Code No: 07A60202 | R07 | Set No. 2

III B.Tech II Semester Examinations,APRIL 2011
SWITCH GEAR AND PROTECTION
Electrical And Electronics Engineering

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. Explain the procedure to filling SF_6 gas in a circuit breaker. And What are the applications of SF_6 gas?   [16]

2. Illustrate the basic features of using 3-zone stepped distance protection scheme for a long transmission lines.   [16]

3. What protective device other than the differential protection are used for the protection of a large transformer? Briefly describe them.   [16]

4. Write short notes on the following: [16]

   (a) Effective grounding.

   (b) Resistance grounding.

   (c) Reactance grounding.   [5+5+6]

5. A 3-phase, 33kV star connected alternator is to be protected using circulating current protection. The pilot wires are connected to the secondary windings of 100/5 ratio current transformer. The protective relay is adjusted to operate with an out-of-balance current of 1A in the pilot wires. Determine the

   (a) earthing resistance which will protect 90% of the winding and

   (b) the percentage of the winding which would be protected if the earthing resistance is 15Ω.   [8+8]

6. (a) Explain the phenomena of lightning and the traveling waves caused by its on transmission lines.

   (b) Draw a connection diagram of typical arc suppression coil.   [8+8]

7. (a) Discuss the performance of a circuit breaker when capacitive currents are interrupted?

   (b) Ina system of 132kV, the line to ground capacitance is $0.01\mu F$ and the inductance is 5H. Determine the voltage appearing across the pole of a Circuit Breaker. If a magnetizing current of 5ampes (instantaneous value) is interrupted. Determine also the value of resistance to be used across the contacts to eliminate the restriking voltage.   [8+8]

8. (a) Describe the construction, principle of operation and applications of an

      i. Induction disc and

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     ii. Induction cup type of relays.

  (b) What is the ratio of reset to pick up value in case of these relays.   [10+6]

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Code No: 07A60202　　　　　R07　　　　　Set No. 4

III B.Tech II Semester Examinations,APRIL 2011
SWITCH GEAR AND PROTECTION
Electrical And Electronics Engineering

Time: 3 hours　　　　　　　　　　　　　　　　　　　　　Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Define the terms
    i. recovery voltage
    ii. Rate of Rise of Restriking Voltage (RRRV)
   Derive the expression for RRRV.
   (b) Explain the effect of RRRV on the operation of circuit breaker under fault
   condition.　　　　　　　　　　　　　　　　　　　　　　　　　　[8+8]

2. (a) What are volt time curves.
   (b) What is their significance in power system studies.　　　　　　[8+8]

3. What is Buchholz relay? Discuss its working principle? For what types of faults is
   it employed?　　　　　　　　　　　　　　　　　　　　　　　　　　[16]

4. (a) Explain the terms "breakers with external source of energy". What is the
   difference between such a breaker and oil circuit breaker?
   (b) With the help of neat sketch, describe the construction of a minimum oil
   circuit breaker.　　　　　　　　　　　　　　　　　　　　　　　[8+8]

5. (a) A 50Hz over head line has the line to ground capacitance of $1.2\mu F$. It is decided
   to use a ground fault neutralizer. Determine the reactance to neutralize the
   capacitance of
   (i)100% of the length of the wire, and (ii) 80% of the length of the wire
   (b) Write short notes on biased differential protection for transformer.　[10+6]

6. Discuss the role of Mho relay in distance protection. 'Mho relay is an inherently
   directional relay', justify?　　　　　　　　　　　　　　　　　　　　[16]

7. (a) What is the main drawback of differential over current protection for bus bars
   and how is it overcome.
   (b) Explain about voltage differential protection of bus bars.　　　　[10+6]

8. (a) What is restricted earth fault protection for generators?
   (b) A 500kVA, 6.6kV star connected alternator has a synchronous reactance of 2
   Ω per phase and negligible resistance. The differential relay operates if the
   out-of-balance current through it exceeds 30% of the normal full load current
   of the alternator. If the star point of the alternator is earthed through a
   resistance of 6.5Ω. What percent of the stator winding is left unprotected?
   Show that the effect of the alternator reactance can neglected.　　　[8+8]

3

Code No: 07A60202

R07

Set No. 4

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Code No: 07A60202 | R07 | Set No. 1

III B.Tech II Semester Examinations,APRIL 2011
SWITCH GEAR AND PROTECTION
Electrical And Electronics Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. Write short notes of the following:

   (a) Causes of over voltages in a power system.
   (b) Switching surges.
   (c) Protection against over voltages. [5+5+6]

2. (a) Discuss the different transformer faults.
   (b) What are the various protection schemes available for transformers. [8+8]

3. Discuss the various types of Stator and Rotor faults generally encountered in Generators and mention the protection schemes employed. [16]

4. Define 'Differential protection'. Describe the principle of circulating current differential protection. [16]

5. (a) Explain over-current protection of feeders.
   (b) With a neat sketch discuss the different types of bus bar arrangements. [6+10]

6. Discuss the merits and demerits of earthing it solidly, through a resistance and through reactance. [16]

7. (a) Compare the arc rupture in oil and air blast circuit breakers and summarize the relative advantages and disadvantages of these types of switch gear.
   (b) Explain the operating duty of a circuit breaker. [8+8]

8. (a) Is it logical to express the breaking capacity of a circuit breaker in MVA? Discuss.
   (b) In a short circuit test on a 3-phase, 132 kV C.B the following observations are made: pf of fault 0.4, the recovery voltage 0.90 times full line value, the breaking current symmetrical, the frequency of oscillations of restriking voltage 16k Hz. Assume that the neutral is grounded and the fault does not involve ground, determine the average rate of rise of restriking voltage. [8+8]

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Code No: 07A60202   **R07**   **Set No. 3**

III B.Tech II Semester Examinations,APRIL 2011
SWITCH GEAR AND PROTECTION
Electrical And Electronics Engineering

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. Describe the arc quenching process in puffer type SF_6 circuit breaker and explain the merits of SF_6 breaker. [8+8]

2. (a) What are the various methods of neutral grounding.

   (b) Explain the phenomenon of "Arcing grounds". [8+8]

3. Why restricted earth fault protection is provided to alternators though it leaves a portion of winding unprotected against earth fault. Can it be justified. [8+8]

4. (a) What is voltage differential protection of bus bar and how is it superior to circulating current protection.

   (b) What is differential protection of bus bars. [10+6]

5. (a) State the various causes of over voltages in a power system?

   (b) Name the various devices used for protection against over voltage due to lightning. [8+8]

6. Describe the principle of differential system of protection applied to a power transformer. What are the shortcomings of this scheme and how are they overcome.
   [16]

7. A generator connected through a 3-cycle Circuit Breaker to a transformer is rated 10MVA, 13.8kV with reactances of $X_d'' = 10\%$, $X_d' = 15\%$ and $X_d = 100\%$. It is operating at no load and rated voltage when a 3-phase short circuit occurs between the breaker and the transformer. Determine

   (a) the sustained short circuit current in breaker;

   (b) the initial symmetrical rms current in the breaker;

   (c) the maximum possible d.c component of the short circuit current in the breaker;

   (d) the momentary current rating of the breaker;

   (e) the current to be interrupted by the breaker and

   (f) the interrupting kVA. [16]

8. (a) Expain the following terms with respect to switch gear protection

      i. Pick up level
      ii. operating time

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       iii. Reach

       iv. Under Reach

       v. Over Reach.

(b) An earth fault setting relay has a setting of 20%, current rating 5A, it is connected to a C.T of ratio 500:5. Calculate pick up current in primary for which the earth fault relay operates.   [8+8]

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