

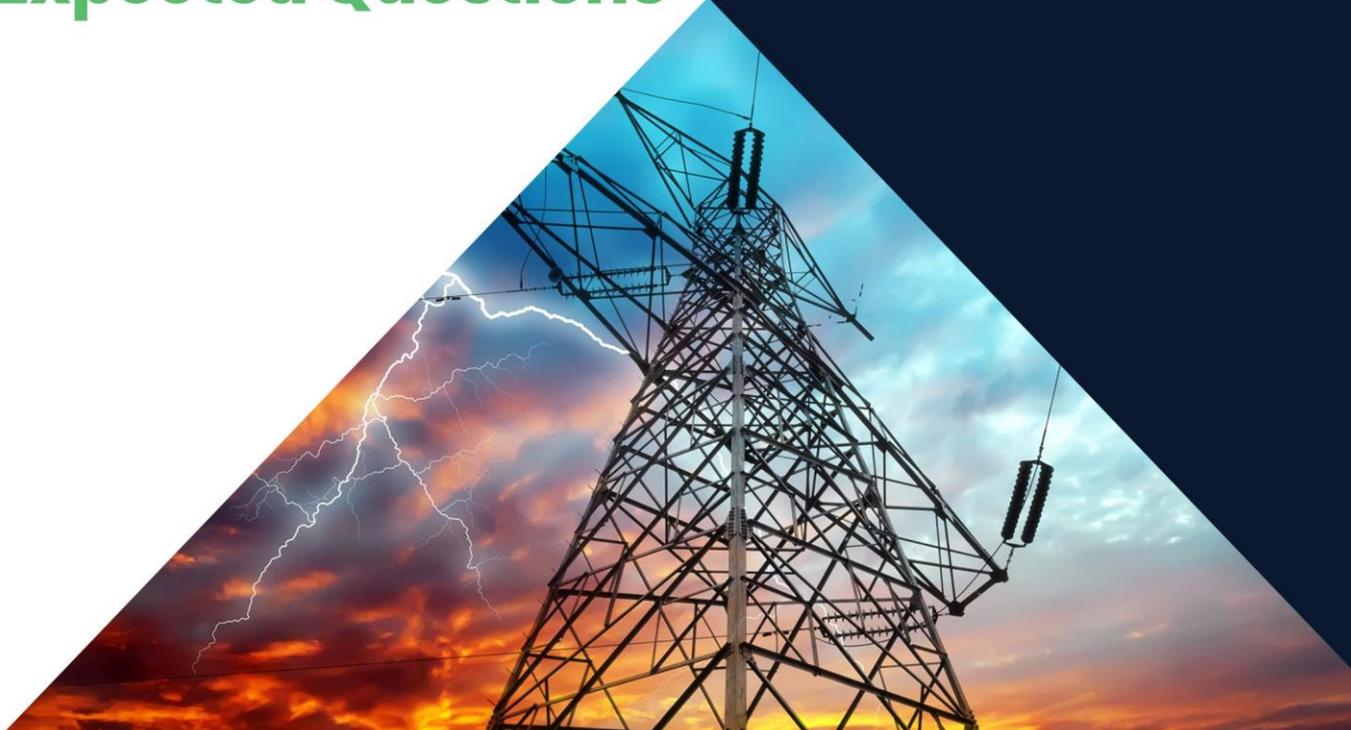


# AE/JE Foundation

## Electrical Engineering

### **Estimation & Costing and Utilization of Electrical Energy**

### **Top 100 Most Expected Questions**







3. **Rod earthing:** It is the cheapest method of earthing and is employed in sandy areas. In this method, a copper rod is hammered directly into the ground, and no excavation work is required. The earthing lead is joined to this rod with the help of nuts and bolts.

4. **Pipe earthing:** Taking into consideration, the factors such as initial cost, inspection, resistance measurement, etc., G.I. pipe earthing is best form of ground connection. Iron is the cheapest material and remains serviceable even if put in salty mass of earth. The pipe used as earth electrode is galvanized and perforated.

5. **Plate earthing:** In this type of earthing, a copper or G.I. plate of dimensions not less than 60 cm x 60 cm x 3.18 mm or 60 cm x 60 cm x 6.35 mm is used as earth electrode instead of G.I. pipe. The plate is buried into ground in such a way that its face is vertical, and the top is not less than 3 m below the ground.

