STUDY MATERIAL FOR ELECTRICAL SUPERVISOR LICENSE EXAMS (DOMESTIC AND INDUSTRIAL)

Solved MCQs and Question Papers from State Electricity Board Exams for Supervisor License (Supervisor Certificate of Competency)

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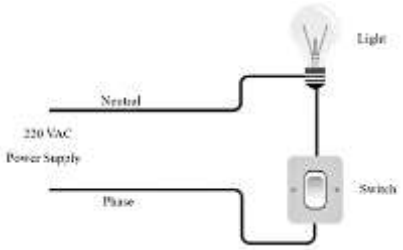
QUESTION PAPER
ODISHA SCC(MV) SUPERVISOR LICENSE EXAM 2019
PAPER 1

1. The auxiliary electrodes (temporary electrodes) to measure the earth resistances of an earth electrode are to be placed at _____distance from electrode under test respectively
(a) 15 & 30 mtr
(b) 15 & 20 mtr
(c) 15 & 50 mtr*
(d) 2 & 4 mtr

2. Minimum value of current above which if passes through human body can cause danger
(a) 1 A
(b) 5 mA
(c) 30 mA*
(d) 20 μA
Hint:
1 mA: Just perceptible tingling sensation.
5 mA: Slight shock, usually not dangerous.
10–20 mA: Painful shock; muscular contractions may make it hard to let go.
30 mA: This is considered the threshold of danger for humans. At this level, prolonged exposure can cause respiratory paralysis and, if sustained, can be fatal. This is why 30 mA is the standard trip threshold for Earth Leakage Circuit Breakers (ELCBs)/RCCBs used for human protection.

3. The fuse wire rating should be decided taking _____ times of continuous current calculated to flow.
(a) 1
(c) 4
(b) 1.5*
(d) 10

4. In house wiring the switches are used to control the ____
(a) Phase*
(b) Neutral
(c) Earthing
(d) Both Phase & Neutral
Hint:



5. Incandescent, LED, Florescent lamps have their lumen output per watt in the descending order of
(a) Fluorescent, LED, Incandescent
(b) Incandescent, Fluorescent. LED
(c) LED, Fluorescent, Incandescent*
(d) Incandescent, LED, Fluorescent
Hint: Typical luminous efficacy in lumens per watt
LED: 80–150 lm/W (highest)
Fluorescent: 50–100 lm/W
Incandescent: 10–17 lm/W (lowest)

6. Specific resistance of a wire depends upon
(a) It's length
(c) It's dimension
(b) It's cross sectional area
(d) It's material
Hint: Specific resistance (ρ) depends only on the nature of the material (e.g., copper, aluminum, nichrome) and temperature.

7. Auto transformer efficiency is ___ than a two winding transformer of same capacity & voltage ratio.
(a) Less
(b) Equal
(c) More*
(d) Data is insufficient

8. Three capacitor of value 2 F, 3 F & 5 F are connected in parallel across a 230 V AC supply, their combined effective capacitance will be
(a) 0.96 F
(b) 10 F*
(c) 5 F
(d) 30 F
Hint: C_{eq} = 2 + 3 + 5 =10 F

9. Service connection to a consumer is generally given not exceeding ___ meters from the distribution mains.
(a) 75
(b) 30*
(c) 50
(d) 100

10. The supply frequency to a consumer should be within
(a) ±1%
(b) ±2%
(c) ±3%*
(d) ±5%
Hint: As per the Indian Electricity Rules (Rule 54) and standard supply regulations, the frequency of the supply to a consumer should be maintained within ±3% of the declared frequency.
For India's standard frequency of 50 Hz, this means the permissible range is:
50 Hz ± 3% = 48.5 Hz to 51.5 Hz

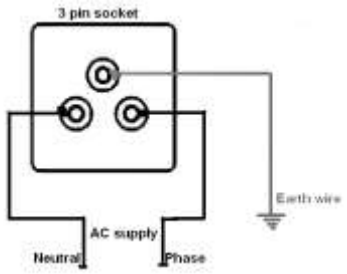
11. Due to leakage flux the stray loss occurs In
(a) Secondary winding
(c) Primary winding
(b) Transformer tank
(d) All of the above*

12. Halon is used as extinguisher for
(a) Electrical fire
(b) Petroleum product
(c) Delicate electronic equipment (like computer) fire
(d) All of the above*
Hint: Halon (Halon 1211 or Halon 1301) is an effective fire extinguishing agent that works by chemically interrupting the combustion chain reaction.

13. To reduce the value of earth resistance of an electrode, we should not
(a) Put salt water to the electrode
(b) Put borrowed earth to the pit*
(c) Increase the diameter of the electrode
(d) Put the electrode in a very water logged soil
Hint: Standard practice is to use backfill compound (bentonite, marconite, etc.) rather than borrowed earth.

14. Which of the following type of power stations can be used as base load stations.
(a) Pumped Storage stations*
(b) Diesel Generator Substations
(c) Purely run off the river hydro stations
(d) Hydro station with limited reservoir capacity
Hint: A base load station supplies power continuously at a nearly constant rate to meet the minimum (base) demand of the grid. It operates at high load factor and is designed to run for long hours.
Pumped Storage stations are capable of running continuously and can supply base load when required. In many contexts, they are treated as base load capable because they provide a stable, continuous supply.

