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Question Paper Code : 71785

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Seventh Semester

Electrical and Electronics Engineering

EE 6702 – PROTECTION AND SWITCHGEAR.

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the types of fault.
2. Give the difference between circuit breaker and switch.
3. Why a shading ring is provide in a induction disc relay?
4. What are the difficulties of differential protection?
5. What is the need for instrument transformer?
6. What are the limitations of buchholz relay?
7. Define sampling theorem.
8. Write about numerical transformer differential protection.
9. Define restriking voltage.
10. What is rupturing capacity?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss in detail about different protection schemes.
(ii) Explain Arc suppression coil earthing with neat diagram.

Or

- (b) Explain how fault current is calculated using symmetrical components.

12. (a) Explain the construction and operating principle of impedance type distance relay with R-X Diagram.

Or

- (b) With the necessary sketches discuss in detail about electromagnetic attraction type relays relay.

13. (a) Give a detailed explanation for protection of transformer using differential protection which includes associated faults.

Or

- (b) Give a detailed explanation about CT'S and PT's and its application to power system.

14. (a) Explain the block diagram of numerical relay with necessary diagram.

Or

- (b) With a neat sketch discuss in detail about the synthesis of reactance relay using phase comparator.

15. (a) Write short notes on :

- (i) Current chopping
- (ii) Interruption of capacitive current.

Or

- (b) With a neat diagram explain the construction and working principle of Air Blast circuit breaker and Vacuum circuit breaker.



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Ans

Question Paper Code : 41012

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Seventh Semester

Electrical and Electronics Engineering

EE6702 – PROTECTION AND SWITCHGEAR

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Why protection scheme is needed for power system ?
2. Write down the importance of symmetrical components for fault current calculation.
3. Mention the principle of operation of distance relay.
4. Determine plug setting multiplier of a 5 ampere, 3 second over current relay having a current setting of 125% and a time setting multiplier of 0.6 connected to supply circuit through a 400/5 current transformer when the circuit carries a fault current of 4000 A.
5. What is the cause of over speed and how alternators are protected from it ?
6. What are the protection methods used for transmission line ?
7. List out the general characteristics of numerical protection.
8. What are the basic circuits used in static relays ?
9. What are the factors responsible for the increase of arc resistance ?
10. A circuit breaker is rated as 1500 A, 1000 MVA, 3 second, 3 phase oil circuit breaker. Find rated making current.



PART – B

(5×16=80 Marks)

11. a) i) Explain clearly about the zones of protection in power system. (8)
 ii) Briefly discuss about nature and causes of faults. (8)
 (OR)
- b) Explain in detail about the need and different methods for neutral grounding with suitable diagram. (16)
12. a) i) With neat sketch explain negative sequence relay. (8)
 ii) Explain clearly about current balance differential relays. (8)
 (OR)
- b) Explain impedance relay with suitable R-X diagrams. (16)
13. a) i) Explain clearly about Buchholz relay for the protection of incipient faults in transformers. (10)
 ii) A star connected, 3 phase, 10 MVA, 6.6 KV alternator has a per phase reactance of 10%. It is protected by Merz-price circulating-current principle which is set to operate for fault currents not less than 175 A. Calculate the value of earthing resistance to be provided in order to ensure that only 10% of the alternator winding remains unprotected. (6)
 (OR)
- b) i) With neat sketch explain the protection schemes for motors. (8)
 ii) With suitable diagrams explain bus bar protection. (8)
14. a) Describe the construction, working principle and operation of static over current relay. (16)
 (OR)
- b) i) Compare static relays with electromagnetic relays. (8)
 ii) Explain the advantages of Numerical relays. (8)
15. a) i) With neat sketch explain resistance switching. (8)
 ii) Explain current chopping with suitable diagrams. (8)
 (OR)
- b) Explain the construction, working principle, operation and application of Vacuum circuit breakers. (16)

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Question Paper Code : 52965

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh Semester

Electrical and Electronics Engineering

EE 6702 – PROTECTION AND SWITCHGEAR

(Regulation 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. Give the consequences of short circuit.
2. Define protected zone.
3. Draw the R-X diagram for the reactance and mho relay.
4. What is an under frequency relay?
5. What are the errors in CT?
6. Why busbar protection is needed?
7. What is static relay?
8. List the merits of Numerical relays.
9. What do you mean by current chopping?
10. What are the advantages of oil as arc quenching medium?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the different faults occurring in power system. Which of these are more frequent?
(ii) Formulate an expression for the reactance of the Peterson coil in terms of capacitance of the protected line.

Or

- (b) (i) Explain the overlapping of protective zones with neat sketch.
(ii) Describe the essential qualities of a protective relay.

12. (a) Describe the construction and principle of operation of an induction type directional over current relay.

Or

- (b) With neat diagram, describe the construction and principle of operation of Negative sequence relay.

13. (a) Describe the various methods of transformer protection.

Or

- (b) Discuss the different methods employed for the protection of Transmission Lines.

14. (a) Draw the schematic block diagram of a Static over current relay and explain the operation.

