

Code : 031713

B.Tech 7th Semester Exam., 2018

PROTECTION OF POWER APPARATUS
AND SYSTEM

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct answer of the following
(any seven) : $2 \times 7 = 14$

(a) Mho relay is normally used for the protection of

- (i) long transmission lines
- (ii) medium transmission lines
- (iii) short transmission lines

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(Turn Over)

(2)

(b) Reactance relay is normally preferred for protection against

- (i) earth fault only
- (ii) phase fault only
- (iii) None of the above

(c) If the fault current is 2000 amps, the relay setting 50% and the CT ratio is 400/5, then the plug setting multiplier will be

- (i) 25 amps
- (ii) 15 amps
- (iii) 50 amps
- (iv) None of the above

(d) Carrier current protection scheme is normally used for

- (i) HV transmission lines only
- (ii) HV cable only
- (iii) HV transmission and cables

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(Continued)

- (e) The reset to pick up current for an induction cup relay is approximately
- (i) 0.99
 - (ii) 1.01
 - (iii) 0.75
 - (iv) None of the above
- (f) If the time of operation of a relay for unit TMS is 10 second, the time of operation for 0.5 TMS will be
- (i) 20 seconds
 - (ii) 5 seconds
 - (iii) 10 seconds
 - (iv) None of the above
- (g) The shape of the disc of an induction disc relay is
- (i) circular
 - (ii) spiral
 - (iii) elliptical
 - (iv) None of the above
- (h) If the phase angle of the voltage coil of a directional relay is 50° , the maximum torque angle of the relay is
- (i) 130°
 - (ii) 100°
 - (iii) 25°
 - (iv) None of the above

- (i) The percent bias for a generator protection lies between
- (i) 5 to 10
 - (ii) 10 to 15
 - (iii) 15 to 20
 - (iv) None of the above
- (j) A shunt fault is characterized by
- (i) increase in current, frequency and p.f.
 - (ii) increase in current, reduction in frequency and p.f.
 - (iii) increase in current and frequency and reduction in p.f.
 - (iv) None of the above

2. (a) Discuss the recovery rate theory and energy balance theory of arc interruption in a circuit breaker. 6
- (b) Describe with neat sketches the working of the cross-jet explosion pot of an oil circuit breaker. Compare its merits and demerits with other types of arc control devices. 8

3. (a) In a 132 kV system, the reactance per phase up to the location of the circuit breaker is 5Ω and capacitance to earth is $0.03 \mu\text{F}$ respectively. Determine (i) the maximum value of restricting voltage, (ii) the maximum value of RRRV and (iii) the frequency of transient oscillations. 8

- (b) Discuss the working principle of a permanent magnet moving coil relay with a neat sketch. State the area of its applications. 6

4. (a) Why are IDMT relay widely used for over-current protection? 6

- (b) In what way is distance protection superior to over-current protection for the protection of transmission line? 8

5. (a) What are different types of distance relays? Compare their merits and demerits. Discuss their field of applications. 7

- (b) Explain why a MHO characteristic is preferred for the protection of long lines against phase faults, where a reactance relay is preferred for ground faults. 7

6. (a) Explain why a reactance relay is preferred for the protection of short lines against both, phase faults as well as ground faults. 7

- (b) Discuss the limitations of wire pilot protection. What type of pilot is used for the protection of EHV and UHV transmission lines? 7

7. (a) What is carrier current protection? For what voltage range is used for the protection of transmission lines? What are its merits and demerits? 7

- (b) What is unit protection? What are its merits and demerits? How does carrier aided distance protection give better performance than carrier current protection? 7

8. (a) What type of protection device is used for the protection of an alternator against overheating of its (i) stator and (ii) rotor? Discuss them in brief. 7

- (b) What is Buchholz relay? Which equipment is protected by it? For what types of faults is it employed? Discuss its working principle. 7

9. (a) An 11 kV, 100 MVA generator is provided with differential scheme of protection the percentage of the generator winding to be protected against phase to ground fault is 80%. The relay is set to operate when there is 15% out of balance current. Determine the value of the resistance to be placed in the neutral to ground connection. 8
- (b) What is magnetizing inrush current? What measures are taken to distinguish between the fault current and inrush current? 6

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