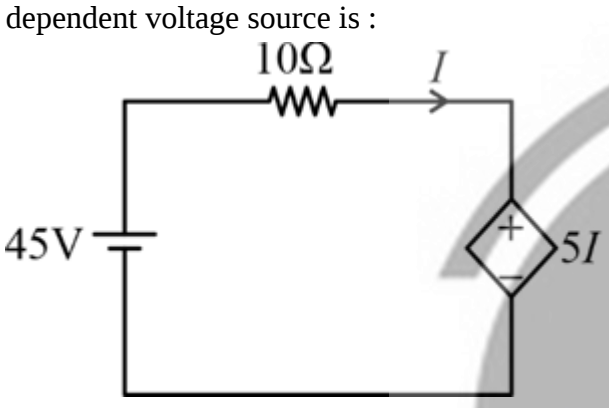
SSC JE 10 OCT

Q 1 The property where magnetic field of one of the coils makes the other coil to induce an EMF in it is called_____.

(A) resistance (B) capacitance

(C) mutual inductance (D) self-inductance

Q 2 In the circuit shown below, the power delivered by the dependent voltage source is :



(A) 45 W (B) –15 W

(C) 0 W (D) –45 W

Q 3 In the context of electromagnetic induction, the fraction of magnetic flux produced by the current in one coil that links the other coil is called_____.

(A) self-induction (B) mutual induction

(C) mutuallyinduced EMF (D) coefficient of coupling

Q 4 Ina shaded-pole induction motor, in the core, when a _____ phase is applied, a/an _____ flux is generated.

(A) three; alternating

(B) single; alternating

(C) three; constant

(D) single; constant

Q 5 The cable rating is suitable for connecting the load of 3 kW to a single-phase supply of 230 Vis _____.

(A) 15 A (B) 5 A

(C) 20 A (D) 10 A

Q 6 Which of the following statements is/are true in regard to auto transformers?

(i) A commonly known auto transformer, variac is used in laboratories and science labs.

(ii) An auto transformer should have small transformation when used in transmission and distribution application.

(iii) An auto transformer is used to raise the voltage in an AC feeder and is known as booster.

(A) (i), (ii) and (iii)

(B) Only (iii)

(C) (i) and (iii)

(D) Only (i)

Q 7 The instantaneous current in a circuit is given by $I = 4\cos(\omega t + \theta)$ A. The RMS value of the current is :

(A) $3\sqrt{3}A$ (B) zero

(C) $2\sqrt{2}A$ (D) $4\sqrt{2}A$

Q 8 Which of the following is a desirable characteristic of a DC servo motor?

(A) Big size of the machine

(B) Less robust

(C) Less inertia

(D) Slowresponse

Q 9 A capacitor that stores energy of 8 J and has capacitance of 1F has a potential difference of _____ across it.

(A) 1V (B) 4 V

(C) 12 V (D) 2 V

Q 10 Which of the following is used with the pressure coil to bring the flux produced by the shunt magnet exactly in quadrature with the applied voltage?

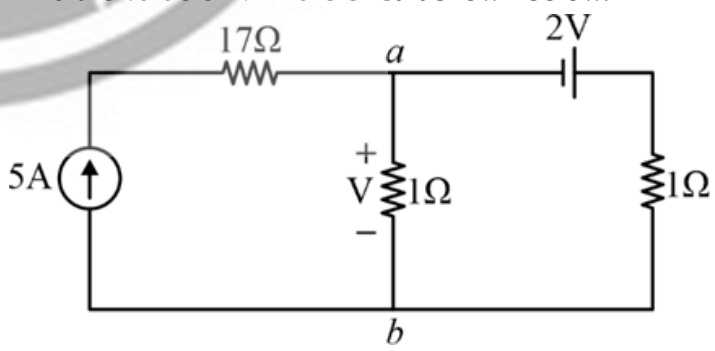
(A) Copper shading bands are provided on the U limb

(B) Aluminium shading bands are provided on the U limb

(C) Aluminium shading bands are provided on the central limb

(D) Copper shading bands are provided on the central limb

Q 11 Find the value of V in the circuit shown below.



(A) 3 V (B) 1.5 V

(C) 0 V (D) –1.5 V

Q 12 Ina transformer, the variation of which quantity leads to induce an EMF?

(A) Frequency (B) Current

(C) Voltage (D) Magnetic flux

Q 13 In the application of electrical and magnetic circuits, the heater element in an electric iron is manufactured by using_____.

(A) Iron (B) Copper

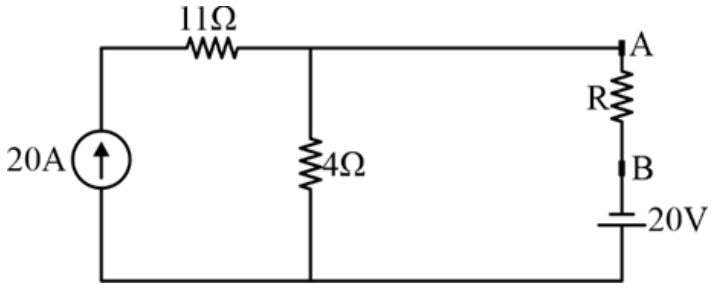
(C) Nichrome (D) Tungsten

Q 14 A series RLC circuit has the following parameter values : R= 5Ω, L = 0.01 H,C= 100 μF, Voltage source (t) = 10 sin 1000 t. What is the value of quality factor?

(A) 1.11 (B) 1

(C) 2.51 (D) 2

Q 15 The Thevenin's equivalent voltage across terminal A-B shown in the figure is _____.



(A) 300 V (B) 10 V

(C) 80 V (D) 100 V

Q 16 How much torque will be produced by the armature of a DC shunt machine if the machine generates 10,000 W of mechanical power in the armature and rotates at the speed of 1500 revolutions per minute?

(A) 0 N-m (B) $\frac{200}{\pi}$N-m

(C) $\frac{20}{\pi}$N-m (D) $\frac{2}{\pi}$N-m

Q 17 Find the input capacitance for a common source (CS) MOSFET amplifier, when C_{gs} = 5pF, C_{gd} = 3pF, and A_V = 3.

