

B.E/B.Tech Degree Examination, December 2020  
Seventh Semester  
**EE16702 – PROTECTION AND SWITCHGEAR**  
(Regulation 2016)

Time: Three hours

Maximum :80 Marks

Answer **ALL** questions**PART A - (8 X 2 = 16 marks)**

1. The burden of a protective relay is the power  
(A) Required to operate the circuit breaker (B) Absorbed by the circuit of relay (C) Developed by the relay circuit (D) None of the above
2. When the fault current is 2000 A, for a relay setting of 50% with CT ratio 500/5, the plug setting multiplier will be?  
(A) 16 (B) 12 (C) 4 (D) 8
3. Carrier current protection the purpose of the wave trap is for  
(A) Trapping power frequency waves (B) Trapping high frequency waves entering into generators/transformer unit (C) Trapping low frequency waves entering into generators  
(D) None of the above
4. Air blast circuit breakers for 400 kV power systems are designed to operate in  
(A) 100 micro-second (B) 50 milli-second (C) 0.5 second (D) 0.1 second
5. Differentiate short circuit and overload.
6. Determine the Plug Setting Multiplier of a 5A, 3 second over current relay having a current setting of 125 % and time setting multiplier of 0.6 connected to the supply circuit through a 400/5 current transformer when the circuit carries a fault current of 4000 A.
7. What is the cause of over speed and how alternators are protected from it?
8. Justify how static relays are meritorious than electromagnetic relays.

**PART B - (4 X16 = 64 marks)**

09. (a) (i) Illustrate the essential qualities of protective relaying system. **(8)**  
(ii) Analyze the various methods of neutral grounding. **(8)**
- (OR)**
- (b) In a 3-phase system, if the per unit values of positive, negative and zero sequence reactance's are given by  $j0.1$ ,  $j0.085$  and  $j0.05$  respectively. **(16)**  
Determine the fault current, if the fault is (a) L-L-G (b) L-L
10. (a) Examine the universal torque equation and illustrate with R-X diagram for the following types of distance relays. **(16)**

- i) Impedance relay
- ii) Reactance relay
- iii) Mho relay

**(OR)**

- (b) A generator is protected for earth fault protection. The generator ratings are 13.2 kV, 10 MVA. The percentage of winding protected against phase to ground fault is 85%. The relay setting is such that it trips for 20% out of balance current. Calculate the resistance to be added in the neutral to ground connection. **(16)**

11. (a) (i) Draw the block diagram of numerical relay and analyze the various components of it. **(10)**
- (ii) Examine the need of current chopping and resistance switching. **(6)**

**(OR)**

- (b) Illustrate with a suitable example, Artificial intelligence application to power system protection. **(16)**

12. (a) With a neat block diagram, discuss the construction, operating principle and applications of SF<sub>6</sub> and Vacuum circuit breakers. What are its advantages over other circuit breakers? **(16)**

**(OR)**

- (b) In a 220 KV system, the reactance and capacitance up to the location of circuit breaker is 8Ω and 0.025 μF respectively. A resistance of 600 Ω is connected across the contacts of the circuit breaker. Determine the following: **(16)**
- (a) Natural frequency of oscillation
  - (b) Damped frequency of oscillation.
  - (c) Critical value of resistance which will give no transient oscillation.
  - (d) The value of resistance which will give damped frequency of oscillation, one fourth of the natural frequency of oscillation.