

601. Generally an electrolytic capacitor is made to provide_____.
- A. fixed capacitance
 - B. variable capacitance
 - C. low capacitance
 - D. large value of capacitance

Ans. D

Sol. Generally electrolytic capacitor is used to provide large value of capacitance. The large capacitance of electrolytic capacitors makes them particularly suitable for passing or bypassing low-frequency signals, and for storing large amounts of energy. They are widely used for decoupling or noise filtering in power supplies and DC link circuits for variable-frequency drives, for coupling signals between amplifier stages, and storing energy as in a flash lamp.

602. Voltage applied across a ceramic dielectric produces an electrostatic field 100 times greater than in air. The dielectric constant? of the ceramic equals_____.
- A. 100/3
 - B. 50
 - C. 100
 - D. 1/100

Ans. C

Sol. Voltage applied across ceramic dielectric produces electrostatic field 100 times greater than in air then the dielectric constant of ceramic will also 100 because, the amount of electrostatic field is directly proportional to relative permittivity. This relative permittivity is called as dielectric constant.

603. Which of the following capacitors of identical rating will have the smallest dimensions?
- A. Ceramic capacitor
 - B. Mica capacitor
 - C. Aluminium foil capacitor
 - D. Paper capacitor

Ans. A

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the dielectric constant of ceramic will also 100 because, the amount of electrostatic field is directly proportional to relative permittivity. This relative permittivity is called as dielectric constant.

604. Internal heating of capacitor is usually attributed to_____.
- A. dielectric charge
 - B. plate vibration
 - C. electron movement
 - D. leakage resistance

Ans. D

Sol. A real capacitor has a leakage resistance internally. It can be said as a large resistance in parallel with capacitor. While the leakage current flowing in it, and then I^2R loss is produced due to that leakage resistance. Hence, the internal loss happens due to the leakage power loss inside the capacitor.

605. During discharge of a battery_____.
- A. the voltage of cell decreases
 - B. the voltage of cell increases
 - C. voltage does not change
 - D. None of these

Ans. A

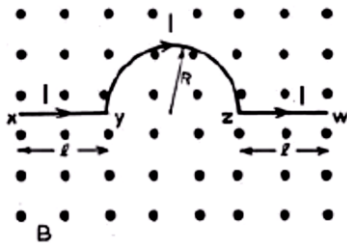
Sol. during discharging the voltage of cell decreases whereas during charging voltage of cell increases.

606. Which efficiency of the battery is more?
- A. Watt hour efficiency
 - B. Ampere hour efficiency
 - C. Overall efficiency
 - D. None of these

Ans. A

Sol. watt hours efficiency of the battery is more. Normally lead acid battery are having the watt-hour efficiency between 70 to 80%.

607. A wire bent into a semi-circle in the centre and straight at both ends is placed in a uniform magnetic field B pointing out of the page shown in the figure. If the wire carries current I , the force on each straight section xy and zw is _____.



- A. IB (current \times Magnetic Field)
- B. ILB (Current \times Length \times Magnetic Field)
- C. IB (Length \times Magnetic Field)
- D. Zero

Ans. B

Sol. force on each straight section xy and zw is given by Lorentz force formula-

$$F = IBL$$

Where ; B : magnetic field

I : current flowing through the wire

L : length of the wire

608. If three $30 \mu F$ capacitors are connected in series, the net capacitance is_____.

- A. $10 \mu F$
- B. $60 \mu F$
- C. $90 \mu F$
- D. None of these

Ans. A

Sol. - If three capacitors of equal capacitance are connected in series. Then their net capacitance will -

$$C_{net} = \frac{C}{3} = \frac{30}{3} = 10 \mu F$$

609. For making capacitors, it is better to select a dielectric having_____.

- A. high permittivity
- B. low permittivity
- C. permittivity same as that of air
- D. None of these

Ans. A

Sol. -Dielectric used for making capacitor should have high permeability. Because the capacitance of capacitor is directly proportional to the dielectric permeability. If dielectric permeability will high then capacitance of capacitor will also high.

610. The materials having low retentivity are suitable for making _____.

- A. temporary magnets
- B. permanent magnets
- C. weak magnets
- D. None of these

Ans. A

Sol. - Materials which are required to retain their magnetism will have a fairly high retentivity and as such are used to make permanent magnets, while those materials required to lose their magnetism quickly such as soft iron cores for relays and solenoids will have a very low retentivity. Low retentivity materials are also suitable for making temporary magnets.

611. In a parallel circuit operating with a source of $30 V$ AC, designed to carry a total current of $6 A$, what happens to the protection device (fuse) when the resistance suddenly changes to 2Ω ?

- A. It closes
- B. There is no change
- C. It shorts to ground
- D. It opens

Ans. D

Sol. - when $30V$ AC source is carrying $6A$ the resistance of the path

$$R_{OLD} = \frac{30}{6} = 5\Omega$$

$$R_{NEW} = 2\Omega$$

As resistance decreases the current in the circuit will increase and fuse gets open circuited to protect the equipment from over current.

612. Which of the following determines total power in a series circuit?

- A. Source voltage times the current
- B. Total voltage applied to the circuit
- C. Current flowing through a switch
- D. Average of the wattage consumed by each resistor

Ans. A

Sol. Explanation - total power in series circuit is given by formula

$$P_{TOTAL} = V_s \times I_s$$

V_s : source voltage

I_s : source current

From the above formula we can say that power is current times of source voltage.

613. What should be observed when connecting a voltmeter into a DC circuit?

- A. RMS
- B. Resistance
- C. Polarity
- D. Power factor

Ans. C

Sol. polarity is most important while connecting voltmeter to DC source. Wrong polarity connection may damage voltmeter.

614. A potential divider is normally connected _____.
- A. outside the generator circuit towards the load circuit
 - B. Within the generator circuit
 - C. at a distance $V/100$ metres from the generator where V is the voltage to be measured in KV
 - D. None of these

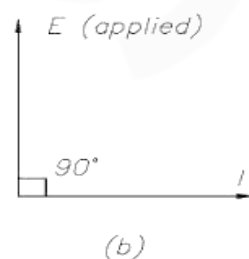
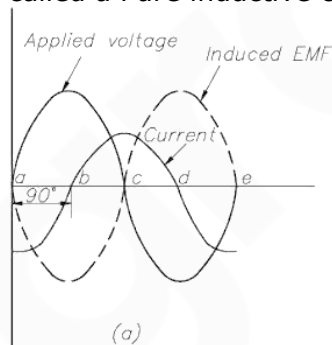
Ans. A

Sol. - The voltage divider should always be connected outside the generator circuit towards the load circuit (Test object) for accurate measurement.