12. Which of the following wiring have a very long life span?

- A. Cleat wiring
- B. Batten wiring
- C. Conduit wiring
- D. Casing capping wiring

Ans. C

Sol. An electrical conduit is a tube like structure which is used to protect and route electrical wiring in a building or an organization. It can be made up of metal, plastic, fiber or fired clay. These are very rigid but flexible in nature.

13. Factors which affects the soil resistivity is \_\_\_\_\_

- A. Soil Condition
- B. Moisture
- C. Climate condition
- D. All of the above

Ans. D

Sol. Soil plays a significant role in determining the performance of electrode. Soil with low resistivity is highly corrosive. If soil is dry then soil resistivity value will be very high. If soil resistivity is high, earth resistance of electrode will also be high.

**Moisture has a great influence on resistivity value of soil.** The resistivity of a soil can be determined by the quantity of water held by the soil and resistivity of the water itself. Conduction of electricity in soil is through water.

Increase or decrease of moisture content determines **the increase or decrease of soil resistivity**. Thus in dry whether resistivity will be very high and in monsoon months the resistivity will be low.

14. Critical pressure for steam is in range of

- A. 100-200 kg/cm<sup>2</sup>
- B. 50-100 kg/cm<sup>2</sup>
- C. 200-250 kg/cm<sup>2</sup>
- D. above 300 kg/cm<sup>2</sup>

Ans. B

Sol. The critical pressure for steam is in the range of 50 – 100 kg/cm<sup>2</sup>



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15. Which one of the wiring is cheap compare to other?
- A. cleat
  - B. concealed conduit
  - C. Batten
  - D. Conduit

Ans. A

Sol. cleat wiring is the cheapest

16. What should be the height of fix switch boards at per ISI specifications?
- A. 1.5 m
  - B. 3 m
  - C. 2 ft
  - D. 3 ft

Ans. A

Sol. Switch boards should be fitted at height of 1.5 meter Horizontal run of wiring should be a height of 3 meter.

17. What does section 44 refer to
- A. Penalty for interference with meter
  - B. penalty for illegal transmission or use of energy
  - C. penalty for maliciously wasting energy
  - D. Theft of energy

Ans. A

Sol. In 1E act, section 44 deals with penalty for interference with motor.

18. The increase in heat dissipation by air blasts is due to increase in
- A. conduction
  - B. Convection
  - C. Radiation
  - D. All of these

Ans. B

Sol. The increase in heat dissipation by air blasts is due to increase in convection.

19. The rated voltage of a 3 phase power system is given as
- A. Rms line to line voltage
  - B. Peak phase voltage
  - C. Rms phase voltage
  - D. Peak line to line voltage

Ans. A

Sol. The rated voltage of 3 phase power system is rms line to line voltage.

20. Which part of the tower is buried in the ground?
- A. Anchor
  - B. Guy wire
  - C. Braces
  - D. Strut inclined support

Ans. A

Sol. Anchor is the part of the tower which is buried in the ground.

21. What is the minimum clearance when 220 kV and 400 kV lines crossing each other.
- A. 5.49 m
  - B. 3.08 m
  - C. 4.58 m
  - D. 2.44 m

Ans. A



Sol. The minimum clearance is 5.49 m for 220 kv and 400 kv lines cross each other.

22. What is the importance of load shedding?

- A. to improve the power factor
- B. to reduce the peak demand
- C. to run the equipment efficiency
- D. to repair the machine

Ans. B

Sol. Load shedding is a way to distribute demand for electrical power across multiple power sources.

23. The material used in liquid fuses is

- A. SF<sub>6</sub>
- B. distilled water
- C. transformer oil
- D. carbon tetrachloride (CCl<sub>4</sub>)

Ans. D

Sol. The material used in liquid fuses is carbon tetrachloride (CCl<sub>4</sub>).

24. Which type of Earthing is suitable for areas which are sandy in character ?

- A. Rod Earthing
- B. Strip earthing
- C. Plate Earthing
- D. Wire Earthing

Ans. A

Sol. Rod Earthing: This system of earthing is suitable for areas which are sandy in character. This system of earthing is very cheap as no excavation work is involved.