15. In 3-pin socket with one phase supply the phase is kept on the
(a) Left side
(b) Right side*
(c) On the top
(d) In any of the above
Hint:
Right pin: Phase (Live)
Left pin: Neutral
Top pin: Earth



16. The losses that occurs in cables are
(a) Copper losses in conductors
(b) Hysteresis loss in dielectric
(c) Eddy current losses in the sheath
(d) All of the above*
Hint:
Copper loss (I^2R) → Conductor
Dielectric loss (hysteresis + eddy) → Insulation/dielectric
Sheath loss (eddy current) → Metallic sheath
Inter-sheath loss → Between sheaths (in some cables)

17. Lamp efficiency is the ratio of
(a) Luminous flux to power input*
(b) Power input to Luminous intensity
(c) Illumination under normal working condition to illumination when everything is perfectly clean

(d) Total lumens reaching the working plane to total lumens given out by the lamp

18. Dielectric heating is possible for heating
(a) Insulating material
(c) Metallic material
(b) Magnetic material
(d) Any of the above
Hint: Dielectric heating (also called capacitive heating or RF heating) is used for heating insulating materials (dielectrics) such as wood, plastics, rubberetc.

19. Sterilization of bandages, absorbent cotton sterilize gauge are done by
(a) ARC heating
(b) Induction heating
(c) Dielectric heating*
(d) Resistance heating
Hint:
Dielectric heating → Works by generating heat inside the material due to molecular friction when exposed to a high-frequency alternating electric field. This allows uniform heating throughout the material, which effectively kills bacteria and microorganisms, achieving sterilization.
Arc heating → Used for melting metals (arc furnaces); too intense and unsuitable for delicate materials
Induction heating → Used for heating conducting/magnetic materials (metals); cotton/gauze are insulators
Resistance heating → Requires direct contact with heating elements; not suitable for uniform sterilization of fibrous materials

20. When a squirrel cage induction motor runs at _____ synchronous speed, it is called to be crawling
(a) Half of
(b) 2/3rd
(c) 1/3rd
(d) 1/7th*
Hint: Crawling is caused by harmonics (specifically the 7th harmonic) in the air-gap flux. The 7th harmonic produces a torque that rotates in the same direction as the fundamental torque. Due to the effect of harmonics, a magnetic locking occurs between the stator and rotor poles at this speed, causing the motor to run stably at 1/7th of synchronous speed. This phenomenon is called *crawling*.

21. The domestic fan motors are single phase
(a) Repulsion motors
(b) Series motors
(c) Capacitor start only motors
(d) Permanent capacitor start & run motors*

22. Capacitor opposes
(a) Change In current
(b) Change in voltage*
(c) Both change in voltage & current
(d) None of the above
Hint: A capacitor opposes any sudden change in voltage across its terminals. This is because the voltage across a capacitor cannot change instantaneously — it takes time to charge or discharge.
Capacitor → Change in voltage
Inductor → Change in current

23. Two capacitors of capacitance 3μF & 6μF In series will have a total capacitance of
(a) 9μF
(b) 2μF*
(c) 18μF
(d) 24μF
Hint: $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$

$\frac{1}{C_{eq}} = \frac{1}{3} + \frac{1}{6} = \frac{1}{2}$

$C_{eq} = 2\ \mu F$

24. If the specific gravity of electrolyte (H_2SO_4) in a lead acid cell Increases, the internal resistance of the cell ____
(a) Remains unchanged
b} Increases
(c) Decreases*
(d) None of the above

25. The capacity of a storage battery is rated in
(a) Ampere
(b) Ampere hours*
(c) KW
(d) Joules

26. An alternating current Is converted to direct current by
(a) Dynamo
h) Transformer
(c) Rectifier*
(d) Motor

27. An electric bulb at 220 V, 50 Hz AC is connected to a 220 V, 5 Hz AC source, then the bulb
(a) Does not glow
(b) Fuses
(c) Glows continuously
(d) Glows intermittently*
Hint: *At 5 Hz*, the current changes direction 10 times per second (5 cycles), which is slow enough for the filament to visibly flicker — so the bulb appears to glow intermittently.
If it were *50 Hz*, the flicker would be too fast to notice, and it would appear to glow continuously.

28. A watt meter indicates _____ power
(a) Active*
(b) Reactive
(c) Apparent
(d) None of the above

29. The advantage of star connected supply system is that ____
(a) Line current is equal to phase current
(b) Two levels of voltages can be used*
(c) Phase sequence can be easily changed
(d) It is a simple arrangement
Hint: In a star connection, both line voltage and phase voltage are available (line voltage = $\sqrt{3}$ × phase voltage), which allows two different voltage levels to be supplied.

