Unit-IV

Electric Traction and Track Electrification

1. Electric traction means:

A) Transportation using diesel engines only
B) Transportation using electric power for movement of trains
C) Transportation using steam engines only
D) Transportation using solar power only

Answer: B) Transportation using electric power for movement of trains

2. Which of the following is a DC traction system voltage commonly used?

A) 25 kV AC
B) 750 V DC
C) 132 kV AC
D) 440 V AC

Answer: B) 750 V DC

3. The most widely used railway electrification system in India is:

A) 750 V DC
B) 1.5 kV DC
C) 25 kV, 50 Hz AC
D) 600 V DC

Answer: C) 25 kV, 50 Hz AC

4. In a single-phase AC traction system, power is supplied through:

A) Two overhead conductors
B) One overhead conductor and rails as return path
C) Underground cable only
D) Three conductors

Answer: B) One overhead conductor and rails as return path

5. The frequency used in low-frequency AC traction systems is generally:

A) 50 Hz
B) 60 Hz
C) 16⅔ Hz or 25 Hz
D) 400 Hz

Answer: C) 16⅔ Hz or 25 Hz

6. A composite traction system uses:

A) Only DC motors
B) Combination of AC and DC systems
C) Only three-phase motors
D) Diesel generators only

Answer: B) Combination of AC and DC systems

7. The Kando system is:

A) A DC traction system
B) A single-phase AC traction system with frequency conversion
C) A diesel-electric system
D) A battery-operated system

Answer: B) A single-phase AC traction system with frequency conversion

8. One major advantage of AC traction over DC traction is:

A) Higher conductor losses
B) Easy voltage transformation
C) Lower transmission voltage
D) More substations required

Answer: B) Easy voltage transformation

9. One advantage of DC traction is:

A) Better acceleration and braking characteristics
B) Higher transmission losses
C) Lower efficiency
D) Poor speed control

Answer: A) Better acceleration and braking characteristics

10. Single-phase traction loads cause:

A) Balanced three-phase currents
B) Current and voltage unbalance in the power system
C) Zero harmonics
D) No effect on the grid

Answer: B) Current and voltage unbalance in the power system

11. Speed–time curves are used to determine:

A) Track length only
B) Train performance characteristics
C) Number of passengers
D) Cost of rails only

Answer: B) Train performance characteristics

12. A trapezoidal speed–time curve consists of:

A) Acceleration, constant speed, and braking periods
B) Acceleration only
C) Braking only
D) Constant speed only

Answer: A) Acceleration, constant speed, and braking periods

13. A quadrilateral speed–time curve is generally used when:

A) Free-running period is absent
B) There is coasting between acceleration and braking
C) Acceleration is zero
D) Train remains stationary

Answer: B) There is coasting between acceleration and braking

14. Tractive effort is defined as:

A) Force required to move the train
B) Weight of the train
C) Braking force only
D) Power supplied to the station

Answer: A) Force required to move the train

15. The SI unit of tractive effort is:

A) Joule
B) Newton
C) Watt
D) Volt

Answer: B) Newton

16. Specific energy consumption is:

A) Energy consumed per unit distance traveled
B) Power generated per station
C) Voltage per kilometer
D) Current per passenger

Answer: A) Energy consumed per unit distance traveled

17. Increasing acceleration generally:

A) Reduces schedule speed
B) Increases schedule speed
C) Has no effect on journey time
D) Decreases power requirement

Answer: B) Increases schedule speed

18. Adhesive weight refers to:

A) Total train weight
B) Weight acting on the driving wheels
C) Weight of passengers only
D) Weight of rails

Answer: B) Weight acting on the driving wheels

19. The coefficient of adhesion is the ratio of:

A) Tractive effort to adhesive weight
B) Power to voltage
C) Current to voltage
D) Speed to acceleration

Answer: A) Tractive effort to adhesive weight

20. Braking retardation is:

A) Rate of increase of speed
B) Rate of decrease of speed during braking
C) Constant train speed
D) Tractive effort per unit mass