25. Which set of rules are to be verified for a completion of wiring on any new installation.

- A. IE Rule, 1956
- B. IE Rule, 1950
- C. IE Rule, 1960
- D. None of these

Ans. A

Sol. IE Rule, 1956: It contains 143 rules.

- (i) Authorization to form duties.
- (ii) Inspection of electric installation
- (iii) Submission of records by supplier etc.

26. What is the dimension of the copper strips used for the strip earthing?

- A. 30 mm x 4 mm
- B. 30 mm x 3 mm
- C. 25 mm x 3 mm
- D. 25 mm x 4 mm

Ans. D

Sol. If copper is used then desired cross sectional area is 25 mm x 4 mm.

27. Resistivity of earth increases sharply when moisture falls below:

- A. 10 %
- B. 20 %
- C. 30 %
- D. 40 %

Ans. B



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Sol. Resistivity decreases rapidly as the moisture content increases from 20 %.

28. If voltage is increased by "n" times, then the size of the conductor would be
- A. Increased by "n" times
  - B. Increased by "n<sup>2</sup>" times
  - C. Reduced by "1/n" times
  - D. Reduced by "1/n<sup>2</sup>" times

Ans. D

Sol.

$$P = VI \cos \theta$$

$$I = \frac{P}{V \cos \theta}$$

Power loss in conductor,

$$P_L = I^2 R = \left( \frac{P}{V \cos \theta} \right)^2 R$$

$$P_L = \frac{P^2 R}{V^2 \cos^2 \theta}$$

$$\frac{1}{R} = \frac{P^2}{P_L V^2 \cos^2 \theta}$$

$$\text{Now, } R = \frac{\rho l}{A}$$

$$\frac{1}{R} = \frac{A}{\rho l}$$

$$\frac{A}{\rho l} = \frac{P^2}{P_L V^2 \cos^2 \theta}$$

$$A \propto \frac{1}{V^2}$$

Therefore, by increasing the voltage, the area of cross section of the conductor reduces. When voltage is increased by "n" times, hence the size of the conductor reduces by 1/n<sup>2</sup> times.

29. Power distribution by cable is generally adopted for line length
- A. Less than 50 km
  - B. Above 50 km
  - C. Less than 10 km
  - D. Above 10 km

Ans. C

Sol. The length of cable for power distribution is generally less than 10 km.

30. What should be the height of fix switch boards at per ISI specifications?
- A. 1.5 m
  - B. 3 m
  - C. 2 ft
  - D. 3 ft

Ans. A

Sol. Switch boards should be fitted at height of 1.5 meter Horizontal run of wiring should be a height of 3 meter.



31. What should be the size of copper coiling conduction in term of section?

- A. 0.020 sq. inches
- B. 0.20 sq. inches
- C. 0.040 sq. inches
- D. 0.0020 sq. inches

Ans. D

Sol. For wiring all conductors should be mode of copper. They should have across section less than 0.0020 sq. inches.

32. What is the earthing resistance for domestic?

- A. 5  $\Omega$
- B. 2  $\Omega$
- C. 0.5  $\Omega$
- D. 0.05  $\Omega$

Ans. A

Sol. The NFPA and IEEE recommend a group resistance value of 5  $\Omega$  for domestic.

For large power station = 0.5  $\Omega$

Small substation = 2 $\Omega$

33. The cheapest plant in operation and maintenance is

- A. thermal power plant
- B. Nuclear power plant
- C. Hydroelectric power plant
- D. Diesel power plant

Ans. C

Sol. From the point of view of operation and maintenance the cheapest plant is Hydro-electric power plant. Also the initial cost of this plant is highest.

34. Maximum permissible span (in meter) for wooden poles is

- A. 10
- B. 20
- C. 30
- D. 75

Ans. D

Sol. Maximum permissible span in wooden poles is 75.

35. The number of electrodes called spikes used for measuring earth resistance is

- A. Three
- B. One
- C. Two
- D. Four

Ans. C

Sol. Two electrodes called spikes are used for measuring earth resistance.