30. The meter constant of an energy meter is 1500 rev / KWh. The disc makes 3000 revolutions in a given time. The energy consumed is ____.
(a) 4 KWh
(b) 1 KWh
(c) 3 KWh
(d) 2 KWh
Hint: Energy consumed = Revolutions / Meter constant
= 3000 / 1500 = 2 kWh

31. The direction of split phase Induction motor can be reversed by Inter changing the connections of supply of ____.
(a) Either main or starting winding*
(b) Both main and starting winding
(c) Rotor winding
(d) None of the above

32. The starter of an alternator Is wound for ____ on the rotor.
(a) More no. of poles than
(b) Less no. of poles than
(c) The same no. of poles*
(d) None of the above

33. In a synchronous generator, if ϕ is the flux per pole, and f is the frequency of the emf induced, then
(a) $E \propto 1/\phi f$
(b) $E \propto \phi f$*
(c) $E \propto \phi/f$
(d) $E \propto f/\phi$

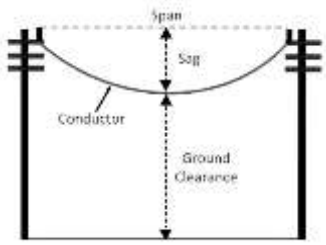
34. Which one of the following can be called as integrating instrument?
(a) Voltmeter
(b) Wattmeter
(c) Power factor meter
(d) Energy meter*
Hint: An energy meter is an integrating instrument because it measures and accumulates the total electrical energy consumed over a period of time (in kWh), rather than indicating an instantaneous value like a voltmeter or wattmeter.

35. For low head and large discharge, the hydraulic turbine used is _____
(a) Francis turbine
(b) Kaplan turbine*
(c) Pelton turbine
(d) None of the above

36. Which of the following plants will take the least time in starting from cold conditions to full load conditions
(a) Nuclear power plant
(c) Steam power plant
(b) Hydroelectric plant*
(d) Gas turbine plant
Hint: A hydroelectric plant can be started very quickly from cold conditions to full load because water flow can be controlled almost instantly using valves, and the turbine-generator set requires minimal warm-up time. In contrast, thermal, nuclear, and steam plants require significant time for boiler heating, steam generation, and system pressurization. Gas turbine plants are also quick to start, but hydroelectric plants are generally the fastest.

37. In overhead transmission line, the sag depends upon ____
(a) Tension in the conductor
(c) Span of conductor
(b) Conductor material

(d) All of the above*
Hint:



38. On an overhead line, the wind load acts ____
(a) Horizontally*
(c) Vertically upward
(b) Vertically downward
(d) None of the above

39. In a string of suspension insulators, voltage across ____
(a) Disc nearest to cross arm is minimum
(b) Middle disc is maximum
(c) Disc nearest to conductor is maximum*
(d) Disc nearest to cross arm is maximum
Hint: In a string of suspension insulators, the voltage distribution is not uniform. The disc nearest to the conductor carries the maximum voltage due to the capacitance between each disc and the earth (shunt capacitance). The voltage progressively decreases toward the cross-arm, so the disc nearest to the cross-arm carries the minimum voltage.

40. Insulators may fail due to ____
(a) Flash over
(b) Short circuits
(c) Deposition of dust
(d) Any of the above*
Hint: Insulators can fail due to:
Flashover – caused by overvoltage (lightning, switching surges)
Short circuits – due to breakdown of insulation
Deposition of dust – contamination on the surface reduces insulation resistance and can cause flashover

41. ACSR conductors having 70 aluminum conductors and 6 steel conductors will be specified as
(a) 70/6*
(c) 70/76
(b) 6/70
(d) 6/76
Hint: ACSR (Aluminum Conductor Steel Reinforced) conductors are specified as: Number of Aluminum conductors / Number of Steel conductors
So for 70 aluminum and 6 steel conductors, it is specified as 70/6.

42. The loads on 3-phase, 4-wlre distributors are usually _____
(a) Balanced
(b) Unbalanced*
(c) Either a or b
(d) None of the above
Hint: In a 3-phase, 4-wire distributor, single-phase loads are connected between any one phase and the neutral. Since these single-phase loads are not equal at all times, the loads on the three phases are generally unbalanced. The neutral wire carries the return current resulting from this unbalance.

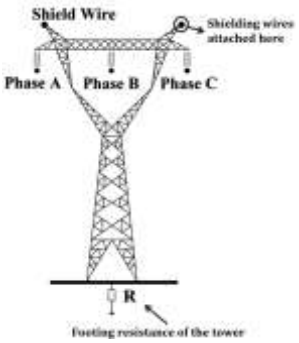
43. Which portion of the power system Is least prone to faults ____
(a) Switchgear
(b) Transformers
(c) Alternators*
(d) Overhead lines
Hint: Alternators (generators) are the least prone to faults in a power system because they are stationary equipment installed indoors with proper protection, cooling, and maintenance.

44. An isolator is designed to open a circuit under ____
(a) Full load
(b) Normal conditions
(c) No load
(d) None of the above
Hint: An isolator (disconnect switch) is designed to open a circuit only under no-load conditions. It does not have arc-quenching capability, so it cannot interrupt load current or fault current. It is used only for isolating a circuit after the circuit breaker has already interrupted the current.