Or

- (b) Explain the operation of distance protection of transmission lines using static comparators with neat diagram.

15. (a) (i) Explain the Various arc interruption methods.
(ii) Describe the operating principle of DC circuit breaker.

Or

- (b) With neat diagram, explain the construction and principle of operation of Air blast circuit breaker.

PART C — (1 × 15 = 15 marks)

16. (a) Discuss the different types of Lightning arresters with neat diagram. (15)

Or

- (b) (i) With a neat sketch, explain the differential system of protection applied to star delta connected transformer. (8)

- (ii) What are the problems arising in differential protection in power transformer and how are they overcome? (7)



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Question Paper Code : 50494

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Seventh Semester

Electrical and Electronics Engineering

EE6702 – PROTECTION AND SWITCHGEAR

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. What is primary protection ?
2. Give the types faults.
3. Write the torque equation of the universal relay.
4. Give the principle of negative sequence relay.
5. Why secondary of transformer should not be opened ?
6. List the types of busbar protection.
7. Define static relay.
8. What is phase comparator ?
9. State the Slepian theory for arc interruption.
10. Define symmetrical breaking capacity.

PART – B

(5×16=80 Marks)

11. a) Explain the various methods of neutral grounding.

(OR)

- b) What are the essential qualities of protective relay ? Explain in detail.



12. a) With neat diagram explain the various types of electromagnetic relays.

(OR)

b) Describe the construction and principle of operation of non-directional Induction type over current Relay.

13. a) Give a brief account on the protection of generator using differential and biased differential protection scheme.

(OR)

b) Give a brief account on the faults and protection of transformers.

14. a) Explain with neat block diagram the operation of static relay and list the advantages and disadvantages.

(OR)

b) Describe the operation of static over current relay with neat diagram.

15. a) Write short notes on :

- i) Current chopping
- ii) Resistance switching

(OR)

b) Describe the construction and principle of operation of Air blast circuit breaker.

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Question Paper Code : 20467

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 600Ω 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.

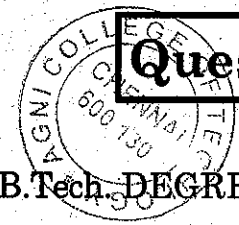
Or

- (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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Question Paper Code : 91500

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Seventh Semester

Electrical and Electronics Engineering

EE 6702 – PROTECTION AND SWITCHGEAR

(Regulations 2013)

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

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. What is the significance of backup protection ?
2. Mention the necessity of providing earth wire in overhead transmission lines.
3. Classify electromagnetic relays.
4. Compare over current and under current relays.
5. How alternators are protected against over speeding ?
6. What is the role of Buchholz's relay ?
7. State the superiority of static relay over electromagnetic relay.
8. How does a numerical over current relay work ?
9. List the methods of arc interruption in circuit breaker.
10. Write specific reasons that support Minimum Oil Circuit Breaker is superior than Bulk Oil Circuit Breaker.



PART - B

(5×13=65 Marks)

11. a) Explain in detail about the nature of occurrence and types of fault in the power systems.

(OR)

b) Write a detailed note on different neutral point grounding schemes of the power systems.

12. a) Describe the principle of operation of various differential relays with neat sketches.

(OR)

b) Discuss in detail about the construction and working principle of Non-directional over current relay.

13. a) Write a detailed note on various faults associated with an generator and also provide information about how Merz-Price Protection Scheme is employed for generators .

(OR)

b) Write a detailed note on different protection schemes used for motor protection.

14. a) Discuss in detail the diagram the working of numerical transformer differential protection.

(OR)

b) Describe with neat block diagram the working of static instantaneous over current protection relay.

15. a) Explain the construction, operating principle of sulphur hexafluoride circuit breakers with neat diagram.

(OR)

b) Explain with neat sketch the construction, operating principle of Bulk oil circuit breakers with its applications and merits.

PART - C

(1×15=15 Marks)

16. a) The neutral point of a three phase 20MVA, 11 kV alternator is earthed through a resistance of 5 ohms, the relay is set to operate when there is an out of balance current of 1.5 A. The CT, have a ratio of 1000/5. What is the percentage of winding protected ? Also calculate the earthing resistance required to protect 90% of the winding.

(OR)

b) A 20 MVA transformer which is used to operate at 30% overload feeds a 11 kV bus bar through a circuit breaker. The transformer circuit breaker is equipped with a 1000/5 current transformer and the feeder circuit breaker with 400/5 current transformer and both the current transformers feed IDMTL relays having the following characteristics.

Plug Setting	2	3	5	10	15	20
Multiplier time (seconds)	10	6	4.1	3	2.5	2.2

The relay on the feeder circuit breaker has 125% plug setting and a 0.3 time multiplier setting. If a fault current of 5000 A flows from the transformer to the feeder, Determine

- i) Operating time of feeder relay. (10)
- ii) Suggest a suitable plug setting and time multiplier setting of the transformer relay to ensure adequate discrimination of 0.5s between the transformer relay and feeder relay. (5)