615. In a pure inductive circuit _____.
- A. The current leads applied voltage by 90 degree
 - B. The current is in phase with applied voltage.
 - C. The current lags applied voltage by 90 degree
 - D. None of these

Ans. C

Sol. for pure inductive circuit current lags voltage by 90. The circuit which contains only inductance (L) and not any other quantities like resistance and capacitance in the Circuit is called a Pure inductive circuit.



616. The average power in a pure inductive circuit is _____.
- A. 0
 - B. VI
 - C. $VI \cos \phi$
 - D. $\sqrt{3}VI \cos \phi$

Ans. A

Sol. $P = V \times I \times \cos \phi$

For pure inductive circuit $\phi = 90^\circ$ (phase angle between voltage and current is 90°)

$$P_{avg} = V \times I \times \cos 90^\circ = 0$$

617. In a R-L series circuit the power factor P.F. is _____.
- A. Leading
 - B. Lagging
 - C. 0
 - D. 1

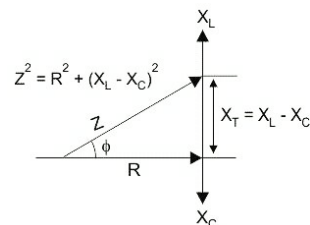
Ans. A

Sol. For series RL circuit that is inductive circuit The circuit which contains Resistance (R) inductance (L) in series and not any other quantities like capacitance in the Circuit. An inductive circuit where the current "lags" the voltage (ELI) is said to have a lagging power factor.

618. The angle of a series R-L-C circuit is leading if _____.
- A. $X_L = 0$
 - B. $R = 0$
 - C. $X_C > X_L$
 - D. $X_C < X_L$

Ans. C

Sol. If the inductive reactance is greater than the capacitive reactance, i.e $X_L > X_C$, then the RLC circuit has lagging phase angle and if the capacitive reactance is greater than the inductive reactance, i.e $X_C > X_L$ then the RLC circuit have leading phase angle and if both inductive and capacitive are the same, i.e $X_L = X_C$ then circuit will behave as purely resistive circuit.



619. In an R-C-L series circuit, during resonance, the impedance will be _____.
- A. zero
 - B. minimum
 - C. maximum
 - D. None of these

Ans. B

Sol. in an series RLC series circuit the total impedance is given as
 $Z = [(R^2 + (X_L - X_C)^2)]^{1/2}$
 X_L : inductive reactance
 X_C : capacitive reactance
 R : resistance
 Z : total impedance
 At resonance ($X_L = X_C$)
 $Z = [R^2]^{1/2} = R$
 Impedance at resonance will be its minimum value.

620. Kirchoff's current law (KCL) is applicable only to _____.
 A. Closed loops in a network
 B. electronic circuits
 C. junction in a network
 D. electric circuits

Ans. C

Sol. Kirchoff's Current Law (KCL) is applicable only to junction in a network.

621. Flow of electrons in the circuit constitutes _____.
 A. Magnetic charge
 B. an e.m.f
 C. an electric current
 D. None of these

Ans. C

Sol. Electric current is nothing but only flow of electrons in a circuit. Flow of electrons are responsible for current flowing through the circuit.

$$I = \frac{q}{t}$$

q: total charge

t : time duration of charge flow

622. The material used for the magnetic circuit where high value of flux density required is _____.
 A. cast iron B. ferro cobalt
 C. soft steel D. gray cast iron

Ans. B

Sol. material used for magnetic circuit where high value of flux density is ferro Cobalt. Cobalt iron alloys have the highest saturation polarization.

623. If two resistances of 10Ω and 10Ω are connected in parallel the equivalent resistance is _____.
 A. 15Ω B. 100Ω
 C. 5Ω D. 1Ω

Ans. C

Sol. -if two resistance are in parallel then their equivalent resistance

$$R_{eq} = (R_1 \times R_2) / (R_1 + R_2)$$

Here $R_1 = R_2 = 10 \Omega$

$$R_{eq} = \frac{10 \times 10}{10 + 10} = \frac{100}{20} = 5 \Omega$$

624. Unit of magnetic flux is _____.
 A. Weber B. ampere-turn
 C. weber/m² D. coulomb

Ans. A

Sol. If we choose a simple flat surface with area A as our test area and there is an angle θ between the normal to the surface and a magnetic field vector (magnitude B) then the magnetic flux is,
 $\phi = BA \cos \theta$

Unit of $\phi = \text{Tesla} \times \text{m}^2 = \text{Weber}$

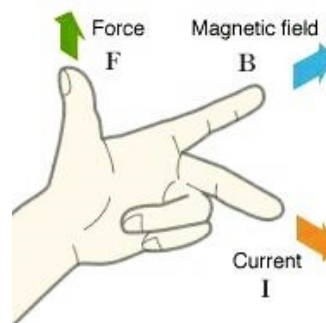
625. Fleming's left hand rule is used to find _____.
 A. Polarity of magnetic pole
 B. direction of flux in a solenoid
 C. direction of magnetic field due to a current carrying conductor in a magnetic field
 D. direction of force on a current carrying conductor in a magnetic field

Ans. D

Sol. Whenever, a current carrying conductor comes under a magnetic field, there will be a force acting on the conductor and on the other hand, if a conductor is forcefully brought under a magnetic field, there will be an induced current in that conductor. In both of the phenomenon, there is a relation between magnetic field, current and force. This relation is directionally determined by Fleming's Left Hand rule.