45. The most dangerous fault in an alternator is
(a) Failure of field*
(b) Starter winding faults
(c) Failure of prime mover
(d) Un-balanced loading
Hint: Failure of field (field failure or loss of excitation) is considered the most dangerous fault in an alternator because:

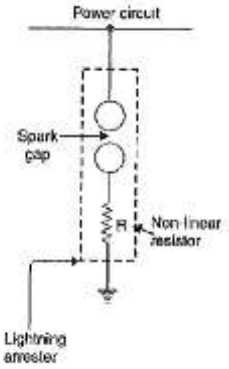
The alternator loses its excitation and stops generating the required EMF
It can cause the machine to operate as an induction generator, drawing reactive power from the system

46. Guard wires are placed ____ the line conductors.
(a) Below
(b) Above*
(c) In middle
(d) None of the above
Hint: Guard wires (also called overhead ground wires or shield wires) are placed above the line conductors to protect them from direct lightning strokes. They intercept lightning strikes and divert the surge current to earth, shielding the phase conductors below.



47. Differential relays are used to protect the equipment against _____
(a) Over current
(b) Reverse current
(c) Internal faults*
(d) None of the above
Hint: Differential relays operate on the principle of comparing the currents entering and leaving the protected equipment (such as a transformer, generator, or busbar). If the currents are unequal, it indicates an *internal fault* within the protected zone. They are highly sensitive and respond only to faults inside the protected area, not to external faults or overloads.

48. A surge diverter should be located _____ the apparatus to be protected
(a) Close to*
(b) Far away from
(c) In the middle of
(d) None of the above
Hint: A surge diverter (lightning arrester) should be located as close as possible to the apparatus being protected. This minimizes the impedance and voltage drop between the surge diverter and the protected equipment, ensuring effective protection against overvoltage surges.



49. Under voltage relays are mostly used for
(a) Transformer protection
(b) Bus bar protection
(c) Motor protection*
(d) Feeder protection
Hint: Under-voltage relays are mostly used for motor protection. When supply voltage drops below a certain level, the motor draws excessive current, which can cause overheating and damage. The under-voltage relay disconnects the motor from the supply

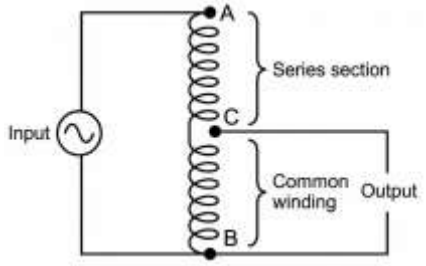
50. A single phase transformer when supplied from 220 V, 50 Hz has eddy current loss of 50 W, if the transformer is connected to a voltage of 330 V, 50 Hz, the eddy current Joss will be
(a) 168.75W
(b) 112.5 W*
(c) 75 W
(d) 50 W
Hint: $P_{e2} / P_{e1} = (V_2 / V_1)^2$
$P_{e2} = 50 \times (330 / 220)^2$
$P_{e2} = 50 \times (1.5)^2$
$P_{e2} = 50 \times 2.25$
$P_{e2} = 112.5$ W

51. What is the load at which maximum efficiency occurs in case of a 100 kVA transformer with iron loss of 1 kW and full-load copper loss of 2 kW?
(a) 100 kVA
(b) 70.7 kVA
(c) 50.5 kVA
(d) 25.2 kVA
Hint: Load fraction = $x = \sqrt{\frac{P_i}{P_{cu}}} = \sqrt{\frac{1}{2}}$

kVA corresponds to maximum efficiency = load fraction x full load kVA

$= \sqrt{\frac{1}{2}} x100 = 70.7\,kVA$

52. In an auto transformer, power is transferred, through
(a) Conduction process only
(b) Induction process only
(c) Both conduction and induction process*
(d) Mutual coupling
Hint: In an autotransformer, power is transferred in two ways:
Conduction – through the direct electrical connection between the primary and secondary (common winding)
Induction – through the magnetic coupling between the windings (transformer action)



Auto transformer

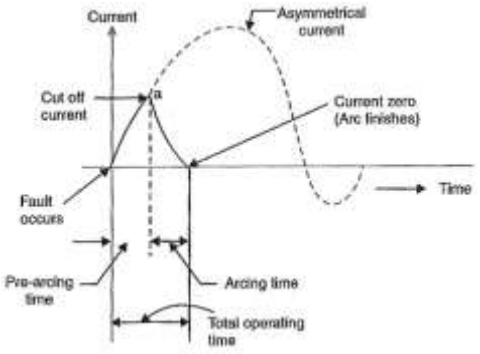
53. Sludge formation in transformer oil is due to which one of the following?
(a) Ingress of dust particles and moisture in the oil
(b) Appearance of small fragments of paper varnish, cotton and other organic materials in the oil · I
(c) Chemical reaction of transformer oil with the insulating materials
(d) Oxidation of transformer oil*
Hint: Sludge formation in transformer oil is primarily caused by the oxidation of the oil over time, especially in the presence of heat, air (oxygen), and moisture. This oxidation leads to the formation of acidic compounds and insoluble materials (sludge) that deposit on windings and other internal parts, reducing cooling efficiency and insulation strength.

54. Which one of the following statement Is correct?
In an induction motor, if the air gap is Increased,
(a) Its speed will reduce
(b) Its efficiency will improve
(c) Its power factor will reduce
(d) Its breakdown torque will reduce
Hint: When the air gap in an induction motor is increased:
The magnetizing current required increases. This increases the reactive power demand. As a result, the power factor decreases.

55. What Is switchgear?
(a) An apparatus used for switching, controlling and protecting the electrical circuits and equipments.*
(b) It detects the faults only.
(c) It corrects the faults only.
(d) All of the above.

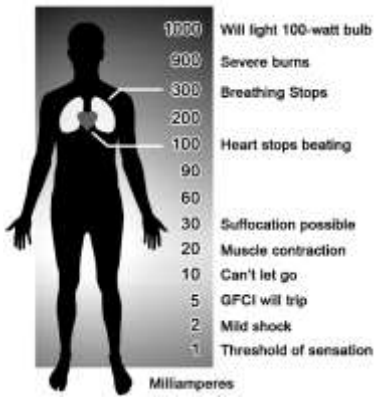
56. Which device sends the information to the circuit breaker to interrupt the circuit in case of fault?
(a) Switch
(b) Relay*
(c) Circuit breaker itself does this function
(d) Fuse
Hint: A relay is the device that senses abnormal conditions (faults) in the power system and sends a trip signal to the circuit breaker to interrupt the circuit. The circuit breaker then operates to open the contacts and clear the fault.

57. In a HRC fuse what is the time between the cut off and the final current zero called?
(a) Pre - arcing time
(b) Arcing time*
(c) Total operating time
(d) None of these
Hint: In an HRC (High Rupturing Capacity) fuse:
Arcing time - the time between the cut-off and the final current zero
Pre-arcing time – the time from the start of the fault current until the fuse element melts and the arc is initiated
Arcing time – the time from the initiation of the arc until the final current zero (when the arc is extinguished and the circuit is completely interrupted)
Total operating time – the sum of pre-arcing time and arcing time



58. Earth tester operates on
(a) AC only
(b) DC only
(c) Both AC and DC*
(d) None of these

59. The effect of electric shock in the human body will depend on
(a) Line voltage
(c) Current flowing in the body*
(b) Resistance
(d) None of the above
Hint: The severity of electric shock depends primarily on the current flowing through the body, not just the voltage. Even a small current (as low as 10–50 mA) can be dangerous, causing muscle contractions, respiratory difficulty, or ventricular fibrillation.



60. Siemens is unit for measuring
(a) Conductance
(c) Flux density
(b) Line current
(d) Electric field
Hint: Siemens (S) is the SI unit of conductance (the reciprocal of resistance).
Conductance = 1 / Resistance
1 Siemens = 1 / Ohm

61. The practical unit of energy is kWH. The unit of energy in the SI is the joule. The number of joules in kWH is
(a) 3.6
(b) 3.6 X 10^{6}*
(c) 3.6 X 10^{-6}
(d) 10^{-6}
Hint:
1 kWh = 1000 W × 3600 s
=1000×3600 J

62. The most common generation voltage in India is
(a) 110 kV
(b) 11 kV*
(c) 1.1 kV
(d) 66 kV

63. The transformer that will have the largest size is
(a) 100 kVA, 25 Hz*
(b) 100 kVA, 100 Hz
(c) 100 kVA, 50 Hz
(d) 100 kVA, 60 Hz
Hint: For a transformer of the same kVA rating, the size depends on the frequency.
Higher frequency → smaller size (because the core flux requirement is lower).
Lower frequency → larger size (because more iron core is needed).

64. There are two transformers of regulation (1) 5 %, (2) 95 %. The one with better regulation is
(a) Second
(b) Both are same
(c) First*
(d) Depends on loading
Hint: Better regulation means a smaller percentage voltage drop from no-load to full-load.
5% is much better than 95% (which is very poor).

65. An Induction motor when started on load does not accelerate up to full speed but runs at 1/7th of the rated speed. The motor is said to be
(a) Locking
(b) plugging
(c) crawling
(d) cogging
Hint: When an induction motor starts on load but does not accelerate to full speed and instead runs stably at a very low speed (like

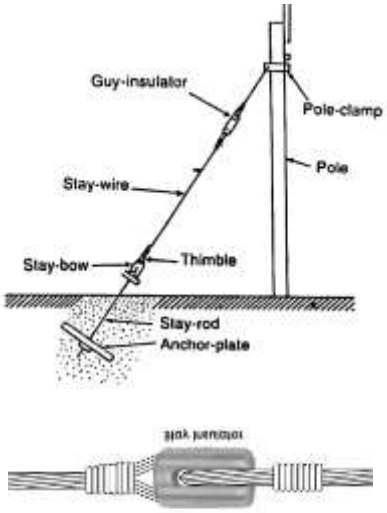
1/7th of rated speed), this phenomenon is called *crawling*. It happens mainly due to harmonics (especially the 7th harmonic) in the air-gap flux, which produce a forward torque at a low speed.

