

23681

M. Tech. 2nd Semester (EEE)

Examination, May-2026

Advanced Switchgear and Protection

Paper : MTEEE-502

Time allowed : 3 Hours]

[Maximum marks : 100

Note : Attempt any five questions in all. All questions carry equal marks. Assume suitable data whenever necessary.

1. (a) Explain the theory of arc interruption in a circuit breaker. What factors help in arc extinction? 10
- (b) Briefly describe current chopping in a circuit breaker and mention its effects. 10
2. Discuss the classification of circuit breakers based on the medium used for arc extinction. Give working principles, construction and application of SF6 circuit breaker. 20

23681-P-3-Q-8 (26)

[P.T.O.]

(2)

23681

3. (a) What is IDMT relay? Explain its time-current characteristics and typical applications in distribution networks. 10
- (b) Describe the essential qualities of protective relays. Why are these qualities important for effective system protection? 10
4. (a) What is carrier current protection? Explain how it helps in protecting high-voltage transmission lines. 10
- (b) Explain the concept of primary and backup protection. How is backup protection coordinated with primary protection? 10
5. (a) Why is differential protection commonly used for transformers? Explain briefly. 10
- (b) Explain the need for bus zone protection. What methods are used to protect busbars? 10
6. Discuss feeder protection in distribution networks. Explain time graded overcurrent protection and its coordination. 20

23681

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23681

7. Discuss in detail the classification of static relays. Explain with diagrams the working of amplitude comparator and phase comparator. 20
8. Compare electromagnetic, static, and numerical relays in terms of construction, performance and applications. 20

23681

23682

M. Tech 2nd Semester (EEE)

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AI Techniques

Paper : MTEEE-504

Time allowed : 3 Hours]

[Maximum marks : 100

Note: All questions carry equal marks. Question No. 1 is compulsory. In addition to the compulsory questions, students will have to attempt four more questions, selecting one question from each unit.

1. Compulsory Question

- (a) Write two limitations of the perceptron model.
- (b) What is a multi-category perceptron?
- (c) What is crossover and mutation in genetic algorithms?
- (d) Write a short note on the convergence of genetic algorithms.
- (e) Define cardinality in the context of fuzzy sets.
- (f) List any two common membership functions used in fuzzy logic.
- (g) Name two applications of fuzzy logic in motor speed control.
- (h) What is load forecasting and how is AI used in it?

23682-P-2-Q-9(26)

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Unit-I

2. Describe perceptron models (discrete, continuous, and multi-category) with training algorithms.
3. Discuss different neural network architectures and explain knowledge representation in neural networks.

Unit-II

4. Explain genetic algorithms with encoding, fitness functions, and reproduction operators.
5. Describe Radial Basis Function (RBF) algorithms and their applications.

Unit-III

6. Describe fuzzy relations and properties of fuzzy relations.
7. Explain membership functions and their importance in fuzzy set theory.

Unit-IV

8. Explain defuzzification and its various methods.
9. Discuss the applications of AI techniques in economic load dispatch and load frequency

23683

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FACTS CONTROLLER

Paper-MTEEE-506

Time allowed : 3 hours]

[Maximum marks : 100

Note : Attempt atleast one question from each unit and attempt in total five questions. All questions carry equal marks.

Unit-I

1. (a) Explain Power flow in AC system.
(b) What are applications from FACTS Controllers ?
2. (a) Discuss Losses and speed of switching.
(b) Explain Series and Parallel FACTS Controllers.

Unit-II

3. (a) Explain Transformer connections for 48 Pulse operation.
(b) Explain Pulse width modulation converter.
4. (a) Explain 3phase full wave bridge converter.
(b) Explain single phase leg Pole operation.

Unit-III

5. (a) Explain switching converter type VAR Generators.
(b) Discuss objectives of shunt compensation.
6. (a) Explain TSC-TCR.
(b) Explain Voltage regulation for Line segmentation.

23683-P-2-Q-8(26)

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Unit-IV

7. (a) Explain Power Oscillation damping.
(b) Explain slope transfer function.
8. (a) Explain the working of STATCOM with a neat sketch.
(b) Explain the control schemes for TCSC.

23684

M. Tech. 2nd Semester (EEE)

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DISTRIBUTED COMPUTER CONTROL SYSTEM

Paper : MTEEE-508

Time allowed : 3 Hours] [Maximum marks : 100

Note : Students have to attempt any **five** questions in total. All questions carry equal marks.

1. (a) What is the aim of plant automation?
(b) Write about the main features of classical approach to plant automation.
2. Write a note on :
(a) Functional levels.
(b) Database organizations
3. (a) What is field domain data communication link?
(b) Explain transfer of process data.
4. (a) Explain manufacturing automation protocols.
(b) Write about buses and communication network of DCS

23684-P-2-Q-8 (26)

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5. (a) Write a note on real-time operating system communication software.
(b) Describe process oriented language.
6. (a) What is application software?
(b) Write a note on software configuration.
7. (a) Define reliability and its basics.
(b) Write about reliability concepts in DCS.
8. Mention application of reliability in :
(a) Power Plant
(b) Iron and Steel Plant

23685

M.Tech. 2nd Semester (EEE)

Examination, May-2026

DEMAND SIDE ENERGY MANAGEMENT

Paper : MTEEE-518

Time allowed : 3 Hours]

[Maximum marks : 100

Note : Attempt five questions in all, selecting one question from each section.

Section-A

1. Define Net Present Value (NPV) and explain its significance in project evaluation. How is the NPV method used to determine the viability of an energy project? 20
2. Explain the concept of depreciation and its role in energy economics. Describe the Straight-Line Depreciation method with an example. 20

Section-B

3. Explain the economic benefits of power factor correction in industries. What are the various methods used for power factor improvement? 20

23685-P-2-Q-8 (26)

23685 [P.T.O.]

4. How can utilities improve their load factor for better energy efficiency? Discuss the importance of voltage regulation in energy conservation. 20

Section-C

5. What is electric lighting and why is it important in energy management? Explain the significance of an energy management program in lighting systems. 20
6. What is non-task lighting and where is it commonly used? What are the best practices for outdoor and landscape lighting? 20

Section-D

7. What is HVAC and why is it important in building energy management? Explain the different types of heat transfer involved in space heating. 20
8. Explain the working principle of electric resistance heating. What is a heat pump and how does it improve heating efficiency? 20