Ans. D

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626. In which of the following voltage sources is the movement of conductors in a magnetic field used to produce voltage?
A. in a thermo couple
B. in a zinc copper element
C. in a D.C. generator
D. in a transformer

Ans. C

Sol. It is based on the principle of production of dynamically (or motionally) induced e.m.f (Electromotive Force). Whenever a conductor cuts magnetic flux, dynamically induced e.m.f. is produced in it according to Faraday's Laws of Electromagnetic Induction. This e.m.f. causes a current to flow if the conductor circuit is closed

627. The relative permeability of a material is 0.95. The material is ____.
A. diamagnetic B. paramagnetic
C. ferromagnetic D. None of these

Ans. A

Sol. -Diamagnetic materials have relative permeability (μ_r) less than 1.

628. The series magnet of a single phase Energy meter consists of coil of ____.
A. thin wire of few turns
B. thick wire of few turns
C. thick wire of more turns
D. thin wire of more turns

Ans. B

Sol. - Series magnet: it consists of a number of U-shaped laminations of silicon steel together to form a core. A coil of thick wire having a few turns is wound in both legs of U-shaped magnet. the coil is known as current coil which is connected in series with load. produce the magnetic field proportional and in phase with line current I.

629. The relative permeability of paramagnetic material is _____.
A. less than unity
B. equal to unity
C. greater than unity
D. None of these

Ans. C

Sol. Explanation - Materials can be classified into 3 groups with regard to their relative permeability:

- Diamagnetic materials $0 \leq \mu_r < 1$
- Paramagnetic materials $\mu_r > 1$
- Ferromagnetic materials $\mu_r \gg 1$

630. Magnetic recording tape is most commonly made from _____.

- A. small particles of iron
B. silicon-iron
C. ferric oxide
D. None of these

Ans. C

Sol. Magnetic tape is a medium for magnetic recording, made of a thin, magnetizable coating on a long, narrow strip of film. The medium is made of a magnetic material like iron oxide or iron-cobalt and it polarizes the metallic grains in one direction or the other (this can be up or down or side to side).

631. Reluctance offered by the magnetic circuit depends upon _____.

- A. nature of magnetic material
B. length of magnetic flux path
C. cross-sectional area of the material
D. All options are correct

Ans. D

Sol. - Reluctance of a magnetic field is given by

$$R = l/(\mu_0\mu_r a)$$

Where, l: length of wire

μ_0 : absolute permeability

μ_r : relative permeability of material

a: area of cross section

632. Moving iron meters can be used to measure _____.

- A. Both AC & DC
B. Only AC
C. Only DC
D. None of these

Ans. A

Sol. Moving iron instrument can be used to measure both AC and DC because torque produced in moving iron instrument is proportional to the square of the current flowing through the coil

$$T \propto I^2$$

633. A network has 10 nodes and 17 branches. The number of different node pair voltage would be
 A. 7 B. 9
 C. 45 D. 10

Ans. C

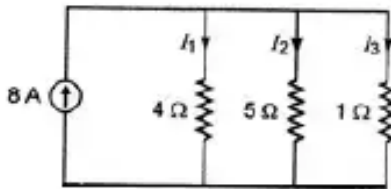
Sol. - The first point could be any one of the 10 nodes. The second point could be any one of the 9 remaining nodes.

So there are $(10 \times 9) = 90$ ways to connect my voltmeter.

But for each one, there's another one that's just the same two points. But with opposite polarity.

So there are $\frac{90}{2} = 45$ distinct different pairs of nodes

634. Find current I_1, I_2 and I_3 respectively in the given figure.



- A. 1.38 A, 1.1 A and 5.52 A
 B. 1.38 A, 5.5 A and 1.1 A
 C. 1.38 A, 0.9 A and 6.38 A
 D. 1.1 A, 5.52 A and 1.38 A

Ans. A

Sol. - as all three resistances are in parallel so potential across them will remain same

i.e. $4I_1 = 5I_2 = I_3$ -----(i)

According to the KCL;

$I_1 + I_2 + I_3 = 8$ -----(ii)

From equation (i)

$I_2 = \frac{4}{5}I_1$

$I_3 = 4 I_1$

Putting values in equation (ii)

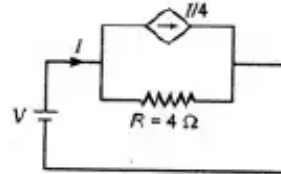
$I_1 + \frac{4}{5}I_1 + 4I_1 = 8$

$I_1 = \frac{40}{29} = 1.38A$

$I_2 = \frac{4}{5} \times 1.38 = 1.10 A$

$I_3 = 4 \times 1.38 = 5.51 A$

635. In the below network effective resistance existing across the voltage source is _____.



- A. 4Ω B. 3Ω
 C. 2Ω D. 1Ω

Ans. B

Sol. using KCL current through resistor

$I_R = I - \left(\frac{I}{4}\right) = \frac{3I}{4}$

$R_{\text{effective}} = \frac{V}{I}$

Voltage drop across resistor 4Ω

$V = \frac{3I}{4} \times 4 = 3I$

$R_{\text{effective}} = \frac{V}{I} = \frac{3I}{I} = 3\Omega$

636. Which one of the following is applicable to any network linear or non-linear, active or passive, time varying or invariant as long as Kirchhoff's laws are not violated?
 A. Tellegen's theorem
 B. Reciprocity theorem
 C. Maximum power transfer theorem
 D. Superposition theorem

Ans. A

Sol. The Tellegen's theorem is applicable to a multitude of network systems. The basic assumptions for the systems are the conservation of flow of extensive quantities (Kirchhoff's current law, KCL) and the uniqueness of the potentials at the network nodes (Kirchhoff's voltage law, KVL). The Tellegen's provides a useful tool to analyze complex network systems. A electrical circuits, biological and metabolic networks, pipeline transport networks, and chemical process networks.

637. In which of the following, it is not desired to attain the condition of maximum power transfer?
 A. Electronic circuits
 B. Communicational circuits
 C. Computer circuits
 D. Electric circuits

Ans. D

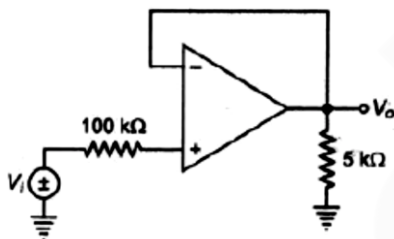
Sol. – In electric circuit it is not desirable to attain condition of maximum power transfer because at maximum power condition the efficiency of equipment reduced to around 50%.