(A) 10 *pF* (B) 15 *pF*

(C) 17 *pF* (D) 12 *pF*

Q 18 The current (*I*) flowing through the p-n junction diode is given by_____.

(A) $I_0 = I\left(e^{qv/\eta KT} - 1\right)$

(B) $I_0 = I\left(e^{\eta KT/qv} - 1\right)$

(C) $I = I_0\left(e^{\eta KT/qv} - 1\right)$

(D) $I = I_0\left(e^{qv/\eta KT} - 1\right)$

Q 19 A heater of resistance 300Ω is connected to the main supply for 10 minutes. If the heat produced in the heater during this time is 18 J, then find the current through it.

(A) 10 A (B) 0.10 A

(C) 0.01 A (D) 100 A

Q 20 Ina shaded-pole induction motor, the part with copper ring is known as _____, and the copper ring is known as _____, which is usually a single-turn coil.

(A) shaded coil; shading pole

(B) shaded coil; shading coil

(C) shaded pole; shading pole

(D) shaded pole; shading coil

Q 21 The conductor of an over-head transmission line has a cross-sectional area of 2 cm^2. If the specific gravity of the conductor material is 9.9 gm/cm^3 and wind pressure is 1.5 kg/m length. The effective weight per metre of length (kg/m) of the conductor will be ____.

(A) 2.48 kg/m (B) 3.48 kg/m

(C) 4.48 kg/m (D) 5.48 kg/m

Q 22 In a shaded pole induction motor, the main core flux is _____ by the flux in the ring that is developed by the _____ current.

(A) opposded; circulating

(B) supported; circulating

(C) opposed; constant

(D) supported; constant

Q 23 Consider the following statements about damper winding used to start a synchronous motor and choose the suitable combination of correct choices.

(1) When a motor is overloaded it does not stop.

(2) Synchronous motor made self-starting by providing damper winding.

(3) Damper winding consists of short-circuited copper bars embedded in the face of the field poles.

(4) Since damper winding resistance is high so it takes a small current from the supply mains.

(A) All (1), (2), (3), (4) are true.

(B) Both (2) and (3) are true

(C) Only (1), (2) and (3) are true.

(D) Both (2) and (4) are true

Q 24 In case of magnetic circuits, the ratio of the flux density developed in the magnetic material to the flux density developed in air, for the same amount of magnetising force applied to it, is called _____.

(A) Reluctance (B) EMF

(C) Relative permeability (D) Absolute permeability

Q 25 Calculate the resistance per metre length of a wire of diameter 40 mm and specific resistance of 3.14 × 10^{-4} Ω-m:

(A) 40 Ω (B) 400 Ω

(C) $\frac{1}{4}\Omega$ (D) 4 Ω

Q 26 The method of creating uniform electrostatic stress in the dielectric of underground cables is known as _____ of cables.

(A) Laying (B) Grading

(C) Armouring (D) Jointing

Q 27 Which of the following materials is used to construct the rotor of variable reluctance stepper motor with salient poles?

(A) Diamagnetic (B) Ferromagnetic

(C) Paramagnetic (D) Nonmagnetic

Q 28 Which type of generator is used in a large wind power plant?

(A) Slip ring motor

(B) Three phase alternator

(C) Induction generator

(D) DC generator

Q 29 In a series connection of inductances, L_1 and L_2 are inductances and M is the mutual inductance. Find the total inductance.

(A) $L_1 + L_2 + 2M$ (B) $L_1 + L_2 + M$

(C) $L_1 + L_2 – M$ (D) $L_1 + L_2 – 2M$

Q 30 The armature reaction effect is high in _____.

(A) Field control method

(B) Series parallel control method

(C) Armature control method

(D) Both the armature and field control methods

Q 31 Identify the FALSE statement associated with the significance of stationary armature in synchronous machine.

(A) In stationary armature configuration, the exciting current is relatively high; therefore, the slip rings and brush gear need to be heavy construction.

(B) The stationary armature is typically housed in a stationary frame,which provides a large surface area for efficient cooling. This allows the armature to operate at high temperatures without

overheating, resulting in higher efficiency and longer lifespan.

(C) The stationary armature is responsible for producing the stator magnetic field in a synchronous machine. The magnetic field produced bythe armature interacts with the magnetic field produced bythe rotor to generate the torque necessary to turn the machine.

(D) The stationary armature is a stationary component that does not rotate, making it less prone to wear and tear. This results in a machine that is highly reliable and requires minimal maintenance.

Q 32 A power system consists of a coal-fired power plant of 800 MW with the availability factor of 0.8 and a wind farm of 400 MW with the availability factor of 0.5. Find the firm power of the system.

(A) 1800 MW (B) 1200 MW

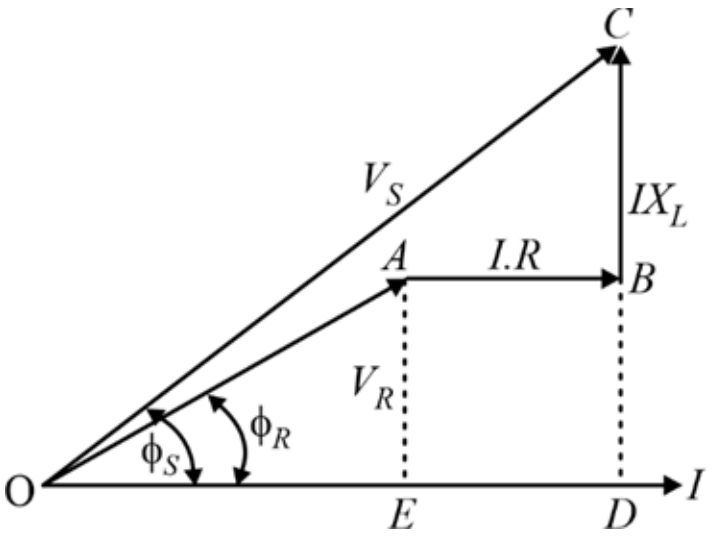
(C) 840 MW (D) 400 MW

Q 33 A 400 W,100 V bulb is connected across a 50 V source. The current drawn by the bulb is _____.