Answer: B) Rate of decrease of speed during braking

Fill in the Blanks – Electric Traction and Track Electrification (25 Questions with Answers)

1. **Electric traction refers to the movement of trains using _____ power.**
   Answer: electrical
2. **In a DC traction system, power is supplied in the form of _____ current.**
   Answer: direct
3. **Modern railway electrification commonly uses _____ phase AC supply.**
   Answer: single
4. **The standard frequency used in most AC traction systems is _____ Hz.**
   Answer: 50
5. **In low-frequency traction systems, frequencies such as _____ Hz are used.**
   Answer: 16.7
6. **A three-phase traction system requires _____ overhead conductors.**
   Answer: two
7. **The Kando system is a type of _____ traction system.**
   Answer: single-phase
8. **In a composite system, both AC and DC equipment are used for power _____.**
   Answer: conversion
9. **Compared to DC systems, AC systems are more economical for long-distance _____.**
   Answer: transmission
10. **One problem of single-phase traction is current _____ in the supply system.**
    Answer: unbalance
11. **Single-phase traction may also cause _____ unbalance in three-phase networks.**
    Answer: voltage
12. **The force required to move a train is called _____ effort.**
    Answer: tractive
13. **Tractive effort is generally measured in _____.**
    Answer: Newtons
14. **The speed-time curve represents variation of _____ with time.**
    Answer: speed

15. **A trapezoidal speed-time curve consists of acceleration, free-running, coasting, and _____ periods.**
    Answer: braking

16. **The quadrilateral speed-time curve includes a period of constant _____.**
    Answer: speed

17. **Power developed by a locomotive is the product of tractive effort and _____.**
    Answer: speed

18. **Specific energy consumption is expressed in watt-hours per _____.**
    Answer: tonne-kilometer

19. **Increasing acceleration generally reduces the total _____ time.**
    Answer: journey

20. **Braking is used to provide the required _____ of the train.**
    Answer: retardation

21. **Retardation is the rate of decrease of _____.**
    Answer: speed

22. **Adhesive weight is the weight acting on the _____ wheels.**
    Answer: driving

23. **The coefficient of adhesion is the ratio of adhesive force to adhesive _____.**
    Answer: weight

24. **Higher adhesive weight allows greater _____ effort without wheel slip.**
    Answer: tractive

25. **Effective braking performance depends on braking retardation and coefficient of _____.**
    Answer: adhesion

Additional Practice Fill in the Blanks

26. **The period during which power supply is cut off and the train slows naturally is called _____.**
    Answer: coasting

27. **AC traction systems require fewer _____ than DC systems for long-distance transmission.**
    Answer: substations

28. Wheel slipping occurs when tractive effort exceeds the available _____ force.
Answer: adhesive

29. Regenerative braking converts mechanical energy into _____ energy.
Answer: electrical

30. The area under a speed-time curve represents the distance _____.
Answer: traveled

Unit-V

Train Lighting Systems

1. The primary requirement of train lighting is:

A) High fuel consumption
B) Reliable and continuous illumination
C) Frequent battery replacement
D) Low passenger capacity

Answer: B) Reliable and continuous illumination

2. Train lighting systems must provide:

A) Constant illumination despite speed variations
B) Illumination only when the train is moving
C) Lighting only during daytime
D) Variable brightness with speed

Answer: A) Constant illumination despite speed variations

3. In train lighting systems, batteries are mainly used to:

A) Increase train speed
B) Store energy and provide lighting when the generator output is insufficient
C) Reduce coach weight
D) Operate brakes only

Answer: B) Store energy and provide lighting when the generator output is insufficient

4. One special requirement of train lighting is:

A) Resistance to vibration and shocks
B) High heat generation
C) Large wiring losses
D) Frequent maintenance

Answer: A) Resistance to vibration and shocks

5. The objective of obtaining unidirectional polarity constant output is:

A) To provide a stable DC supply to lamps and batteries
B) To increase AC frequency
C) To reduce coach capacity
D) To stop battery charging

Answer: A) To provide a stable DC supply to lamps and batteries

6. In the Single Battery System, the battery is connected: