

Government Polytechnic, Rajkot

Electrical Engineering Department

Diploma in Electrical Engineering, Semester-4

Course Name: **Utilization of Electrical Power**

Course Code: **DI04000181**

Question Bank

Unit – 1 Electrical Traction Supply System

Supply System

1. Write a short note on the current scenario of electrification of railway lines in India.
2. Draw key schematic diagram of 25kV AC traction substation.
3. List major equipments used in a Traction Substation and give brief details.

Current Collection

4. Write various types of overhead current collecting systems.
5. Explain construction and working of pantograph current collector with diagram.
6. Write different types of catenary systems. Explain any one.
7. Explain the construction and working of double catenary system.
8. Draw key diagram of Feeding Post.

Motors & Speed Control

9. Write electrical features of traction motor.
10. List various types of motors used for traction purpose.
11. Draw and explain speed torque characteristics of dc series motor.
12. Draw and explain speed torque characteristics of 3 phase induction motor
13. Why dc series motor is best suited for traction system? Explain.

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Coach Wiring & Auxiliary Equipments

14. List various types of Auxiliary supply and explain any one.
15. Explain the working of brushless alternator.
16. Compare 110V DC system with 24V DC system.
17. List the auxiliary equipments used in electric locomotive
18. Explain the function of Arno convertor
19. Draw and explain block diagram of Static Converter.
20. Write a short note on hotel load converter.
21. Write short note on distributed power wireless control system.

Braking

22. Write the types electrical braking.
23. Explain regenerative braking system used for ac series motor.
24. What is plugging? How it is employed to dc series motor?

Locomotives

25. Classify electric locomotives.
26. Explain the specifications of D.C locomotive
27. Draw the layout of the DC locomotive and label the main components.
28. Draw the layout of single-phase ac locomotive and label the main components.
29. Draw power circuit diagram of composite locomotive, state and explain functions of main equipments used in it.
30. List major equipments used in electric locomotives and explain any two.
31. Block diagram of locomotive power circuit.
32. Write equations of specific energy output and specific energy consumption.

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Unit 2: Applications of Electric Furnace

1. Explain construction of electric arc furnace(EAF).
2. Describe working of electric arc furnace.
3. State factors affecting the capacity utilization of electric arc furnace.
4. Write a short note on Energy Efficient EAF Technologies.
5. Explain working principle of induction heating / induction furnace.
6. Describe construction & working of coreless induction furnace.

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Unit 3: Electrostatics & Electroplating Applications

1. What is electrostatic paint? Explain the working principle of electrostatic painting.
2. List different electrostatic charging methods. Explain Corona charging in detail.
3. Explain the 'Faraday cage effect' and 'Wraparound effect' with respect to electrostatic painting.
4. Explain the principle of electroplating with a suitable diagram

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Unit 4: Street Lighting

Laws of Illumination & Definitions

1. Define
 - a. Illumination
 - b. Absorption factor
 - c. Luminous flux
 - d. Lamp Efficiency
 - e. Waste Light factor
 - f. Luminous Intensity
2. Explain Solid angle.
3. Explain Depreciation factor and Utilization factor.
4. Establish relation between plane angle and solid angle.
5. Explain space height ratio.
6. Describe basic principle of Luxmeter.
7. Explain Cosine law of illumination.
8. Explain inverse square law of illumination.

Various Lamps

9. Explain construction and working principle of sodium vapor lamp.
10. Give the advantages of Electronic Ballast.
11. Explain the construction of electronic ballast with the help of diagram.
12. State and explain requirements of good lighting scheme / Explain different types of lighting schemes.

Street Lighting

13. State and explain factors affecting street light pole arrangement.
14. Write a short note on pole spacing optimization.
15. Estimate watt rating of street light luminaries.
16. Explain methods for illumination measurement.

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Unit 5: Applications of Regenerative Braking

1. How regenerative braking works in Electric Vehicle (EV)?
2. State the advantages of regenerative braking.
3. Discuss the application and benefits of regenerative braking in E-bicycles, E-scooters, and electrical trains/metros.
4. Explain how the number of stops affects energy saving in an electric train.
Calculate the energy saving considering 50% and 75% regenerative braking efficiency.
5. Based on case studies, compare the energy savings obtained through regenerative braking in an electric car (on flat/descent) with that of an electric train (varying number of stops).

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Unit 6: Reactive Power Compensation

1. Define power factor.
2. Describe adverse effects of low power factor in detail.
3. Discuss various methods of power factor improvement.
4. Derive the condition for most economical power factor.
5. List advantages of Reactive Power Management using Capacitors.
6. Explain in detail: Centralized Reactive Power Compensation.
7. Write short note on “Effect of Power Factor on Cable Size & Energy Savings”