(A) 2 A (B) 0 A

(C) 4 A (D) 1 A

Q 34 The figure shows the lagging load phasor representation of a transmission line, where VS, R, XL, VR and I represent the sending end voltage, line resistance, line inductance, receiving end voltage and line current, respectively. Identify the transmission line which is most suited for it.



(A) 200 kV transmission line

(B) 10 kV transmission line

(C) 400 kV transmission line

(D) 100 kV transmission line

Q 35 The deflection produced by a half wave rectifier type AC voltmeter is how much times the deflection produced by the DC of equal magnitude voltage?

(A) 0.45 times (B) 0.40 times

(C) 0.90 times (D) 0.80 times

Q 36 When one tenant re-lets space to another under the terms of their own lease, it is called _____.

(A) Building lease (B) Perpetual lease

(C) Sublease (D) Occupational lease

Q 37 Select the light bulb that uses the least amount of energy while yet producing an adequate amount of light.

(A) Fluorescent lamp

(B) Incandescent lamp

(C) LED lamp

(D) Neon lamps

Q 38 Calculate the line value of induced emf of a 10-pole, 3-phase, 60 Hz star-connected alternator with 60 slots and 4 conductors per slot. The value of the pitch factor is 0.966, the distribution factor is = 0.966, the flux per pole is 0.12 Wb and it is sinusoidally distributed.

(A) 927.36 V (B) 688.92 V

(C) 1193.4 V (D) 2066.76 V

Q 39 What is the purpose of cost estimation?

(A) To assess project risks

(B) To determine project timelines

(C) To predict project expenses

(D) To allocate human resources

Q 40 Which option is INCORRECT in relation to the applications of synchronous motors?

(A) They are used in factories having a large number of induction motors operated at leading power factor.

(B) They are used to regulate the voltage at the end of transmission line.

(C) They are used in large loads where constant speed is required.

(D) They are used in power house and substation in parallel to the bus bar to improve the power factors.

Q 41 Which of the given statements is NOT true about the double layer winding in the electrical machine?

(A) Leakage reactance will be more as more winding is there.

(B) Improved emf waveform will be there.

(C) Easier to manufacture and lower cost of the coils

(D) Fractional slot winding can be possible.

Q 42 A JFET has the following parameters: I_{DSS} = 30 mA, V_{GS} (off) = –5V, V_{GS} = –4.5 V. Find the value of drain current.

(A) 15 mA (B) 0.3 mA

(C) 0.5 mA (D) 30 mA

Q 43 Which of the following components are connected to the gearbox and generator box, respectively, in a horizontal-type wind turbine?

(A) Low speed shaft and accelerometer

(B) Low speed shaft and high speed shaft

(C) High speed shaft and low speed shaft

(D) High speed shaft and accelerometer

Q 44 If the peak value of an alternating current is 8 A, then the RMS value of the current will be _____.

(A) $4\sqrt{2}A$ (B) $\sqrt{3}A$

(C) $2\sqrt{3}A$ (D) $3\sqrt{2}A$

Q 45 The armature resistance of a 220 volt DC machine is 0.5 ohm. What is the value of the back EMF when the

machine functions as a motor if the full load armature current is 25 amps?

(A) 209 V (B) 207.5 V

(C) 207 V (D) 210 V

Q 46 Which of the following types of fields is used as a coupling medium in all electromechanical conversion devices?

(A) Thermal field only

(B) Both electric field and magnetic field

(C) Magnetic field only

(D) Electric field only

Q 47 Which of the following statements regarding the spinning reserve is/are true?

(A) It is the reserve capacity which is in operation, but not available for service.

(B) It acts as a cushion in case of emergency requirements.

(C) It is a capacity which is always connected to the bus and is used in case of need.

(A) A and B (B) Only B

(C) A and C (D) B and C

Q 48 Which of the following constitutes a valid reason for rejecting the lowest bid?

(A) Unreasonable compensation is received

(B) Bidder has not signed

(C) Lack of sufficient opposition

(D) All of the options

Q 49 The expression for the RMS value of the current of a triangular wave form is:

(A) $\frac{I_{max}}{\sqrt{2}}$ (B) $\sqrt{3}I_{max}$

(C) $\frac{I_{max}}{2}$ (D) $\frac{I_{max}}{\sqrt{3}}$

Q 50 What will be the primary current of a 20 kVA, 6600/220 V, 50 Hz step-down ideal transformer?

(A) 1.515 A (B) 0 A

(C) 1.3 A (D) 3.03 A

Q 51 Find the most economical size of a single core cable working on a 100 kV single phase system and the maximum permissible stress in the dielectric is not to exceed $50\sqrt{2}$ kV/cm.

(A) 0 cm (B) 10 cm

(C) 4 cm (D) 8 cm

Q 52 Which of the following statements is NOT correct about generation of alternating voltage?

(A) A 4-pole generator completes four cycles per revolution.

(B) The number of times the armature rotates per second, the same number of cycles will be produced by the armature voltage.

(C) For the production of voltage, either the armature or the field rotates.

(D) An increase in the number of poles, increases the frequency.

Q 53 The no load ratio of a 50 Hz single-phase transformer is 2000/200 V. The maximum flux in the core is 0.05 Wb. What is the approximate number of primary turns?

(A) 145 turns (B) 180 turns

(C) 200 turns (D) 100 turns

Q 54 The bandwidth of CRO is the range of frequencies over which gain of _____.

(A) vertical amplifier is within 3 dB of the mid-band frequency gain

(B) vertical amplifier is within 5 dB of the mid-band frequency gain

(C) horizontal amplifier is within 5 dB of the mid-band frequency gain

(D) horizontal amplifier is within 3 dB of the mid-band frequency gain

Q 55 How many terminals does a servo-motor contain?

(A) 3 (B) 4

(C) 2 (D) 1

Q 56 Mechanical losses in a synchronous motor include:

(A) core losses in the laminations

(B) Joule losses in the rotor winding

(C) friction and windage losses

(D) Eddy current losses in the stator

Q 57 Select the INCORRECT statement for an overhead transmission line supported by supports at equal levels.

