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Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Switchgear and Protection

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO full questions from each part.

PART – A

1   a. With a neat sketch, explain the construction operation and characteristic of HRC fuse.
    (08 Marks)

    b. What is isolating switch? Mention the types of isolators and explain any one in brief with a neat sketch.
    (08 Marks)

    c. Define the following:
    i)   Fuse
    ii)   Rated current of the fuse
    iii) Fusing current
    iv)   Fusing factor of the fuse.
    (04 Marks)

2   a. Explain how the arc is formed and maintained between the contacts of a circuit breaker. What are the different methods of arc quenching?
    (08 Marks)

    b. Derive an expression for restriking voltage and RRRV in terms of system voltage, inductance, and capacitance.
    (06 Marks)

    c. A 50Hz, 3-phase alternator has rated voltage of 13.5kV connected to a circuit breaker, inductive reactance = 4Ω/ph capacitance = $2\,\pi F$. Determine:
    i)   Frequency of oscillation
    ii)   Maximum restriking voltage
    iii) Maximum RRRV.
    (06 Marks)

3   a. Explain with neat diagram, minimum oil circuit breaker.
    (08 Marks)

    b. Discuss the properties of sulphur-hexafluoride (SF_6) gas that makes it superior for application in circuit breakers.
    (06 Marks)

    c. Write a short note on : i) Unit test and ii) Synthetic testing of circuit breaker.
    (06 Marks)

4   a. With a neat diagram, explain the construction and working of vacuum circuit breaker.
    (08 Marks)

    b. Explain the working principle of the lightning arrestor.
    (06 Marks)

    c. Explain the various causes of over voltage in power system.
    (06 Marks)

PART – B

5   a. What is relay? Explain the essential qualities of the relay.
    (08 Marks)

    b. With a neat diagram, explain the zones of protection in a typical power system.
    (06 Marks)

    c. Give the detailed classification of protective relays.
    (06 Marks)

6   a. With a neat diagram, explain the operation of induction type non directional over current relay.
    (08 Marks)

    b. With a neat diagram, explain the working of current differential relay.
    (06 Marks)

    c. Draw and explain the working of impedance relay and obtain its torque equation.   **(06 Marks)**

1 of 2

7 a. Discuss the generator protection schemes against : i) Rotor faults; ii) Abnormal running conditions. **(10 Marks)**

   b. A synchronous generator rated at 20kV protected by a circulating current system having neutral grounded through a resistance of 15Ω. The differential protection relay is set to operate when there is an out-of-balance current of 3Amps. The CTs have the ratio of 1000/5 Amps. Determine:

   i)   The percentage of winding remains unprotected.

   ii)   Value of earth resistance to achieve 75% protection of winding. **(10 Marks)**

8 a. Draw and explain the Buchholz relay for protection of power transformer. **(08 Marks)**

   b. With the neat circuit diagram, explain how the protection of Induction motor is possible by a single phase preventer. **(06 Marks)**

   c. List the various abnormal conditions against which a large induction motor has to be protected. **(06 Marks)**

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