36. What is the minimum permissible size of aluminium cable for lighting circuit?

- A. 1 mm<sup>2</sup>
- B. 1.5 mm<sup>2</sup>
- C. 2 mm<sup>2</sup>
- D. 0.5 mm<sup>2</sup>

Ans. B

Sol. For copper cable size = 1.1 mm<sup>2</sup>

For aluminium cable = 1.5 mm<sup>2</sup>



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37. For what voltage levels are the screwed conduit circuits used?
- A. Less than 250 V
  - B. For voltages between 250 V – 600 V
  - C. For voltage above 600 V
  - D. None of these

Ans. B

Sol. The screwed conduit circuits operate for the voltages between 250 V to 600 V.

38. What is the maximum distance between the two successive cleats?
- A. 0.25 m
  - B. 0.6 m
  - C. 0.9 m
  - D. 1.25 m

Ans. B

Sol. The maximum distance between the two successive cleats is 0.6 m.

39. What should be the insulation resistance in case of PVC wires?
- A. 12.5 M $\Omega$  / number of outlets
  - B. 82.5 M $\Omega$  / number of outlets
  - C. 2.5 M $\Omega$  / number of outlets
  - D. 10.5 M $\Omega$  / number of outlets

Ans. A

Sol. The insulation resistance for PVC wires should be 12.5 M $\Omega$  / number of outlets.

40. In case of extra high voltage lines, the minimum clearance required above ground should be.
- A. 3.8 m
  - B. 4.5 m
  - C. 6.1 m
  - D. 6.8 m

Ans. C

Sol. No conductor of an overhead line including service erected elsewhere along or across any street shall be at height less than 6.1 m ("5.8 m + 0.3m" for every kV or part thereof by which voltage of the Lines exceeds 33kV" which provided that the minimum clearance along or across any street shall not be less than 6.1 m in case of EHV lines.

41. Which of the following is the main disadvantage of conduit wiring?
- A. Very tough to install
  - B. It is not long lasting
  - C. Very difficult to detect fault
  - D. Appearance is not good.

Ans. C

Sol. **The main advantages of conduit wiring are as follows:**

- 1) The safest wiring, Appearance is better, Long lasting.
- 2) No risk of shock, fire or mechanical wear and tear.
- 3) No risk of damage of cable insulation, Safe from humidity, smoke, steam etc.

**Disadvantages of Conduit Wiring are as follows:**

- 1) Very expensive.
- 2) Installation is not easy.
- 3) Not easy to customize for future.
- 4) Hard to detect the faults.



42. Inside the Earth or Pit, the earthing electrode should be placed :

- A. Vertical
- B. Horizontal
- C. Inclined at 45°
- D. Inclined at any angle other than 45°

Ans. A

Sol. The earthing electrode should be placed at a vertical position inside the earth or a pit.

43. The colour of three phase neutral wire is –

- A. Green
- B. Black
- C. Yellow
- D. White

Ans. B

Sol. ⚡ Ground/Earth wire = Green

⚡ Three phase Neutral = Black

⚡ Phase wire = Red, Yellow, Blue

44. Cutting plier use for electrical work must have

- A. High strength
- B. Insulation
- C. Not corrode
- D. sharp

Ans. B

Sol. Cutting plier are used for electrical work must have insulation for safety purposes.

45. Which one of the wiring is cheap compare to other?

- A. cleat
- B. concealed conduit
- C. Batten
- D. Conduit

Ans. A

Sol. cleat wiring is the cheapest

46. The Prescribed weather condition for measuring the resistance of earth electrode as per BIS is \_\_\_\_\_

- A. Dry
- B. Wet
- C. Any
- D. None of these

Ans. A

Sol. Soil plays a significant role in determining the performance of electrode. Soil with low resistivity is highly corrosive. If soil is dry then soil resistivity value will be very high. If soil resistivity is high, earth resistance of electrode will also be high.

47. What is the minimum prescribed size of earth continuity conductor in house wiring ?

- A. 18 SWG
- B. 14 SWG
- C. 8 SWG
- D. 10 SWG

Ans. B

Sol. The conductor, by means of which the metal body of an equipment or appliance is connected to the earth, is known as earth continuity conductor (E C C). The earth continuity can be ensured either through metal conduit, metal sheathed cables or by a special earth continuity conductor. The cross section of earth continuity conductor should not be less than 2.9 mm<sup>2</sup> (14 SWG) or half of the installation conductor size.