638. A current mirror can be used as an active load because_____.
- it has low AC resistance
 - it has high AC resistance
 - it has high DC resistance
 - it has low DC resistance

Ans. B

Sol. The current mirror is used to provide bias currents and active loads to circuits. Ideal current mirror circuit has infinite AC resistance while practical current source has high AC resistance.

639. In the below given network, the ideal closed loop voltage gain is _____.



- 1
- 1
- ∞
- 50

Ans. A

Sol. Given circuit is non inverting amplifier.

Closed loop gain of non inverting amplifier $(A_v) = 1 + R_F/R_2$
 $R_F = 0$ (feedback resistor)
 $A_v = 1 + 0/R_2 = 1$

640. Which of the following is essential for the reciprocity theorem to be applicable?
- Linearity
 - Bilateralism
 - No initial history
 - All options are correct

Ans. D

Sol. Reciprocity Theorem states that – In any branch of a network or circuit, the current due to a single source of voltage (V) in the network is equal to the current through that branch in which the source was originally placed when the source is again put in the branch in which the current

was originally obtained. This theorem is used in the bilateral linear network which consists bilateral components.

641. If the capacitor of a single phase motor is short circuited, the motor will _____.
- start
 - not start
 - start with jerks
 - start and then stop

Ans. B

Sol. If capacitor of single phase induction motor is short circuit then auxiliary winding will act as open circuit because capacitive reactance will become infinite of auxiliary winding.

$$X_c = \frac{1}{2\pi f C}$$

If $C = 0$ then $X_c = \infty$

So there will be no phase difference between main and auxiliary winding magnetic fields and motor starting torque will not produce. That's why motor will not run.

642. The speed of the rotating magnetic field in an induction motor is known as the _____.
- slip speed
 - effective speed
 - shaft speed
 - synchronous speed

Ans. D

Sol. Rotating magnetic field of induction motor runs with a speed of synchronous Speed. Which is given by

$$N_s = \frac{120f}{P}$$

643. When the frequency of the rotor of an induction motor is small, it can be measured by_____.
- galvanometer
 - d.c. moving coil milli-voltmeter
 - d.c. moving coil ammeter
 - a.c. voltmeter

Ans. B

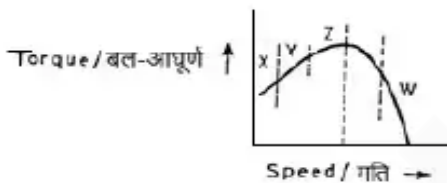
Sol. – DC moving coil mili voltmeter are used to measure frequency of rotor of induction motor. When frequency is low.

644. The value of the capacitor in a capacitor start motor controls the _____.
- starting torque
 - speed of the motor
 - efficiency
 - None of these

Ans. A

Sol. capacitor in single phase induction motor are used to provide starting torque to the motor. Capacitor provide phase difference between auxiliary and main winding magnetic field of single phase induction motor.

645. In the below given torque/speed characteristics of an induction motor, stable region is _____.

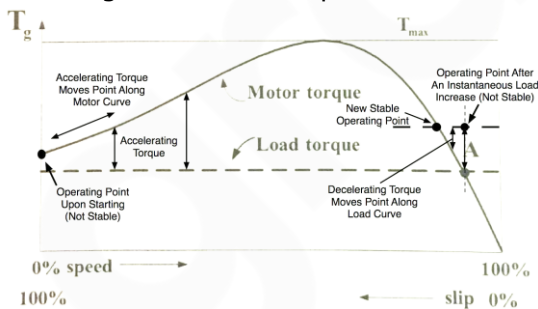


- X
- Y
- Z
- W

Ans. D

Sol. - 'w' is stable region

Because at point 'w' we can see that by increasing load torque (T_L) speed of motor decreases. And by decreasing load torque (T_L) speed increases. Therefore 'w' is stable region for motor operation.



646. Which of the following is most economical method for starting single-phase motor?
- Capacitor start method
 - Split-phase method
 - Induction-start method
 - Resistance-start method

Ans. A

Sol. Capacitor start is the most economical method to start Induction motor.

647. What is the use of the circuit shown in the figure below?

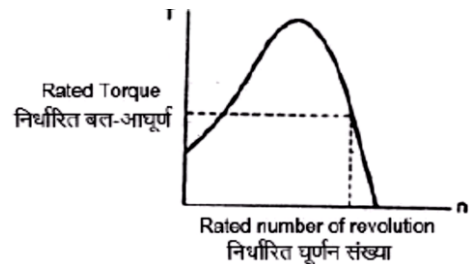


- To reduce the starting current to a very low
- To achieve a smooth starting
- To attain a higher starting torque
- To attain a higher maximum torque

Ans. B

Sol. resistance is connected in one phase of three phase induction motor is to provide smooth starting to the motor.

648. Which of the following motors is represented by the characteristics curve shown below?



- D.C. shunt motor
- D.C. series motor
- D.C. compound motor
- Asynchronous motor

Ans. D

Sol. asynchronous motors also known as induction motors, also run by the principle of electromagnetic induction, in which the rotor does not receive any electric power by conduction as in the case of D.C motors. The shown characteristics is of asynchronous motor.

649. For a 100% efficient transformer, the primary winding has 1000 turns and the secondary 100 turns. If the power input to the above transformer is 1000 watts, the power output is _____.
- A. 1000 watts B. 100 watts
C. 10 watts D. 10 kW

Ans. A

Sol. – transformer efficiency is 100% that's why

$$P_{\text{OUTPUT}} = P_{\text{INPUT}}$$

Therefore output power will same as input.

$$P_{\text{OUT}} = 1000 \text{ Watts.}$$

650. What is the efficiency of transformer compared with that of electrical motors of the same power?
- A. Much smaller
B. Somewhat smaller
C. About same
D. Much higher

Ans. D

Sol. Transformer efficiency is generally greater than 95%, while that of the motors is ~70%. Because Transformers has copper & core loss. Motor or Generator has Mechanical loss (Friction loss & Windage), Core loss (Stator core & Rotor core) & Copper loss (Stator Cu & Rotor Cu). Hence Generator/Motor has less efficiency than transformers

651. In a common emitter amplifier, the un-bypassed emitter resistance provides _____.
- A. voltage-shunt feedback
B. current series feedback
C. negative-voltage feedback
D. positive-current feedback

Ans. C

Sol. An un bypassed emitter resistor (or cathode resistor in a tube amplifier) provides negative CURRENT feedback. It tends to want to reduce the base-emitter current variations, thus reducing overall gain.

652. Which input yields natural response?
- A. step input B. sinusoidal input
C. impulse input D. ramp input

Ans. C

Sol. Impulse input yields natural response. All other signals are

generated by applying various operation on signal.

653. The voltage of a circuit is measured by a voltmeter having input impedance comparable with the output impedance of the circuit thereby causing error in voltage measurement. This error may be called as _____.
- A. gross error
B. random error
C. error caused by misuse of instrument
D. error caused by loading effect

Ans. D

Sol. – It is the most common type of error which is caused by the instrument in measurement work. For example, when the voltmeter is connected to the high resistance circuit it gives a misleading reading, and when it is connected to the low resistance circuit, it gives the dependable reading

654. Which of the following options is an Active transducer?
- A. photo emissive cell
B. photo voltaic cell
C. selsyn
D. photo emissive cell, photo voltaic cell and selsyn

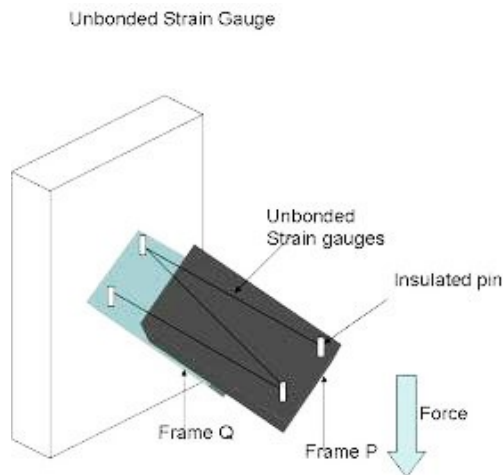
Ans. B

Sol. Active transducers generate electric current or voltage directly in response to environmental stimulation. Photo voltaic cells are an active transducers.

655. Un-bonded strain gauges are ____.
- A. exclusively used for transducer applications
B. exclusively used for stress analysis
C. used for unbounded strains only
D. None of these

Ans. A

Sol. These strain gauges are not directly bonded (that is, pasted) onto the surface of the structure under study. Hence they are termed as unbounded strain gauges
Un - bonded strain gauge's are extensively used as transducers.



656. Dynamometer type moving coil instruments are provided with _____.

- A. eddy current damping
- B. pneumatic damping
- C. fluid friction damping
- D. electrostatic damping

Ans. B

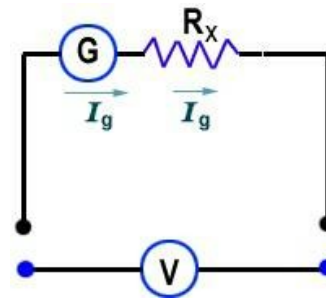
Sol. – In pneumatic damping system light aluminum piston is attached to the spindle of the instrument and is arranged to move in a fix air chamber closed at one end. The cross section of the chamber may be either circular or rectangular and clearance between chamber and side of piston is uniform.

657. Voltmeter is a galvanometer with _____.

- A. high resistance
- B. low resistance
- C. both low and high resistance
- D. uncertain resistance

Ans. A

Sol. Voltmeter is an electrical measuring device, which is used to measure potential difference between two points in a circuit. Galvanometer is a very sensitive instrument, therefore it can not measure high potential difference. In order to convert a Galvanometer into voltmeter, a very high resistance known as "series resistance" is connected in series with the galvanometer.



658. Strain gauge rosettes are used when _____.

- A. the direction of hoop stress is not known
- B. the direction of principal stress is not known
- C. the direction of principal stress is known
- D. the direction of longitudinal stress is not known

Ans. B

Sol. - wire strain gage can effectively measure strain in only one direction. To determine the three independent components of plane strain, three linearly independent strain measures are needed. i.e., three strain gages positioned in a rosette-like layout.

659. The dead time of an instrument refers to _____.

- A. large change of input quantity for which there is no output.
- B. the time encountered when the instrument has to wait for some reactions to take place.
- C. the time before the instrument begins to response after the quantity has altered.
- D. retardation or delay in the response of an instrument to a change in the input signal.

Ans. C

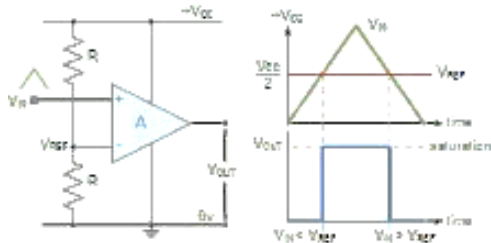
Sol. Dead time is the delay from when a controller output (CO) signal is issued until when the measured process variable (PV) first begins to respond. The presence of dead time (θ_p), is never a good thing in a control loop.

660. One input terminal of high gain comparator circuit is grounded and a sinusoidal voltage is applied to the other input. The output of comparator will be _____.

- A. a sinusoidal
- B. a full rectified sinusoidal
- C. a half rectified sinusoidal
- D. a square wave

Ans. D

Sol. a comparator is a device that compares two voltages or currents and outputs a digital signal indicating which is larger.



When one terminal is grounded the output will square wave.

661. A minimum-phase system with no zeros has a phase-angle of -270° at gain crossover frequency. The system is _____.
- A. stable
 - B. unstable
 - C. marginally stable
 - D. conditionally stable

Ans. B

Sol. a linear, time-invariant system is said to be minimum-phase if the system and its inverse are causal and stable. A system with rational transfer function is minimum-phase if all its zeros are also inside the unit circle.