(A) Sag is directly proportional to the weight per unit length of the conductor.

(B) Sag is inversely proportional to the tension of the conductor.

(C) Sag is directly proportional to the square of the length of the conductor span.

(D) Sag is inversely proportional to the height of the supporting tower.

Q 58 Choose the correct alternative regarding Neon Lamps.

(A) If helium gas is used instead of neon, a greenish red colour is obtained.

(B) The neon lamp normally emits green colour.

(C) The neon lamp consists of neon and argon gas.

(D) The power factor of the neon tube is higher.

Q 59 Which of the following lamps is well suited for street lightning in terms of high luminous efficiency?

(A) Compact fluorescent lamp

(B) Sodium vapour lamp

(C) Fluorescent lamp

(D) Incandescent lamp

Q 60 Arrange the following in the increasing order of energy released during their processing as a biomass.

(A) Bagasse

(B) Municipal solid waste

(C) Wheat and rice straw

(D) Wood pellets

(A) B-D-A-C (B) D-B-C-A

(C) C-A-B-D (D) A-B-C-D

Q 61 The range of a moving iron ammeter can be extended by using a _____.

(A) multiplier connected in series with an ammeter

(B) shunt connected in series with an ammeter

(C) multiplier connected in parallel with an ammeter

(D) shunt connected in parallel with an ammeter

Q 62 Self-inductance does NOT depend on which of the following parameters?

(A) Flux
(B) Length of the conductor
(C) Current flowing through the conductor
(D) Number of turns

Q 63 What will be the phase difference between the alternating current and the voltage represented by the following equation $I = I_0 \sin(\omega t)$ and $E = E_0 \cos(\omega t + \pi/3)$?

(A) $4\pi/3$
(B) $\pi/3$
(C) $5\pi/3$
(D) $5\pi/6$

Q 64 Which of the following statements is true regarding the voltage drop due to armature reaction for unity power factors in an alternator?

(A) The voltage drop is zero for unity power factors.
(B) The voltage drop is minimum for unity power factors.
(C) The voltage drop is maximum for unity power factors.
(D) The voltage drop remains constant irrespective of the power factor.

Q 65 Which of the following statements about the losses in a DC motor is INCORRECT?

(A) Stray load losses are produced due to the distortion of the air gap flux due to armature reaction.
(B) In series motors, the field ohmic loss forms a part of the armature circuit loss.
(C) The no load rotational loss is made up of iron loss and mechanical loss.
(D) Brush losses forms a part of mechanical losses.

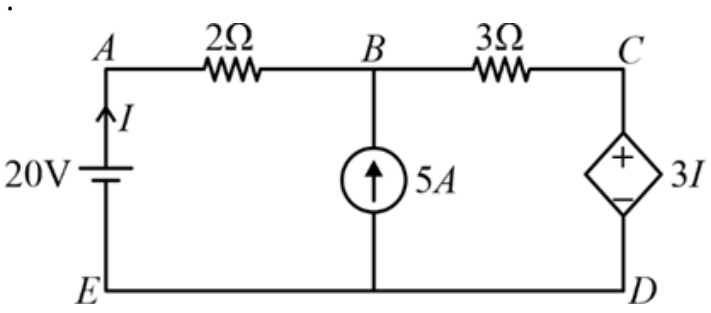
Q 66 In electromagnetic induction, Lenz's law directly follows _____.

(A) the law of conservation of energy
(B) Laplace's law
(C) Faraday's second law
(D) Faraday's first law

Q 67 Find the common base configuration current gain of a transistor if the common emitter configuration current gain of the transistor is 50.

(A) 0.99
(B) 0.97
(C) 1
(D) 0.98

Q 68 In the circuit shown below, the value of the current I is :



(A) 1A
(B) $-\frac{5}{8}$A
(C) $\frac{5}{8}$A
(D) 0A

Q 69 An RLC series circuit has resonance frequency of 170 kHz and quality factor of 25. Find the bandwidth of the circuit.

(A) 50 Hz
(B) 68 kHz
(C) 13.6 kHz
(D) 6.8 kHz

Q 70 According to IS (Indian Standard) specification 1180-1964 for outdoor type distribution transformer, the tapings shall be provided on hv side in _____.

(A) 6 steps
(B) 3 steps
(C) 2 steps
(D) 5 steps

Q 71 The Ohmic loss during the open-circuit test is considered negligible because:

(A) the Ohmic loss is proportional to the square of the applied voltage, which is high in the open- circuit test
(B) the Ohmic loss is proportional to the square of the applied current, which is high in the open- circuit test
(C) the Ohmic loss is proportional to the square of the applied current, which is low in the open- circuit test
(D) the Ohmic loss is proportional to the square of the applied voltage, which is low in the open- circuit test

Q 72 In commercial multimeters, to obtain the same deflection on corresponding DC and AC voltage ranges, the multiplier for AC range is to be _____.

(A) dependent on the duration of testing
(B) lowered proportionately
(C) kept the same
(D) increased proportionately

Q 73 Which of the following statements are INCORRECT about PMMC instruments?

I. The torque-to-weight ratio is high, which gives a high accuracy.
II. A single instrument can be used for several, different current voltage ranges by using the instrument transformer.
III. The scale is uniformly divided.
IV. The cost of PMMC instruments is lower than that of moving iron instruments.

(A) Only II and IV
(B) Only I and IV
(C) Only II and III
(D) Only I and III

Q 74 The voltage across the impedance 'Z' is $100 \angle 15$ V and the current through 'Z' is $20 \angle -45$ A. Find the reactive power (Q).

(A) Q = 1000 VAR
(B) Q = 6000 VAR
(C) Q = 6000 VAR
(D) Q = 1732 VAR

Q 75 In electromagnetic induction, according to Fleming's right-hand rule, the forefinger represents _____.

(A) direction of the magnetic field
(B) direction of the induced current
(C) direction of the motion of the conductor
(D) direction of the induced EMF

Q 76 What will happen with a single-phase induction motor that has a short-circuited capacitor?