66. The owner of every Installation of voltage exceeding 250 V shall affix permanently Danger Notice in a conspicuous location in accordance with CEA (Measures relating to safety an Electric Supply), regulation, 2010
(a) Regulation 18*
(c) Regulation 28
(b) Regulation 11
(d) Regulation 49

67. In accordance with CEA (Measures relating to safety and Electric Supply), regulation, 2010; the supplier or owner of installation shall provide a suitable isolating device at the point of commencement of supply, fixed at height not more than ___ meters above the ground for multi-storied building more than 15 meters in height.
(a) 1.70*
(c) 3.0
(b) 2.0
(d) 3.5

68. While providing the ELCB to electrical installation as per the provision under CEA (Measures relating to safety and Electric Supply), regulation, 2010: the maximum earth leakage threshold limit for tripping in case of domestic connections and for other installations should be ____mA and ___ mA respectively.
(a) 30 and 100*
(c) 5 and 10
(b) 50 and 70
(d) 50 and 100

69. The stay insulator in the stay wire shall be at height of at least ____ meters from the ground as per CEA (Measures relating to safety and Electric Supply), regulation, 2010.
(a) 3*
(b) 2.5
(c) 1.5
(d) 2
Hint:



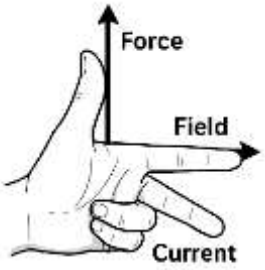
70. The cross-sectional area of the earthing conductor in mines shall not be more than ____ sq. cm. as per as per CEA (Measures relating to safety and Electric Supply), regulation, 2010.
(a) 0.15
(b) 0.25*
(c) 0.4
(d) Neither of any one

71. The dielectric strength of air under normal conditions is around
(a) 30 kV/cm
(b) 100 kV/cm
(c) 150 kV/cm
(d) 200 kV/cm
Hint: Under normal atmospheric conditions, the dielectric strength of air is approximately 30 kV/cm for uniform field gaps. This means that if the electric field strength in air exceeds about 30 kV/cm, the air breaks down and becomes conductive, causing a spark or arc.

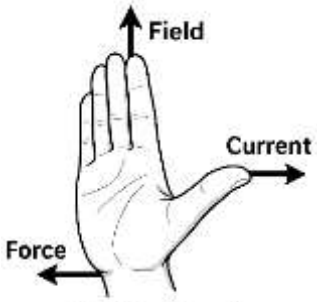
72. If the diameter of a metal wire of a given length is doubled, its resistance will ____.
(a) Be doubled
(b) Be halved
(c) Remain the same
(d) Be 1/4th time*
Hint: $R \propto 1/d^2$
When diameter is doubled,
$R' = 1/(2d)^2 = 1/4d^2 = (1/4)R$

73. In Fleming's left hand rule, the thumb always represents direction of
(a) Current flow
(b) Induced emf
(c) Magnetic field

(d) Mechanical force
Hint: Fleming's Left Hand Rule is used for electric motors.
According to this rule:
Thumb → direction of Mechanical force (motion of the conductor)
Forefinger → direction of Magnetic field
Middle finger → direction of Current flow

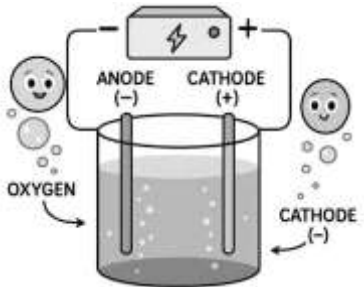


Fleming's Left-Hand Rule



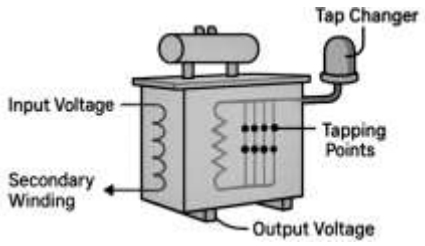
Right-Hand Palm Rule

74. When an electric current is passed through a bucket full of water, lot of bubbling is there. The electric current is
(a) AC
(b) DC
(c) Pulsating
(d) None of these
Hint: When **DC (Direct Current)** is passed through water, electrolysis occurs. The water decomposes into hydrogen and oxygen gases, which appear as bubbles. Hydrogen collects at the cathode (negative electrode) and oxygen at the anode (positive electrode).



With **AC (Alternating Current)**, the polarity reverses rapidly (50 times per second in India), so the gases produced at each electrode alternate and tend to recombine, resulting in much less visible bubbling. That's why continuous and vigorous bubbling is characteristic of DC.

75. A tap changer is used on a transformer for
(a) Adjustments in primary voltage
(b) Adjustments In secondary voltage*
(c) Adjustments In both primary and secondary voltages
(d) Adjustment In power factor
Hint: A tap changer is used on a transformer to adjust the number of turns in the winding, thereby changing the turns ratio and hence the secondary voltage. It helps maintain the desired output voltage despite variations in the input (primary) voltage or load conditions.