662. Transfer function of a system is $G(s) = K/[s^2(1 + sT)]$. This open-loop system is _____.
- A. stable
 - B. unstable
 - C. marginally stable
 - D. conditionally stable

Ans. B

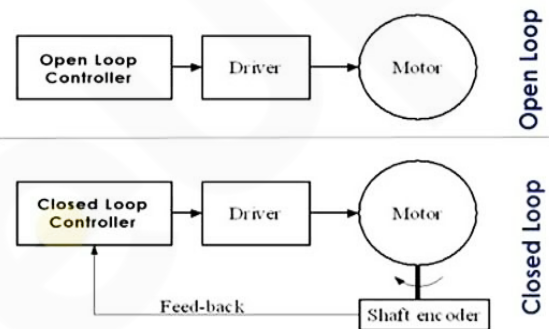
Sol. using R – H criteria
 The characteristic equation is;
 $1 + G(s)H(s) = 0$
 $1 + K/s^2(1 + sT) = 0$
 $s^3 T + s^2 + K = 0$
 $s^3 T K$
 $s^2 1$
 $s^1 - K$

There is a sign change therefore given system is unstable.

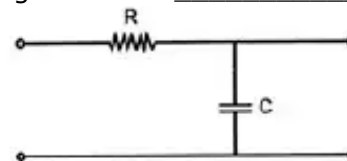
663. In a closed-loop system in which the output is the speed of a motor, the output rate control can be used to _____.
- A. limit the speed of the motor
 - B. limit the torque output of motor
 - C. limit the acceleration of the motor
 - D. reduce the damping of the system

Ans. C

Sol. In closed loop control system of motor output rate control can be used to limit acceleration of motor.



664. If an input signal with non-zero direct current (dc) component is applied to a low pass RC network, then dc component in the output signal will be _____.

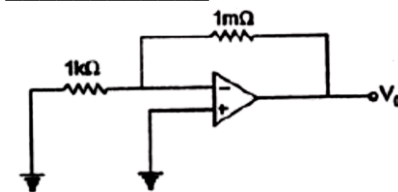


- A. the same as that in the input
- B. less than that in the input
- C. more than that in the input
- D. zero

Ans. A

Sol. –The given circuit is low pass filter
 The Low Pass Filter – the low pass filter only allows low frequency signals from 0Hz to its cut-off frequency, f_c point to pass while blocking those any higher. This will not block DC components of the signal. Therefore DC component in the output signal will remain same as in of input signal

665. An OP AMP has an offset voltage of 1 mV and is ideal in all other respects. If this OP AMP is used in the circuit shown in the figure, the output voltage will be approximately _____.



- A. 3 V B. 2 V
C. 1 V D. 3.5 V

Ans. C

Sol. Input offset voltage (v_{io}) the voltage that must be applied between input terminals of OPAMP to ensure zero output for zero input.

$$v_{io} = |v_+ - v_-|$$

As non inverting terminal of the given op amp is connected to the ground.

$$v_+ = 0$$

$$v_{io} = |0 - v_-| = v_-$$

$$v_- = R_1 / (R_1 + R_F) v_o$$

$$v_o = (1 + R_F / R_1) v_-$$

$$v_o = (1 + R_F / R_1) v_{io}$$

$$v_o = [1 + (1 \times 10^6) / (1 \times 10^3)] \times 1 \times 10^{-3}$$

$$v_o = [1 + (1 \times 10^3)] \times 1 \times 10^{-3}$$

As $1 \ll 1000$ therefore it can be neglected

$$v_o = 1 \times 10^3 \times 1 \times 10^{-3} = 1 \text{ V}$$

666. A freshly painted layer may be dried electronically by _____.

- A. convective heating
B. induction heating
C. dielectric heating
D. emissive heating

Ans. C

Sol. Dielectric heating, also known as electronic heating, RF (radio frequency) heating, and high-frequency heating, is the process in which a high-frequency alternating electric field, or radio wave or microwave electromagnetic radiation heats a dielectric material. Dielectric heating can be used to remove freshly painted layer.

667. Two heaters, rated at 1000 W, 250 V each are connected in series across a 250 V, 50 Hz ac mains. The total power drawn from the supply would be _____ watt.

- A. 1000 B. 500
C. 250 D. 2000

Ans. B

Sol. - Resistance of heater element

$$R = V^2 / P = \frac{250 \times 250}{1000} = 62.5 \Omega$$

As both heater are in series. Their combined resistance

$$R_{series} = 62.5 + 62.5 = 125 \Omega$$

$$\text{Power consumption (P)} = V^2 / R_{series} = \frac{250 \times 250}{125} = 500 \text{ W}$$

668. What is the maximum length of the flexible conduit in motor installation?

- A. Less than 1.25 m
B. Less than 2.25 m
C. Less than 3.5 m
D. can exceed not more than 5 m.

Ans. A

Sol. - An electrical conduit is a tube used to protect and route electrical wiring in a building or structure. Electrical conduit may be made of metal, plastic, fiber, or fired clay. Most conduit is rigid, but flexible conduit is used for some purposes.

Conduit is generally installed by electricians at the site of installation of electrical equipment. The maximum length of electrical conduit for motor installation should be less than 1.25m.

669. Which among these fuse is very fast in operation?

- A. Semiconductor fuses
B. High rupturing capacity type
C. Cartridge type
D. Kit Kat type

Ans. A

Sol. Semiconductor protection fuses is one of the fastest growing market in today's world. These fuses are used to protect against over-current conditions in semiconductor devices. Because of their fast action, semiconductor fuses help to limit the short circuit current significantly.

670. What is the factor of safety used for current ratings in a power installation?

- A. 1
- B. 1.5
- C. 1.75
- D. 2

Ans. D

Sol. - Factors of safety (FoS), also known as (and used interchangeably with) safety factor (SF), is a term describing the load carrying capacity of a system beyond the expected or actual loads. Factor of safety for current is taken around 1.5 times of maximum value of current.

671. Which among these is a method of wiring?

- A) Joint box
- B) Tee system
- C) Loop in system

- A. Only A
- B. Only B
- C. Only A and C
- D. A, B and C

Ans. D

Sol. **Joint Box or Tee or Jointing System**

In this method of wiring, connections to appliances are made through joints. These joints are made in joint boxes by means of suitable connectors or joints cutouts.

Loop-in or Looping System

This method of wiring is universally used in wiring. Lamps and other appliances are connected in parallel so that each of the appliances can be controlled individually. When a connection is required at a light or switch, the feed conductor is looped in by bringing it directly to the terminal and then carrying it forward again to the next point to be fed.