(A) Will run in the same direction with less speed
(B) Will run in the reverse direction
(C) Will run

(D) Will not run

Q 77 A moving coil instrument gives a full-scale deflection of 10 mA when the potential difference across its terminals is 100 mV. Calculate the shunt resistance for full scale deflection which corresponds to 200 A?

(A) 50.02 mΩ (B) 500.02 mΩ
(C) 500.02 μΩ (D) 50.02 μΩ

Q 78 Which of the following is NOT suitable for the overhead conductor of a transmission line?

(A) High electrical conductivity
(B) High specific gravity
(C) Lower cost
(D) High tensile strength

Q 79 In Electromagnetism, the field pattern of a magnetic field inside the toroid is _____.

(A) hyperbolic (B) parabolic
(C) non-uniform (D) uniform

Q 80 The candle power of a lamp placed normal to a working plane is 40 candle power. Find the distance if the illumination is 10 lux?

(A) 3 m (B) 1.414 m
(C) 2 m (D) 2.5 m

Q 81 Which of the following defines the use of a thermostat in an electric kettle?

(A) It is used to compare the ambient temperature with the temperature inside the kettle.
(B) It is used to stop the flow of electricity through the heating element once the appropriate temperature is reached.
(C) It is used to maintain the temperature inside the kettle.
(D) It is used to reduce the temperature in case of overheating of the heating element.

Q 82 In a capacitor start induction run motor, when motor reaches to _____ of full speed, the centrifugal switch S opens and cuts out capacitor from supply.

(A) 75% (B) 25%
(C) 100% (D) 50%

Q 83 A wire of resistance 88 Ω is stretched to twice its original length. The resistance of a stretched wire would be _____.

(A) 176 Ω (B) 22 Ω
(C) 88 Ω (D) 352 Ω

Q 84 In the wind power plant, which of the following features differentiates the wound rotor synchronous generator from squirrel cage induction generators?

(A) The wound rotor synchronous generator includes an external mechanism to control the stater side.
(B) A gearbox is not required in the wound rotor synchronous generator.
(C) The wound rotor synchronous generator includes an external mechanism to control the rotor output.
(D) A reactive power compensation unit is not needed in wound rotor synchronous generators.

Q 85 In case of magnetic circuits, the flux produced per unit area of the magnetic material, for every unit of the magnetising force applied to it, is called _____.

(A) absolute permeability
(B) MMF
(C) relative permeability
(D) EMF

Q 86 In electrical applications, electric geyser coils are made up of a _____.

(A) high-resistance metal
(B) high-inductance metal
(C) low-inductance metal
(D) low-resistance metal

Q 87 Three phases (R, Y and B) of a balanced AC circuit with the phase sequence RYB are connected in star. These three voltages are equal in magnitude and displaced from one another by _____ electrical angle.

(A) 120° (B) 360°
(C) 240° (D) 90°

Q 88 The compensation for light load is done by using a metallic strip provided between the _____.

(A) disc and the pointer
(B) central limb of shunt magnet and disc
(C) permanent magnet and disc
(D) central limb of series magnet and disc

Q 89 Diffusion capacitance of a p-n junction diode increases with increase in the _____ and the _____.

(A) mean lifetime of minority carriers; diode current
(B) thermal voltage; ideality factor (η)
(C) mean lifetime of minority carriers; thermal voltage
(D) diode current; thermal voltage

Q 90 The dual pair of the node and open circuit are _____

(A) mesh and short circuit
(B) KVL and short circuit
(C) mesh and KCL
(D) mesh and open circuit

Q 91 The input signal of a common drain amplifier is applied to the Gate through the ____.

(A) coupling capacitor
(B) input inductor
(C) variable resistor
(D) input resistor

Q 92 How many windings are present in auto transformers?

(A) 2 (B) 4
(C) 1 (D) 3

Q 93 Which of the following quantities can be changed to control the speed of the brushless DC motor?

(A) Wind pressure (B) Applied DC source voltage
(C) Wind direction (D) Temperature

Q 94 In a single value capacitor run motor, the starting torque is about _____ of rated torque.

(A) 20 to 30% (B) 10 to 20%

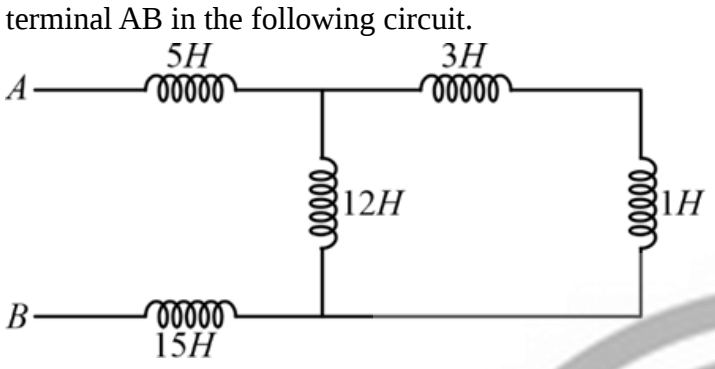
(C) 50 to 100 % (D) 10 to 30%

Q 95 In case of heating effect, if 1 calorie of heat energy is converted into joules, then its value will be _____.

(A) 4.186 joules (B) 3.743 joules

(C) 2.563 joules (D) 1.853 joules

Q 96 Find the value of equivalent inductance across terminal AB in the following circuit.



(A) 26 H (B) 23 H

(C) 36 H (D) 50 H

Q 97 If the energy stored in a 5H inductor is 160 joules, then calculate the current passing through it.

(A) 64 A (B) 8 A

(C) 10 A (D) 18 A

Q 98 If supports are at equal levels and tension in an overhead line is increased to two times, then _____.

(A) sag becomes zero

(B) sag also increases to four times

(C) sag also increases to two times

(D) sag decreases to half of the previous value

Q 99 The bundled conductors can be formed from two or more stranded conductors, bundled together to increase the _____.

(A) copper losses (B) communication line interference

(C) line inductance (D) current carrying capacity

Q 100 In a three-phase balanced star connected system, which of the following will hold true? [∅ is the angle between phase voltage and phase current.]

(A) The angle between line currents and the corresponding line voltages is 30° + ∅ for lagging.

(B) The angle between line currents and the corresponding line voltages is 30° + ∅ for leading.

(C) The angle between line currents and the corresponding line voltages are in phase.

(D) The angle between line currents and the corresponding line voltages is 30° – ∅ for lagging.

Answer Key

Q1	C
Q2	D
Q3	D
Q4	B
Q5	A
Q6	A
Q7	C
Q8	C
Q9	B
Q10	D
Q11	B
Q12	D
Q13	C
Q14	D
Q15	D
Q16	B
Q17	C
Q18	D
Q19	C
Q20	D
Q21	A
Q22	A
Q23	C
Q24	C
Q25	C
Q26	B
Q27	B
Q28	C
Q29	A,D
Q30	A
Q31	A
Q32	C
Q33	A
Q34	B
Q35	A
Q36	C
Q37	C
Q38	D
Q39	C
Q40	A
Q41	A
Q42	B
Q43	B
Q44	A
Q45	B
Q46	C
Q47	D
Q48	D
Q49	D
Q50	D
Q51	C
Q52	A
Q53	B
Q54	A
Q55	A
Q56	C
Q57	D
Q58	C
Q59	B
Q60	D
Q61	D
Q62	B
Q63	D
Q64	B
Q65	D
Q66	A
Q67	D
Q68	C
Q69	D
Q70	D
Q71	C
Q72	B
Q73	A
Q74	D
Q75	A
Q76	D
Q77	C
Q78	B
Q79	C
Q80	C
Q81	B
Q82	A
Q83	D
Q84	C
Q85	A
Q86	A
Q87	A
Q88	B
Q89	A
Q90	A
Q91	A
Q92	C
Q93	B
Q94	C
Q95	A
Q96	B
Q97	B
Q98	D
Q99	D
Q100	A

Hints & Solutions

Q 1 **Text Solution:**

Mutual inductance is the property due to which the magnetic field of one of the coil makes the other coil to induce an EMF.

For example Transformer.

Q 2 **Text Solution:**

Power delivered Power absorbed

Here independent source is absorbing power.

$P_{absorbed} = 5I \times I$

$= 5I^2$

$P_{delivered} = -P_{absorbed}$

$\frac{45-5I}{10} = I$

45 = 15I

I = 3A

$P_{delivered} = -5I^2$

= – 5 × $(3)^2$

= – 5 × 9

= – 45 W

Q 3 **Text Solution:**

$M = K\sqrt{L_1 L_2}$

k is fraction of magnetic flux produced by the current in one coil that links the other coil.

Q 4 **Text Solution:**

When we apply single phase source in single phase shaded-pole induction motor then an alternating flux is generated.

Q 5 **Text Solution:**

V = 230 V

P = 3 × 10^3 W

3000 = 230 × I

$I = \frac{3000}{230} = 13.043$ A

Therefore, the suitable rating of cable should be 15A.

Q 6 **Text Solution:**

In auto transformer

- A commonly known auto transformer, variac is used in laboratories and science labs.
- An auto transformer should have small transformation when used in transmission and distribution application.
- An auto transformer is used to raise the voltage in an AC feeder and is known as booster.

Therefore, all the above statement given are true regarding auto transformer.

Q 7 **Text Solution:**

$I_{rms} = \frac{I_{peak}}{\sqrt{2}}$

$I_{rms} = \frac{4}{\sqrt{2}} = 2\sqrt{2}$ A

Q 8 **Text Solution:**

DC servo motor should have low rotor inertia to get required accelerating characterstics.

The servo motor also have high $\frac{X}{R}$ ratio. The diameter of rotor should be small.

So, less inertia is the correct answer.

Q 9 **Text Solution:**

$E = \frac{1}{2}CV^2$

$8 = \frac{1}{2} \times 1 \times V^2$

$V^2 = 16$

$V = 4V$

Q 10 **Text Solution:**

The copper shading bands are provided on the central limbs of the shunt-magnet and there position is adjustable. They bring the potential coil flux exactly in quadrature with applied voltage.

Q 11 **Text Solution:**

$V = V_{ab}$

$\frac{V+2}{1} - 5 + V = 0$

V = 1.5 V

$V = V_{ab} = 1.5\,V$

Q 12 **Text Solution:**

$e = -\frac{d\phi}{dt}$ (Negative sign is due to Lenz's law

So variation of flux leads to induce EMF in transformer.

Q 13 **Text Solution:**

Nichrome is used in the application of electrical and magnetic circuits as heater element. When nichrome is heated for the first time, it forms an adherent layer of chromium oxide. Since the material beneath this layer will not oxidize the wire will not break or burn.

Note : Nichrom is an only of nickel (80%) and chromium (20%) and it has melting point of 1400°C

Q 14 **Text Solution:**

$Q = \frac{1}{R}\sqrt{\frac{L}{C}}$

$Q = \frac{1}{5}\sqrt{\frac{0.01}{100 \times 10^{-6}}}$

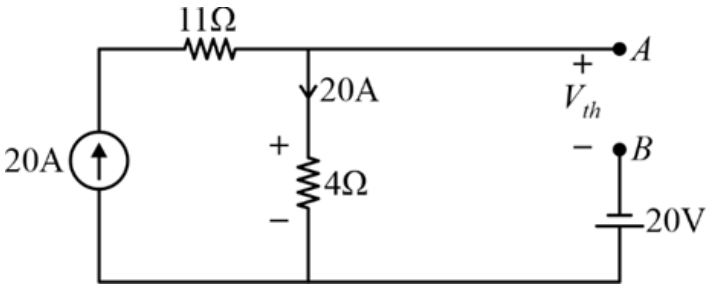
$Q = \frac{1}{5}\sqrt{1 \times 10^{-2} \times 10^{-2} \times 10^{+6}}$

$Q = \frac{1}{5}\sqrt{10^2}$

$Q = \frac{10}{5} = 2$

Q 15 Text Solution:

AB will open circuit for Theonin voltage



$4 \times 20 - V_{th} + 20 = 0$

$V_{th} = 100V$

Q 16 Text Solution:

Torque × speed = power

T × ω = P

$\omega = \frac{2\pi N}{60} = \frac{2\times1500\times\pi}{60}$ = 50 π

$T = \frac{P}{\omega} = \frac{10{,}000}{50\pi}$

$T = \frac{200}{\pi}$N-m

Q 17 Text Solution:

$C_{in} = 5 + 3(1 + A_V)$

$A_V = 3$

$C_{in} = 5 + 3(1 + 3)$

= 17 *pF*

Q 18 Text Solution:

$I_D = I_0\left[\left(e^{\frac{qV}{\eta kT}}\right) - 1\right]$

I_D and V are diode current and voltage respectively,

q is the charge of the electron

h is the ideality factor

K is Boltzmann's constant

T is temperature in kelvin

$\frac{kT}{q}$ is also known as thermal voltage V_T,

the thermal voltage at 300°K = $V_T = \frac{kT}{q} = 25.9\ \text{mV}$

Q 19 Text Solution:

$E = I^2 \times R \times t$

$E\ =\ 18\ J$

$R\ =\ 300\Omega$

t = 10 × 60 sec = 600 sec

$I = \sqrt{\frac{E}{R\times t}}$

$= \sqrt{\frac{18}{300\times600}}$

= 0.01 A

Q 20 Text Solution:

In a shaded-pole inductor motor, then part with copper ring is known as shaded pole. This copper ring is known as shading coil.

Q 21 Text Solution:

Pressure due to weight = $9.9 \times 10^3 \times 2 \times 10^{-4}$

= 1.98 kg/m

Pressure due to wind = 1.5 kg/m

Effective weight = $\sqrt{(1.98)^2 + (1.5)^2}$

= 2.48 kg/m

Q 22 Text Solution:

In shaded pole induction motor, the main core flux is opposed by the flux in the ring that is developed by the circulating current.

Q 23 Text Solution:

The damper winding in synchronous not performs two functions

(a) Prevent hunting

(b) Provides starting torque.

- Hurting is the phenomenon that occurs in synchronous motor due to varying load or supply frequency.
- So due to damper winding when a motor is overloaded it does not stop.
- Damper winding provides staring torque.
- Damper winding consists of short-circuited copper bars embaded in the face of the field poles. So under normal condition damper winding does not carry any current.

Therefore, statement (i), (ii) and (iii) are current.

Q 24 Text Solution:

$B = \mu_0\ \mu_r\ H$

For magnetic material flux density B_1,

$B_1 = \mu_0\ \mu_r\ H$

For air flux density B_2

$B_2 = \mu_0\ H$ (μ_r = 1 for air)

$\frac{B_1}{B_2} = \frac{\mu_0\mu_r H}{\mu_0 H} = \mu_r$

Q 25 Text Solution:

Length = 1m

Diameter = 40mm = 40×10^{-3}m

Radius = 20×10^{-3}m

$R = \rho\frac{\ell}{A}$

$= 3.14 \times 10^{-4} \times \frac{1}{\pi\times\left(20\times10^{-3}\right)} = \frac{1}{4}\Omega$

Q 26 Text Solution:

Grading is a method of creating uniform electrostatic stress in the dielectric of underground cables.

Q 27 Text Solution:

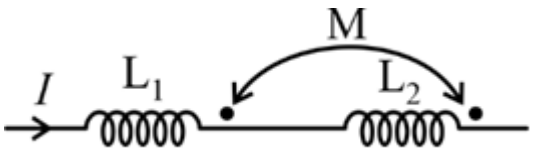
Fenomagnetic materials is used to construct the rotor of variable reluctance stepper motor with salient poles.

Q 28 Text Solution:

Induction generator is used in a large wind power plant. Hence the speed of rotor is great than synchronous speed.

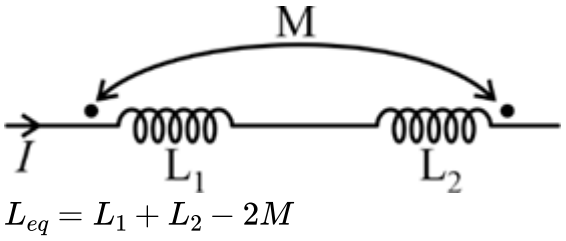
Q 29 Text Solution:

Case : 1



$L_{eq} = L_1 + L_2 + 2M$

Case : 2



$L_{eq} = L_1 + L_2 - 2M$

Q 30 Text Solution:

In field control method we reduce the working flux to increase the speed.
Therefore, the effect of armature flux on rotor field flux will increase in case of field working method.

Q 31 Text Solution:
In stationary armature configuration, the exciting current is relatively low.
Therefore the slip rings and brush great need to be heavy construction.
Here the statement (a) is wrong

Q 32 Text Solution:
Firm power = 800 × 0.8 + 400 × 0.5 = 840
Note : Firm power is power producing capacity, intended to be available at all times.

Q 33 Text Solution:
$\frac{V^2}{R} = 400$
$R = \frac{V^2}{400}$
$R = \frac{100 \times 100}{400}$
$R = 25\Omega$
Current drawn at $50V = \frac{50}{25} = 2A$

Q 34 Text Solution:
(b)

Q 35 Text Solution:
The deflection produced by a half wave rectifies type AC voltmeter is 0.45 times the deflection produced by the DC.

Q 36 Text Solution:
When one tenant re-lets space to another under the terms of their own lease, is called Sublease.

Q 37 Text Solution:
Light emitting diode use least amoutn of energy while producing an adequate amount of light.

Q 38 Text Solution:
We know that
$E = \sqrt{2}\pi \times f \times T_{ph} \times \phi \times k_w$
$Z = 60 \times 4 = 240$ (Z = total number of conductor)
Number of turns $= \frac{240}{2} = 120$
T_{ph} = turns per phase $= \frac{120}{3} = 40$
$E = \sqrt{2}\pi \times f \times T_p \times \phi \times k_w$
$E = \sqrt{2} \times \pi \times 60 \times 40 \times 0.12 \times 0.966 \times 0.966$
$E_{line} = \sqrt{3}E$
$= \sqrt{3}\left[\sqrt{2}\pi \times 60 \times 40 \times 0.12 \times (0.966)^2\right]$
= 2066.76 V

Q 39 Text Solution:
Cost estimation is done to predict the quantity, cost and price of resource required.