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48. Value of resistance of wet skin of human body is \_\_\_\_\_
- A. Between 100k $\Omega$  to 600 k $\Omega$                       B. 1 k $\Omega$   
C. Between 0.4k $\Omega$  to 0.6k $\Omega$                       D. 0.1 k $\Omega$

Ans. B

Sol. The NIOSH states "Under dry conditions, the resistance offered by the human body may be as high as 100,000 ohms. Wet or broken skin may drop the body's resistance to 1,000 ohms," adding that "high-voltage electrical energy quickly breaks down human skin, reducing the human body's resistance to 500 ohms"

49. The minimum spacing between two electrodes in pipe earthing is \_\_\_\_\_ times the length of electrodes.
- A. 2 times    B. 4 times  
C. 3 times    D. 1.5 times

Ans. A

Sol. Distance between two earthing pit is 2 X Length of earthing electrode.

50. Which among these is NOT the main requirement of the insulating materials?
- A. Non inflammable                                      B. Low permittivity  
C. High dielectric strength                              D. None of the above

Ans. D

Sol. An ideal insulating material should have Non inflammable, Low permittivity, No erosion of surface and High dielectric strength.



## UTILIZATION OF ELECTRICAL ENERGY

51. Which heating method is used in the drying and baking of potteries \_\_\_\_\_?

- A. Radiant heating
- B. Resistance heating
- C. Arc heating
- D. Induction heating

Ans. B

Sol. The resistance heating is used for

- (i) Heat treatments of metals
- (ii) Drying and baking of potteries
- (iii) staving of enameled wire

52. Which of the following has highest values of thermal conductivity.

- A. copper
- B. Aluminium
- C. Brass
- D. Steel

Ans. A

Sol. Copper has the highest thermal conductivity and electrical conductivity

53. The batteries used in mobile/cell phone is

- A. Li-ion Battery
- B. Ni-Cd Battery
- C. NH<sub>4</sub>Cl Battery
- D. Lead Acid Battery

Ans. A

Sol. Li-ion is a type of secondary battery used in computer and electronic gadgets as it is highly reliable.

54. The material used for coating the electrode is called

- A. Slag
- B. Protective layer
- C. Binder
- D. Flux

Ans. D

Sol. Flux gives alloy to bead material, bead becomes stronger than even the parent metal.

55. A mercury vapour lamps produces

- A. yellow light
- B. Red light
- C. orange light
- D. Greenish blue

Ans. D

Sol. Clear mercury lamps produces white light with bluish-green tint due to mercury's combination of spectral lines.

56. The method of heating used for non-conducting material is

- A. arc heating
- B. dielectric heating
- C. resistance heating
- D. None of above

Ans. B



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Sol. Dielectric heating is also known as electronic heating, is the process in which high frequency alternating electric field or radio wave heats and dielectric material.

For plastic heating, food drying. Dielectric heating are used.

57. Process used to deposited are metal over another metal is called

- A. electrolysis
- B. carbon plating
- C. electro plating
- D. None of these

Ans. C

Sol. Electroplating is a process that uses electric current to reduce dissolved metal cation so that they form thin coherent metal coating on an electrode.

58. The Arc voltage for Arc welding is in the range of :

- A. 20V to 80V
- B. 150V to 200V
- C. 220V to 440V
- D. 1KV to 1.5KV

Ans. A

Sol. The voltage range for an Arc welding is generally between the 20V - 80V

59. \_\_\_\_\_ is a phenomenon in which a temperature difference between two dissimilar electrical conductors produces a voltage difference between the two substances.

- A. seebeck effect
- B. peltier effect
- C. Faraday's effect
- D. ohm's law

Ans. A

Sol. The Seebeck effect is a phenomenon in which a temperature difference between two dissimilar electrical conductors or semiconductors produces a voltage difference between the two substances.

60. The production of electrical power from a galvanic cell with electrodes at different temperatures is called as \_\_\_\_\_.

- A. thermoelectric cell
- B. thermovoltaic cell
- C. Thermogalvanic cell
- D. none of these

Ans. C

Sol. Thermogalvanic cell is used for the production of electrical power from a galvanic cell with electrodes at different temperatures.

61. Spot welding

- A. provides mechanical strength
- B. air fight welding
- C. water fight welding
- D. None of these

Ans. A

Sol. Spot welding only provides mechanical strength and is neither air fight nor water fight.