672. Which among these is a part of distribution system?

- A) Feeders
- B) Distributors
- C) Service mains

- A. Only A
- B. Only B
- C. Only C
- D. A, B and C

Ans. D

Sol. Electric power distribution is the final stage in the delivery of electric power; it carries electricity from the transmission system to individual consumers. Feeders, distributor and service mains are the part of distribution system

673. What is the maximum span upto which the wooden poles can be used?

- A. 20 m
- B. 50 m
- C. 60 m
- D. 100 m

Ans. C

Sol. Maximum span for wooden pole is 60m.

674. For what voltage is the H-type of poles used?

- A. 22 kV
- B. 130 kV
- C. 11 kV
- D. All options are correct

Ans. B

Sol. H – poles are used for 132 kv.

675. To prevent the decaying owing to snow and rain, the wooden poles are protected by _____ cap at the top.

- A) Aluminium
 - B) Zinc
 - C) Cement
- A. Only A
 - B. Only B
 - C. Only C
 - D. A, B and C

Ans. D

Sol. aluminum, zinc and cement are used to prevent decay of wooden poles from snow and rain.

676. Steel rail poles of height 13 meters are used for transmission purpose of _____ voltage.

- A. 33 kV
- B. 11 kV
- C. 22 kV
- D. Both 33 kV and 11 kV

Ans. A

Sol. Normally, we use 45 Kg per meter rail pole in 11 KV and for 33 KV we use 45 Kg per meter and 52 Kg per meter rail poles. The length of the different size rail pole differs from 9 meters to 13 meters.

677. The squirrel-cage winding of a single-phase motor is placed in the _____.

- A. armature B. stator
- C. rotor D. field

Ans. C

Sol. –squirrel cage rotor consists of a cylindrical laminated core with parallel slots for carrying the rotor conductors, which are not wires, as we think, but thick, heavy bars of copper or aluminium or its alloys. Squirrel cage winding are placed in rotor.

678. NEMA standards rate motors according to _____.

- A. frame number B. horsepower
- C. voltage D. weight

Ans. A

Sol. The National Electrical Manufacturers Association (NEMA) represents nearly 350 electrical equipment and medical imaging manufacturers at the forefront of electrical safety, reliability, and resilience, as well as efficiency and energy security. NEMA standard rates motor according to frame numbers.

679. Which of the following motors is most suitable for signalling devices and timer?

- A. D.C. series motor
- B. D.C. shunt motor
- C. Two phase induction motor
- D. Reluctance motor

Ans. D

Sol. –Reluctance motor is used for many constant speed applications such as electric clock timer, signaling devices, recording instruments etc.

680. The purpose of skewing of rotor slots in induction motor is_____.

- A. to reduce the magnetic hum of the motor
- B. to increase the distribution factor
- C. to reduce the locking tendency of rotor
- D. to increase the breadth factor

Ans. C

Sol. In Squirrel cage rotor, slots in lamination or rotor core is not made

parallel to the rotor shaft. A slight angle is maintained due to some advantages. This is called the rotor Skew.

Skew helps to make the motor run quietly by reducing the magnetic hum. It reduce rotor locking tendency. *Rotor locking tendency occurs when rotor teeth remain directly under stator teeth thus they might be magnetically attracted.*

681. In an induction motor, if the rotor resistance is equal to stand-still reactance then the maximum torque is _____.

- A. less than starting torque
- B. equal to starting torque
- C. more than starting torque
- D. None of these

Ans. B

Sol. - The developed torque is maximum when the rotor resistance per phase is equal to the rotor reactance per phase under running conditions.

682. The m.m.f. produced by a single phase winding is_____.

- A. pulsating and stationary
- B. pulsating and rotating
- C. constant in amplitude and stationary
- D. constant in amplitude and rotating

Ans. A

Sol.

$$i_a = I_m \cos \omega t; (I_m = \text{maximum value of the phase current}) \quad (5.35)$$

the mmf wave is given by

$$\begin{aligned} \phi_{a1} &= \frac{4}{\pi} K_w \left(\frac{N_{ph} \text{ (series)}}{P} \right) I_m \cos \omega t \cos \theta \\ &= F_m \cos \omega t \cos \theta \end{aligned} \quad (5.36)$$

where

$$F_m = \frac{4}{\pi} K_w \left(\frac{N_{ph} \text{ (series)}}{P} \right) I_m = \frac{4\sqrt{2}}{\pi} K_w \left(\frac{N_{ph} \text{ (series)}}{P} \right) I \quad (5.37)$$

where $I = I_m / \sqrt{2}$ = rms value of phase current.

when one phase carries sinusoidal current.

the mmf of one phase is a *standing wave* (pulsating wave) in space whose peak always coincides with the phase axis while the peak amplitude varies sinusoidally with time. This is illustrated in Fig. 5.29, where a half-cycle of pulsation is indicated.

683. Usually wide and very sensitive speed control is required in case of _____.

- A. Reciprocating pumps
- B. Colliery winders
- C. Centrifugal blowers
- D. Lathe machines

Ans. B

Sol. In ward-Leonard method, very fine speed control over the whole range from zero to normal speed in both directions can be obtained. The motor-generator set can provide speed both below and above the rated speed and in both direction. In case of colliery winders fine speed control required.

684. Inter-poles are used in_____.

- A. lap wound machines
- B. wave wound machines
- C. both lap and wave wound machines
- D. None of these

Ans. C

Sol. In DC machine One way to reduce the effects of armature reaction is to place small auxiliary poles called "inter poles" between the main field poles. in Generators the inter poles have a few turns of large wire and are connected in series with the armature.

685. For the production of induced e.m.f. field system of an electric machine _____.

- A. must be on stator
- B. may be on stator or rotor
- C. must be on rotor
- D. None of these

Ans. B

Sol. Current produced by the relative motion of stator/rotor conductor or magnet is called induced current, set up by an induced electromotive force or EMF. The production of EMF in a coil is called the phenomenon of ELECTROMAGNETIC INDUCTION. EMF is produced when a current carrying conductor placed in a rotating magnetic field. Where either field is rotating or conductor.

