[5354]-632

B.E. (Electrical)

SWITCHGEAR AND PROTECTION

(2012 Pattern)

Time : 2½Hours]   *[Max. Marks : 70*

Instructions to the candidates:

    1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.

    2) Neat diagrams must be drawn wherever necessary.

    3) Figures to the right indicate full marks.

    4) Use of electronic pocket calculator is allowed.

    5) Assume suitable data, if necessary.

Q1) a) Draw and explain the trip circuit of circuit breaker. **[6]**

    b) In a 220kV system, the reactance and capacitance up to the location of circuit breaker is 8Ω and 0.025μF, respectively. A resistance of 600Ω is connected across the contacts of the circuit breaker. **[4]**

    Determine the following :

    i) Natural frequency of Oscillation.

    ii) Damped frequency of Oscillation.

    iii) Critical value of resistance which will give no transient oscillation.

OR

Q2) a) Explain the current chopping phenomenon. **[6]**

    b) Write a note on "Autoreclosing". **[4]**

Q3) a) Explain the different ratings of a circuit breaker. **[6]**

    b) What are the various causes of faults? **[4]**

OR

P.T.O.

Q4) a) State and derive the equation for restriking voltage, RRRV and max. RRRV. **[6]**

b) A CB is tested for its make-break test. The values obtained during the testing are as follows : Under a faulty condition, the CB is closed and the peak of the first envelop of current is recorded as 50kA. The peak to peak system voltage is 36kV. The AC & DC component of the breaking test are 25kA and 10kA respectively. Determine : **[4]**

   i) Rated line voltage for which the breaker is to be installed.

   ii) Peak making current

   iii) Symmetrical breaking current.

   iv) Asymmetrical breaking current.

Q5) a) Draw and explain Horn-Gap arrester. **[8]**

b) Draw block diagram of static relays also mention its advantages and limitations. **[8]**

OR

Q6) a) Explain how to protect an overhead transmission line from direct lightning strokes. **[8]**

b) What is PMU? Draw and explain it with block diagram. **[8]**

Q7) a) Explain "the magnetic inrush current" phenomenon in transformer and how to overcome the same. **[8]**

b) What are the abnormal conditions and causes of failure in 3 phase induction motor. **[8]**

OR

Q8) a) Explain the protection of alternator against **[10]**

   i) Interturn faults

   ii) Loss of excitation

   iii) Loss of prime - mover

b) A generator is provided with 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 such that it trips for 25% out of balance. Calculate the resistance to be added in neutral to ground connection. **[6]**

Q9) a) Explain with neat diagram high impedance differential protection for busbar. **[8]**

b) Write a note on :

i) Three stepped distance protection **[4]**

ii) WAM **[6]**

OR

Q10) a) Explain how impedance relay is used for transmission line protection. Derive its torque equation & draw its characteristics on R-X plain. **[8]**

b) i) Draw the algorithm for impedance numerical relay. **[4]**

ii) Draw and explain schematic of carrier aided protection. **[6]**

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