62. Earth conductor provides path for \_\_\_\_\_ to enter in earth.

- A. Leakage current
- B. High Voltage
- C. Circuit Current
- D. None of these



Ans. A

Sol. The current leaking from the power supply unit should flow through the ground connection and into the installations earth ground.

63. Inverse square law is the law of

- A. current
- B. power
- C. Illumination
- D. Magnetism

Ans. C

Sol. Inverse square law of Illumination : This law state that Illumination (E) at any point on a plane perpendicular to the line joining the point and source is inversely proportional to square of the distance between source and plane.

$$E = \frac{I}{r^2}$$

64. Electric fuse is made up of

- A. tin- lead alloy
- B. iron- tin alloy
- C. lead- iron alloy
- D. none of these

Ans. A

Sol. electric fuse is made up of alloy of lead and tin and has low melting point. As the current more than rated current flows the wire/ fuse melts and prevents over- current in the circuit.

65. A process that uses an electric current to reduce dissolved metal cations so that they form a thin coherent metal coating on an electrode is called:

- A. electroplating
- B. ionization
- C. oxidation
- D. none of these

Ans. A

Sol. process that uses an electric current to reduce dissolved metal cations so that they form a thin coherent metal coating on an electrode is called electroplating. Electroplating is primarily used to change the surface properties of an object (such as abrasion and wear resistance, corrosion protection, lubricity, aesthetic qualities), but may also be used to build up thickness on undersized parts or to form objects by electroforming.

66. Which one of the following is defined as the number of lumens emitted by a source in unit solid angle is given direction

- A. Luminous flux
- B. Brightness
- C. Candle power
- D. Illumination

Ans. C

Sol.

$$\text{Candle power} = \frac{\text{lumen}}{\text{solid angle}}$$



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73. Which of the following will need lowest level of illumination?

- A. Displays
- B. Fine engraving
- C. Railway platform
- D. Auditoriums

Ans. C

Sol. From all the above options Railway platform needs the least amount of display.

74. Which type of fire extinguisher is not suitable for electric fire

- A. foam extinguisher
- B. carbon dioxide extinguisher
- C. Soda acid extinguisher
- D. dry powder extinguisher

Ans. C

Sol. The water/soda mixture is conductive and will short out the electrical equipment and cause rapid corrosion damage. The electrical equipment will likely be damaged or destroyed beyond the damage from the fire itself. In a worst-case situation, the electrical current could be conducted back to the operator or others in the area causing injury or death.

75. In which welding, the parts lie in the same plane and are joined at their edges

- A. Butt joint
- B. lap joint
- C. edge joint
- D. corner joint

Ans. A

Sol. Butt joint weld may be used on material up to 25 mm thick.

76. In percussion welding, the heat is produced by a rapid discharge of stored electrical energy from

- A. Capacitor
- B. Inductor
- C. Resistor
- D. Transformer

Ans. A

Sol. In percussion welding, the heat is produced by a rapid discharge of stored electrical energy from capacitor.

77. Spot welding is used to weld metal pieces whose thickness

- A. Should be greater than 12 mm
- B. Lesser than 12 mm
- C. Lies between 15 to 20 mm
- D. Greater than 20 mm

Ans. B

Sol. Spot welding is used to weld metal pieces whose thickness is less than 12 mm.

78. By adding nearly 1% of cadmium to the copper conductor, we get cadmium copper conductor, which of the following result is obtained?

- A. Resistance Increases.
- B. Resistance would remain same.
- C. Tensile strength increases to 50%.
- D. Variation in sag due to change in load increases.

Ans. C



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Sol. With the addition of 0.7% to 1% of cadmium to the copper conductor, The following result is obtained.

- 1) Tensile strength increases to 50 %.
- 2) Resistivity decreases around 15%-18%.
- 3) Easily Jointing.
- 4) More resistance to atmospheric corrosion.
- 5) Better resistance to wear.
- 6) Easy machinability.
- 7) The temperature at which copper annealed is also increases.
- 8) Temperature effect on stress is also reduces.

79. A 1200-watt lamp has a mean spherical candle power (MSCP) of 1600 watt, is suspended over the working floor. Then calculate the Lamp Efficiency.