686. The number of conductors of the compensating winding in a D.C. machine _____.

- A. is always more than the number of armature conductors per pole
- B. is always less than the number of armature conductors per pole
- C. may be less or more than the number of armature conductors per pole
- D. None of these

Ans. B

Sol. - The cross-magnetizing effect of armature reaction may cause trouble in d.c. machines subjected to large fluctuations in load. In order to neutralize the cross magnetizing effect of armature reaction, a compensating winding is used. The compensating windings consist of a series of coils embedded in slots in the pole faces. These coils are connected in series with the armature. The number of turns in the compensating winding are always less than number of armature conductors.

687. Two D.C. machines 500 kW each are tested by Hopkinson testing method. The power input would be _____.

- A. 500 kW
- B. 100 kW
- C. 1000 kW
- D. None of these

Ans. B

Sol. - Power input for Hopkinson test for given rating machines should be 100 kW.

688. In a D.C. machine, how are the commutating pole winding connected?

- A. In series with the shunt winding
- B. Parallel to the shunt winding
- C. In series with the armature winding
- D. Parallel to the armature winding

Ans. A

Sol. A commutator consists of a set of copper segments, fixed around the part of the circumference of the rotating machine, or the rotor. Commutator segments are connected in series with the coils of the armature, with the number of coils (and commutator segments) depending on the speed and voltage of the machine.

689. In motor circuit static frequency changers are used for _____.
- A. improved cooling
 - B. Power factor improvement
 - C. reversal of direction
 - D. speed regulation

Ans. D

Sol. Frequency changers are used for converting bulk AC power from one frequency to another, The speed of an AC motor is dependent on the frequency of the AC power supply, so changing frequency allows the motor speed to be changed. This allows fan or pump output to be varied to match process conditions, which can provide energy savings.

690. In case of travelling cranes, the motor preferred for boom hoist is _____.
- A. slip ring induction motor
 - B. squirrel cage induction motor
 - C. synchronous motor
 - D. single phase motor

Ans. A

Sol. For hoisting and lowering of crane requires high starting torque. Hence ac slip ring induction motor, Ward Leonard controlled DC shunt motors are preferred.

691. Light duty cranes are generally used in _____.
- A. automobile workshops
 - B. pumping stations
 - C. power houses
 - D. All options are correct

Ans. D

Sol. - Light duty cranes design promote easy installation and smooth, repetitive, robust lifting. Light duty cranes are used in - Automobile workshop, Pumping station and Power houses etc.

692. 15 minutes rated motors are suitable for _____.
- A. Light duty cranes
 - B. Medium duty cranes
 - C. Heavy duty cranes
 - D. All options are correct

Ans. D

Sol. 15 minutes rated motors are suitable for light crane application.

693. Free running and coasting periods are generally long in case of ____.
- A. Urban service
 - B. Sub-urban service
 - C. Main-line service
 - D. All options are correct

Ans. C

Sol. free running and costing period of main line service is long because we can not shut down main line during maintenance. It requires service during running condition.

694. Arc blow is a welding defect which is encountered in _____.
- A. arc welding using d.c. current
 - B. arc welding using a.c. current
 - C. gas welding
 - D. thermit welding

Ans. B

Sol. -Arc blow is the undesirable effect of a wandering welding arc during arc welding. They are two kinds of arc blow: Magnetic and Thermal. Magnetic arc blow or "arc wander" is the deflection of welding filler material within an electric arc deposit by a build up of magnetic force surrounding the weld pool.

695. Portion of the installed reserve kept in operable condition but not placed in service to supply the peak load is known as _____.
- A. Operating reserve
 - B. Spinning reserve
 - C. Cold reserve
 - D. Hot reserve

Ans. C

Sol. reserve energy which is currently cold. Refers specifically to energy produced by thermal generators which is available but not currently operating, and derives from the fact that an available, nonfunctional oven or steam boiler is colder than one which is in operation.

696. The transmission lines which feed different sub-stations represent ____.
- A. primary transmission
 - B. secondary transmission
 - C. primary distribution
 - D. secondary distribution

Ans. C

Sol. The primary step down sub stations are created nearer to load center along the primary transmission lines. Here primary transmission voltages are stepped down to different suitable voltages for secondary transmission purpose.

697. Transmitting power at high voltage requires more _____.
- A. maintenance and protection of the equipment
 - B. faster controls for minimising the arcing of contacts
 - C. larger controls for minimising the arcing of contacts
 - D. All options are correct

Ans. D

Sol. – The primary reason that power is transmitted at high voltages is to increase efficiency. As electricity is transmitted over long distances, there are inherent energy losses along the way. High voltage transmission minimizes the amount of power lost as electricity flows from one location to the next. How? The higher the voltage, the lower the current. The lower the current, the lower the resistance in the conductors. And when resistance is low, energy losses are low also.

698. The conductors used for transmitting power must have following characteristics.
- A. It should have low value of specific resistance.
 - B. It should be light in weight and not brittle
 - C. It should have low cost and high tensile strength
 - D. All options are correct

Ans. D

Sol. **Required Properties in Materials Used for Conductor in Transmission Line**

1. High conductivity
2. High tensile strength
3. Light weight
4. High resistance to corrosion in whether conditions

5. High thermal stability
6. Low coefficient of thermal expansion
7. Low cost

699. Copper conductors are generally used for transmission lines because it _____.
- A. has longer life and high conductivity
 - B. is strong enough to allow long spans
 - C. requires more support
 - D. requires more insulators

Ans. A

Sol. – Copper is better material for transmission lines as far as electrical conductivity, mechanical strength (tensile) and thermal coefficient of expansion is considered. However Aluminum is cheaper and lighter than copper. For the same power loss aluminum conductors gives theoretically 50% mass saving as copper is 1.7 times more conductive but has 3.3 times more mass than aluminum. Hence Aluminum is used for transmission lines.

700. Steel poles are generally used for transmission lines because
- A) it has more mechanical strength and more life.
 - B) it occupies less space and give better appearance.
 - C) It has high cost.
- Which of the above provided reason/s is/are correct.
- A. Only A
 - B. Only B
 - C. Only C
 - D. Both A and B

Ans. D

Sol. Steel poles possess greater mechanical strength, longer life and permit longer spans to be used. Such poles are generally used for distribution purposes in the cities. This type of supports need to be galvanised or painted in order to prolong its life.