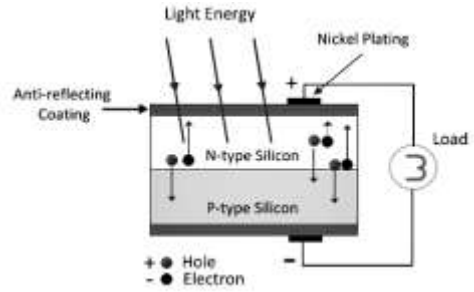
76. The noise in a transformer due to vibration of laminations set by magnetic forces, is called
(a) Flicker noise
(b) Humming noise
(c) Transit time noise
(d) Agitation noise
Hint: When a transformer is energized, the alternating magnetic flux in the core causes the laminations to expand and contract slightly due to magnetostriction and the magnetic forces between them. This vibration of the laminations produces a characteristic low-frequency sound known as humming noise

77. The efficiency of transformer compared with that of electric motors of the same rating is
(b) Much smaller
(a) About the same
(c) Slightly higher
(d) Much higher*
Hint: A transformer is a *static device* — it has no moving parts, so there are no mechanical losses (like friction and windage losses in motors).
These losses are relatively small, so transformer efficiencies typically range from 95% to 99%.
In contrast, electric motors have additional mechanical losses (friction in bearings, windage) and generally have efficiencies ranging from 70% to 95% depending on size and type.

78. A transformer is provided with three independent secondary windings of 6 V-1 A; 24 V -1 A ; 240 V- 0.5 A. The rating of transformer shall be ____
(a) 6 VA
(b) 24 VA
(c) 120 VA
(d) 150 VA*
Hint: The transformer rating in VA is determined by the total secondary output:
First winding: 6 V × 1 A = 6 VA
Second winding: 24 V × 1 A = 24 VA
Third winding: 240 V × 0.5 A = 120 VA
Total: 6 + 24 + 120 = 150 VA

79. Which part of the transformer is subjected to maximum heating?
(a) Core
(b) Winding*
(c) Oil
(d) Frame
Hint: The windings of a transformer carry the load current and are made of copper or aluminum conductors, which have resistance. This resistance causes I^2R (copper) losses, which generate heat. Additionally, the windings are also subject to eddy current and stray losses. Since the windings are the primary source of heat generation in a transformer, they are subjected to the maximum heating.

80. Photo-voltaic cell produces electric energy from
(a) Electromagnetic energy*
(c) Develops power proportional to the power of the wind
(c) Geothermal energy
(d) All of these
Hint: A photovoltaic (PV) cell converts light energy (electromagnetic radiation from the sun) directly into electrical energy through the photovoltaic effect. When photons strike the semiconductor material (usually silicon), they knock electrons loose, creating an electric current.



Photovoltaic (solar) cell

81. Wind energy
(a) Is clean, renewable energy
(b) Has higher cost
(b) Electrostatic energy
(d) Both (a) and (b) above*

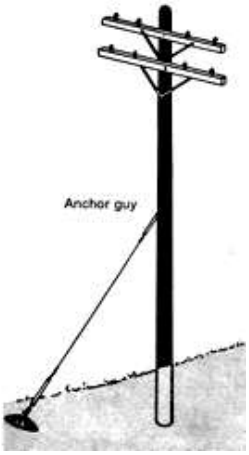
82. Load factor is defined as
(a) Maximum demand / Average demand
(b) Average demand / Maximum demand*
(c) Maximum demand I Peak load
(d) Maximum demand / Minimum demand
Hint: Load factor is the ratio of the average load (demand) to the maximum (peak) demand over a given period of time. It is always less than or equal to 1 (since average demand ≤ maximum demand).

A higher load factor indicates that the load is being used more efficiently and consistently, which is desirable for power systems because it reduces the cost per unit of electricity generated.

83. Concrete poles are used because of their
(a) Longer life
(b) Less maintenance cost
(c) Both (a) and (b)*
(d) None of these

84. Guy is fastened to a pole to
(a) Strengthen the pole*

(b) Hold telephone cables
(c) Keep the wires from sagging
(d) None of these
Hint:



85. One Pico farad is equal to
(a) 10^{-2} farad
(b) $10^{=6}$ farad
(c) 10^{-9} farad
(d) 10^{-12} farad*

86. Megger is used for the measurement of
(a) Low resistance
b} Medium resistance
(c) High resistance
(d) Very high resistance
Hint: A megger (megohmmeter) is used to measure very high resistances, particularly insulation resistance, and it operates by applying a high DC voltage. The readings are typically in megohms (MΩ) or higher.

87. The reactive power can be calculated by using the formula ____
(a) kVA x Cosϕ
(b) kW x Cosϕ
(c) kW x Sinϕ
(d) kVA x Sinϕ

88. Safe value of current carrying capacity of cables is determined by
(a) Maximum voltage
(b) Maximum temperature
(c) Power factor
(d) Maximum pressure
Hint: The safe current-carrying capacity (ampacity) of a cable is determined by the maximum temperature the insulation can withstand without being damaged. If too much current flows, the cable heats up, and exceeding the permissible temperature can degrade or melt the insulation, leading to failure or fire hazards.

