)   A 3 phase, 2 pole, 11kv, 10000 kVA alternator has neutral earthed through a resistance of 8 ohms. The machine has current balance protection which operates up on out of balance current exceed 20% of full load. Find the percentage of winding protected against earth fault.   [7]

5   a)   What is the need for the transformer protection from internal faults?   [8]
   b)   Derive a relation between the turns ratio of main transformer and the current transformer used in differential protection by an example.   [7]

6   a)   Discuss why the impedance relay is used for the three zone protection.   [8]
   b)   Explain in detail about carrier current protection.   [7]

7   a)   Draw and explain about the characteristics of static reactance relay.   [8]
   b)   What are the various components used in the static relay operation?   [7]

8   a)   Define impulse ratio and discuss it should be low or high for better protection.   [8]
   b)   Explain the system performance if effected by un grounded neutral.   [7]

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1. a) Explain in detail about energy balance and recovery rate theories with necessary characteristics. [8]
   b) Discuss where the auto reclosures are used in the power system. [7]

2. a) Explain the dielectric properties of SF_6 gas. [8]
   b) Draw the diagram and explain about the single puffer type SF_6 circuit breaker. [7]

3. a) Compare various characteristics of different distance relays. [8]
   b) Write the applications of under voltage relays. [7]

4. a) A 11kv three phase alternator has full load rated current of 200A. Reactance of armature winding is 17%. The differential protection system is set to operate an earth fault currents of more than 200A. Find the neutral earthing resistance which gives earth fault protection to 90% of stator winding. [8]
   b) By drawing the relevant diagram explain how an alternator is protected from turn to turn fault. [7]

5. a) Explain in detail about the operation of a relay which gives the alarm in the transformer protection. [8]
   b) What are the possible connections of main transformer and the current transformers in the differential protection? Draw the connection diagrams. [7]

6. a) Explain about the over current protection of bus bars with relevant connection diagram. [8]
   b) Explain about the three zone distance relay protection. [7]

7. a) Discuss the function of UJT and SCR in the operation of static relay. [8]
   b) Draw and explain about the operation of static over current relay. [7]

8. a) Discuss the need of grounding the power system. [8]
   b) Explain in detail about insulation coordination with an example. [7]

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Set No. 3

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Time: 3 hours   **Max. Marks: 75**

Answer any FIVE Questions
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1 a) By the circuit diagram explain how the arc between the contacts of a circuit breaker is gets reduced by using a resistor. [8]

   b) Derive the expression for the maximum voltage that will cause the arc to struck back. [7]

2 a) Explain the principle of arc quenching in the air blast circuit breaker. [8]

   b) Discuss the advantages and disadvantages of air blast circuit breaker. [7]

3 a) Explain about the principle of operation of attracted armature type relay with neat sketch. [8]

   b) What are the various applications of over current relays? [7]

4 a) Discuss how the generator is protected from faults in the stator winding. [8]

   b) A generator is provided with a restricted earth fault protection. The ratings are 11kv, 5000 kVA. The percentage of winding protected against phase to ground fault is 80%. The relay setting is such that it trips for 30% out of balance. Calculate the resistance to be added in the neutral to ground connection. [7]

5 a) Discuss how a transformer is protected by percentage differential protection. [8]

   b) What are the advantages and disadvantages of Buchholtz's relay? [7]

6 a) Explain about the operation of translay relay and discuss its advantages. [8]

   b) Discuss about the differential protection of bus bars. [7]

7 a) Discuss about the zero crossing detectors used in the static relays. [8]

   b) Draw and explain about the micro processor based digital relays. [7]

8 a) Explain about the properties of lightning arresters. [8]

   b) Explain briefly about arcing grounds. [7]

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Time: 3 hours   **Max. Marks: 75**

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1 a) What are the various ratings of circuit breakers? Explain. [8]
  b) Discuss the effects of current chopping on the system and explain how it is avoided. [7]

2 a) Draw the cross sectional diagram and explain about the vacuum circuit breaker. [8]
  b) Explain in detail about the operation of double pressure type SF_6 circuit breaker. [7]

3 a) Derive the operating condition for the impedance relay by drawing the characteristics. [8]
  b) Explain about the percentage differential relay with neat sketch. [7]

4 a) What are various abnormal running conditions of an alternator and discuss how the protection is given for each abnormal condition? [8]
  b) The neutral point of a 10kV alternator is earthed through a resistance of 15 ohms; the relay is set to operate when there is an out of balance current of 1A. The CTs have a ratio of 1000/5. What is the % of winding is protected against fault to earth and what must be the minimum value of earthing resistance to give 90% protection to each phase winding. [7]

5 a) Discuss about the role of current transformer in the transformer protection with diagrams. [8]
  b) Explain how a transformer is protected from internal faults. [7]

6 a) Discuss about various schemes of protection of bus bars. [8]
  b) Explain how a line is protected by dividing in to three zones. [7]

7 a) Explain briefly about various components used in the static relay operation. [8]
  b) Draw the characteristics and explain about the static impedance relay. [7]

8 a) Explain in detail about the reactance grounding with necessary equations. [8]
  b) Write the advantages and disadvantages of zinc oxide lightning arrester. [7]

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