- |            |            |
|------------|------------|
| A. 16.75 % | B. 22.50 % |
| C. 25.75 % | D. 28.75 % |

Ans. A

Sol.

$$\text{Lamp efficiency} = \frac{\text{luminous flux}}{\text{Input power}}$$

$$\eta = \frac{4\pi \times 1600}{1200} = 16.75\%$$

80. What is the unit of luminance?

- |                           |                             |
|---------------------------|-----------------------------|
| A. candela                | B. Lux                      |
| C. candela/m <sup>2</sup> | D. m <sup>2</sup> / candela |

Ans. C

Sol. Unit of luminance = Candela/m<sup>2</sup>.

Unit of luminance intensity = Candela

81. Which type of welding is used on Bridges?

- |                  |                  |
|------------------|------------------|
| A. MIG welding   | B. TIG welding   |
| C. Stick welding | D. None of these |

Ans. C

Sol. Stick welding used on bridges and other outdoor elements like rain will not compromise the integrity of the weld.

82. An ideal traction system should have:

- A. High starting tractive effort and self-contained and compact locomotive of train unit.
- B. Equipment and capable of withstanding large temporary overloads of high efficiency and low initial as well as maintenance cost.
- C. Easy speed control
- D. All of the above

Ans. D



Sol. **Requirements of ideal traction system:** Normally, no single traction system fulfills the requirements of ideal traction system, why because each traction system has its merits and suffers from its own demerits, in the fields of applications. The requirements of ideal traction systems are:

1. Ideal traction system should have the capability of developing high tractive effort in order to have rapid acceleration.
2. The speed control of the traction motors should be easy.
3. Vehicles should be able to run on any route, without interruption.
4. Equipment required for traction system should be minimum with high efficiency.
5. It must be free from smoke, ash, dust, etc.
6. Regenerative braking should be possible, and braking should be in such a way to cause minimum wear on the break shoe.
7. Locomotive should be self-contained, and it must be capable of withstanding overloads.
8. Interference to the communication lines should be eliminated while the locomotive running along the track.

83. Which of the following test is usually conducted to determine the efficiency of traction motors?

- |                     |                     |
|---------------------|---------------------|
| A. Field's test     | B. Swinburne's test |
| C. Hopkinson's test | D. Retardation test |

Ans. A

Sol. Field test is usually conducted to determine the efficiency of traction motor this test is more reliable and efficiency for testing at traction system.

84. Which motor is used in electric traction system?

- |                    |                     |
|--------------------|---------------------|
| A. DC Series Motor | B. DC Shunt Motor   |
| C. Universal Motor | D. Reluctance Motor |

Ans. A

Sol. In electric traction system DC series motor is used. A series-wound DC motor has a low resistance field and armature circuit. Because of this, when voltage is applied to it, the current is high, the advantage of high current is that the magnetic fields inside the motor are strong, producing high torque (turning force), so it is ideal for starting a heavy object like a train.

85. The method of speed control adopted in 25 kW, single-phase, 50 Hz traction is:

- A. Tap changing control of transformer
- B. Reduced current method
- C. Series-parallel control
- D. Rheostatic control



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Ans. A

Sol. **Single-phase AC system:**

In this system of track electrification, usually AC series motors are used for getting the necessary propelling power. The distribution network employed for such traction systems

is normally 15-25 kV at reduced frequency of  $163\frac{2}{3}$  Hz or 25 Hz. The main reason of operating at reduced frequencies is AC series motors that are more efficient and show better performance at low frequency. These high voltages are stepped down to suitable low voltage  $V$  by means of step-down transformer. Low frequency can be obtained from normal supply frequency with the help of frequency converter.

Low-frequency operation of overhead transmission line reduces the line reactance and hence the voltage drops directly, and single-phase AC system is mainly preferred for main line services where the cost of overhead structure is not much importance more-over rapid acceleration and retardation is not required for suburban services.

86. The most vital factor against electric traction is:

- A. Its high maintenance cost.
- B. The possibility of power failure.
- C. High initial cost in laying out overhead electric supply system.
- D. The necessity of providing negative booster.