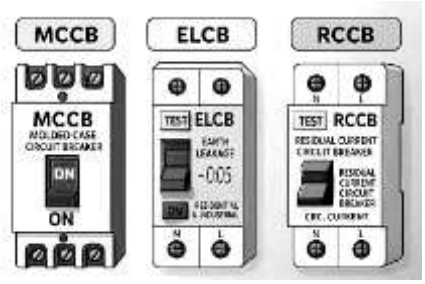
89. The holes on the aluminum disc in an energy meter help to
(a) Prevent creeping*
(b) Reduce the resistance
(c) Reduce the friction
(d) Reduce the weight of the disc
Hint: The holes drilled in the aluminum disc of an energy meter create a small braking torque due to eddy currents when the disc rotates slowly. This helps prevent creeping, which is the slow, unwanted rotation of the disc when no load is connected (caused by voltage coil vibration, stray fields, etc.).

90. The body resistance value of a person with normal age and health is about ____
(a) 1 kilo ohm*
(b) 10 kilo ohm
(c) 5 kilo ohm
(d) 0.5 kilo ohm

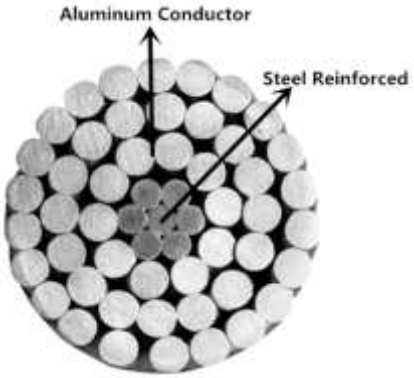
91. Maximum interval between supports for overhead Line of voltage not exceeding 650 V as per the CEA Regulations is
(a) 72 mtr
(b) 50 mtr
(c) 65 mtr*
(d) 100 mtr

92. Which of the following motor is mostly used for driving a refrigerator
(a) A universal motor
(b) A capacitor start induction motor
(c) A D.C. shunt motor
(d) A plain squirrel cage induction motor*

93. For protection of persons from the risk of electrocution in domestic wiring system, a device is provided named
(a) MCB
(b) MCCB
(c) FUSE unit
(d) ELCB*
Hint: An ELCB (Earth Leakage Circuit Breaker) is specifically designed to protect persons from the risk of electrocution. It detects leakage current flowing to earth (for example, through a person's body) and quickly disconnects the supply, thereby preventing electric shock.



94. ACSR conductor stands for
(a) An Aluminum Alloy conductor
(b) Aluminum conductor steel reinforced*
(c) Alloy conductor with steel
(d) None of this
Hint:



95. The maximum permissible load in lighting sub-circuit is ____
(a) 800 W*
(b) 850 W
(c) 875 W
(d) 880 W
Hint: **Lighting and fan sub-circuits:** The total load must not exceed 800 W, and the maximum number of connection points (lights, fans, and 5A sockets) is limited to 10 points as per Indian Electricity (IE) rules.
Power sub-circuits: The maximum load is restricted to 3000 W with a maximum of 2 points (15A outlets)

96. When the overhead LT line passes adjacent to the building the horizontal clearance must be
(a) Not less than 1.0 metres
(b) Not less than 1.2 metres*
(c) Not Jess than 1.6 metres
(d) None of these

97. The inner tube of high pressure MV lamp has ____
a} Argon gas*
(b) Halogen gas
(c) Helium gas
(d) Nitrogen gas
Hint: The inner discharge tube of a high-pressure mercury vapor (MV) lamp contains argon gas along with a small amount of high-purity mercury.
The argon gas is easily ionized and helps to initiate the arc discharge when the lamp is first turned on (during the starting phase) before the mercury vaporizes from the heat.
The outer glass envelope typically contains nitrogen gas, which acts as thermal insulation and protects the internal parts from oxidation.

98. A tube lamp circuit meant for 220 V, 50 Hz AC supply is connected to 220 V DC supply. What is the consequence?
(a) The tube lamp glows normally
(b) The tube lamp becomes brighter
(c) The tube lamp becomes less bright
(d) The tube lamp Initially starts and then the tube bums out*
Hint: A tube lamp circuit designed for 220 V, 50 Hz AC supply typically uses a choke (inductor) in series with the tube to limit current and provide a high voltage kick to start the lamp. The choke only works with alternating current because its inductive reactance depends on frequency:
$X_L = 2\pi fL$
On DC:
Frequency $f = 0 \rightarrow$ inductive reactance $X_L = 0$
The choke acts as a simple resistor (only its small winding resistance remains)
Due to small resistance, excessive current flows. Because of this, the tube may initially start (if the starter momentarily breaks the circuit and the choke induces a high voltage kick), but then the excessive current will quickly burn out the tube/ballast.

99. According to National Electric code, what should be the minimum acceptable value of the insulation resistance for domestic Installation?
(a) Not less than 0.1 MΩ
(b) Not less than 0.5 MΩ
(c) Not less than 0.25 MΩ
(d) Not less than 1 MΩ*

100. Instrument transformers are used on AC circuits for extending the range of ____
(a) Ammeters only
(b) Voltmeters only

(c) Watt meters only
(d) All of the above*