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**Question Paper Code : 20467**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Seventh Semester

Electrical and Electronics Engineering

EE 6702 – PROTECTION AND SWITCHGEAR

(Regulations 2013)

(Common to PTEE 6702 – Protection and Switch Gear for B.E (Part – Time) Sixth Semester – Electrical and Electronics Engineering – Regulations 2014)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the effects of short circuit faults on power system, if the fault remain uncleared?

2. How protective relays are classified based on their functions?

3. Differentiate time graded system and current graded system used in overcurrent protection.

4. What are the factors affecting the performance of differential relays?

5. In the event of faults in generator windings, field excitation is to be suppressed as early as possible. Why?

6. Which type of protection scheme is preferred for EHV and UHV power lines?

7. In what way the static relays are meritorious than electromagnetic relays?

8. List the electronic circuits commonly used in static relays.

9. Why the rate of rise of restriking voltage plays important role in circuit breaker operation?

10. Why oil circuit breakers are not suitable for heavy current interruption at low voltages?

PART B — (5 × 13 = 65 marks)

11. (a) (i) What are the essential requirements of protective relaying? Justify. (7)

(ii) Discuss briefly about primary protection and back-up protection. (6)

Or

(b) Discuss the following neutral grounding schemes. Illustrate your answers with appropriate phasor diagrams, benefits and recommendations.

(i) Resistance earthing (5)

(ii) Reactance earthing (3)

(iii) Arc suppression coil (5)

12. (a) Explain various time-current characteristics of an overcurrent relay with relevant applications. Also comment about the technique to realize those time–current characteristics using electromagnetic relays.

Or

(b) Discuss with relevant connection diagram and phasor diagram, the directional overcurrent relay.

13. (a) An alternator rated at 10 kV protected by the balanced circulating current system has its neutral grounded through a resistance of 10 ohms. The protective relay is set to operate when there is an out of balance current of 1.8 A in the pilot wires which are connected to the secondary windings of 1000/5 CT ratio. Determine the percentage of winding which remains unprotected and minimum value of earthing resistance required to protect 80% of the winding.

Or

(b) Explain how a transformer can be protected against magnetizing inrush current. Illustrate with suitable diagram.

14. (a) Discuss in detail, the integrating type and instantaneous type static amplitude comparators. Illustrate your answer with appropriate circuits and waveforms.

Or

(b) How static overcurrent relays are different from electromechanical overcurrent relays?. Explain how the operation of instantaneous overcurrent relay is achieved using electronic circuits.

15. (a) Describe the constructional and operational aspects of cross blast and axial blast air circuit breakers (ACB). Also discuss the meritorious features of ACB over Oil circuit breakers.

Or

(b) Derive the expression to find the critical value of resistance to be connected across the circuit breaker contacts.



PART C — (1 × 15 = 15 marks)

16. (a) In a 132 kV, 50 Hz system, the inductance and capacitance up to the location of the circuit breaker is and 0.02 $\mu F$ respectively. A resistance of 600 Ω is connected across the contacts of the circuit breaker. Determine

(i) Natural frequency of oscillations.

(ii) Damped frequency if oscillations and

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

Or

(b) Consider a ring main feeder with one infeed bus and three outgoing bus. Design a overcurrent protection scheme for a short circuit fault at the middle of the feeder connecting two outgoing buses. Represent the given case as single line diagram and illustrate your answer by indicating the location of circuit breakers, operating time of each circuit breaker for the given fault. Also mention which relay should be with directional feature.

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