Ans. C

Sol. **Advantages of electric traction:**

1. Electric traction system is cleaner and easier to handle.
2. No need of storage of coal and water that in turn reduces the maintenance cost as well as the saving of high-grade coal.
3. Electric energy drawn from the supply distribution system is sufficient to maintain the common necessities of locomotives such as fans and lights; therefore, there is not need of providing additional generators.
4. The maintenance and running costs are comparatively low.
5. The speed control of the electric motor is easy.
6. Regenerative braking is possible so that the energy can be fed back to the supply system during the braking period.
7. In electric traction system, in addition to the mechanical braking, electrical braking can also be used that reduces the wear on the brake shoes, wheels, etc.
8. Electrically operated vehicles can withstand for overloads, as the system is capable of drawing more energy from the system.



**Disadvantages of electric traction:**

1. Electric traction system involves high erection cost of power system.
2. Interference causes to the communication lines due to the overhead distribution networks.
3. The failure of power supply brings whole traction system to stand still.
4. In an electric traction system, the electrically operated vehicles have to move only on the electrified routes.
5. Additional equipment should be needed for the provision of regenerative braking, it will increase the overall cost of installation.

87. Which of the following is not an advantage of using 25 kV, 50 Hz AC system in electric traction?

- A. Light overhead catenary                      B. More number of substations  
C. Simplicity of substation design              D. Flexibility in location of substation

Ans. B

Sol. The advantages of 25 kV, 50 Hz AC system are as follows:

1. Light overhead catenary
2. Less number of substations
3. Flexibility in the location of substations
4. Simplicity of substation design
5. Lower cost of fixed installations
6. Higher coefficient of adhesion
7. Higher starting efficiency

The disadvantages of 25 kV, 50 Hz AC system are as follows:

1. Single phase ac system produces both current and voltage unbalancing effect on the supply.
2. It produces interference in telecommunication systems.

88. According to second law of illumination, the illumination at any point on an inclined surface is

- A. Directly proportional to the cosine of the angle between the normal to the surface at that point  
B. Directly proportional to the sin of the angle between the normal to the surface at that point  
C. Directly proportional to the tan of the angle between the normal to the surface at that point  
D. Directly proportional to the cotangent of the angle between the normal to the surface at that point

Ans. A



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Sol. According to second law of illumination, the illumination at any point on an inclined surface is directly proportional to the cosine of the angle between the normal to the surface at that point.

89. The illumination level in houses is in range
- A. 10-20 lumen/m<sup>2</sup>
  - B. 30-50 lumen/m<sup>2</sup>
  - C. 40-75 lumen/m<sup>2</sup>
  - D. 100-140 lumen/m<sup>2</sup>

Ans. D

Sol. The illumination level in houses is in the range of 100-140 lumen/m<sup>2</sup>.

90. The type of lamps having highest illumination efficiency is
- A. mercury vapour lamp
  - B. incandescent lamp
  - C. Sodium vapour lamp
  - D. fluorescent lamp

Ans. C

Sol. Illumination efficiency for

- 1) Mercury vapor lamp - 35-65 lumens/watt
- 2) Incandescent lamp - 15-20 lumens/watt
- 3) Sodium vapor lamp - 200 lumens /watt
- 4) Fluorescent lamp - 70-90 lumens/watt

91. Illumination is measured using which one of the following?

- A. Millivoltmeter
- B. Stroboscope
- C. Luxmeter
- D. pH meter

Ans. C

Sol. Lux meters are used for measuring brightness in lux, fc or cd/m<sup>2</sup>. Some lux meters are equipped with an internal memory or data logger to record and save measurements.

92. The source of illumination for a cinema projector is \_\_\_\_\_

- A. Incand escent lamp
- B. Mercury vapour lamp
- C. Sodium lamp
- D. Carbon arc lamp

Ans. D

Sol. Carbon rod is used for a carbon arc could last for an hour at the most whereas xenon lamps becomes the most common light source , as they could stay lit for extended period of time.

So source of illumination for a cinema projector is a carbon arc lamp.

93. Which of the following will need the highest level of illumination?

- A. Proof reading
- B. Bed rooms
- C. Hospital wards
- D. Railway platforms

Ans. A

Sol. Proof reading needs the highest level illumination.







5. Uniform heating
  6. High efficiency
  7. Automatic protection
  8. Better working conditions
  9. Less floor area is required.
100. Which type of heating is used for sterilization?
- A. High frequency eddy current heating
  - B. Coreless type heating
  - C. Core type heating
  - D. Dielectric heating

Ans. D

Sol. Dielectric heating is used for sterilization.

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