Q 40 Text Solution:
Synchronous machine are used as condensor where large number of induction motor operate at lagging power factor.

Q 41 Text Solution:
Leakage reactance in double layer winding is lower.
So option a is not true.

Q 42 Text Solution:
$I_D = 30 \times \left(1 - \frac{V_{Gs}}{V_{Gs}(off)}\right)^2$
$I_D = 30\left(1 - \frac{-4.5}{-5}\right)^2$
$I_D = 30 \times (1 - 0.9)^2$
$I_D = 30 \times 0.01$
$I_D = 0.3\,\text{mA}$

Q 43 Text Solution:
Low speed shaft and high speed shaft are connected to the gear box and generator box respectively.

Q 44 Text Solution:
$I_{peak} = \sqrt{2} \times I_{rms}$
$I_{rms} = \frac{I_{peak}}{\sqrt{2}}$
$= \frac{8}{\sqrt{2}}$
$= 4\sqrt{2}$ A

Q 45 Text Solution:
$E = V - I_a R_a$
E = 220 – 0.5 × 25
E = 207.5 V

Q 46 Text Solution:
Magnetic field is used as a coupling medium in all electromechanical conversion.
Example: Induction machine.

Q 47 Text Solution:
The spinning reserve is the extra generating capacity that is available.
Therefore, statement (B) and statement (C) are true regarding spinning capacity

Q 48 Text Solution:
All the tenders received may be rejected if
(i) The lowest tenders has quated a figure, which is higher than the funds available for the execution of the work.
(ii) Radial changes in design are found necessary during the interval preceding the opening the tenders.
(iii) Unreasonable compensation is received.
(iv) Bidder has not signed.
(vi) Luck of sufficient opposition
Therefore, all the options are correct.

Q 49 Text Solution:
In case of triangular wave, $I_{rms} = \frac{I_{max}}{\sqrt{3}}$

Q 50 Text Solution:
VI = 20 × 1000
6600 × I = 20 × 1000
$\text{I} = \frac{20 \times 1000}{6600}$
= 3.03 A

Q 51 Text Solution:
For most economical size of cable $\frac{R}{r} = e$

$g_{max} = \frac{V}{R}$

$50\sqrt{2} = \frac{100\sqrt{2}}{R}$

R = 2 cm

Diameter = 2 × 2 = 4 cm

Q 52 Text Solution:

$\theta_{electrical} = \frac{P}{2}\theta_{mechanical}$

$\omega_{electrical} = \frac{P}{2}\omega_{mechanical}$

$\theta_{electrical} = \frac{4}{2}\theta_{mechanical}$

$\theta_{electrical} = 2\theta_{mechanical}$

So, 4 pole generator completes two electrical cycles per revolution.

Q 53 Text Solution:

N_P = approximate number of primary turns.

E = $\sqrt{2} \times \pi \times \phi \times f \times N_P$

$N_P = \frac{2000}{\sqrt{2}\times\pi\times50\times0.05} = 180$

Q 54 Text Solution:

The bandwidth of CRO is the range of frequencies over which gain vertical amplifier is within 3 dB of the mid-band frequency gain.

Q 55 Text Solution:

Servo-motor contain 3 terminals, they are power, ground and control.

Q 56 Text Solution:

Friction loss and windag loss are the mechanical losses in synchronous motor.

Q 57 Text Solution:

$S = \frac{W\ell^2}{8T}$

So, sag is not inversely proportional to the height of the supporting tower.

Q 58 Text Solution:

Neon lamp consist of small glass capsule that contains a mixture of neon and other gases.

Q 59 Text Solution:

Incandescent lamp

Q 60 Text Solution:

(d)

Q 61 Text Solution:

By connecting shunt resistance in parallel with an ammeter we can increase the range of moving iron ammeter.

Q 62 Text Solution:

$L = \frac{\lambda}{I}$

$L = \frac{N\phi}{I}$ .....(1)

$\phi = \frac{MME}{\text{Reluctance}} = \frac{NI}{\frac{\ell}{\mu A}}$

$\phi = \frac{N\times I\times\mu\times A}{\ell}$

$L = \frac{N\times N\times I\times\mu\times A}{\ell\times I}$

$L = \frac{\mu N^2 A}{\ell}$ .....(2)

l = Length of the magnetic path

A = Cross section area

μ = Permeability of magnetic material

∴ From (1) and (2) self-inductance does not depend on length of conductor.

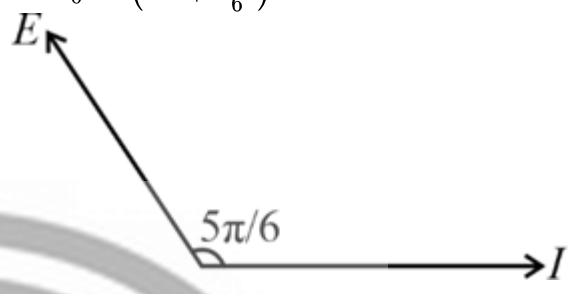
Q 63 Text Solution:

$I = I_0 \sin(\omega t)$

$E = E_0 \cos\left(\omega t + \frac{\pi}{3}\right)$

$E = E_0 \sin\left(\omega t + \frac{\pi}{3} + \frac{\pi}{2}\right)$

$= E_0 \sin\left(\omega t + \frac{5\pi}{6}\right)$



Q 64 Text Solution:

In alternator at unity the voltage drop is minimum.

Q 65 Text Solution:

The magnitude of brush losses depends on the voltage drop at the contact point and on the armature current. Threfore, Brush losses are not a form of mechanical losses.

Q 66 Text Solution:

लेन्ज़ का नियम सीधे तौर पर ऊर्जा संरक्षण के नियम का पालन करता है।

Q 67 Text Solution:

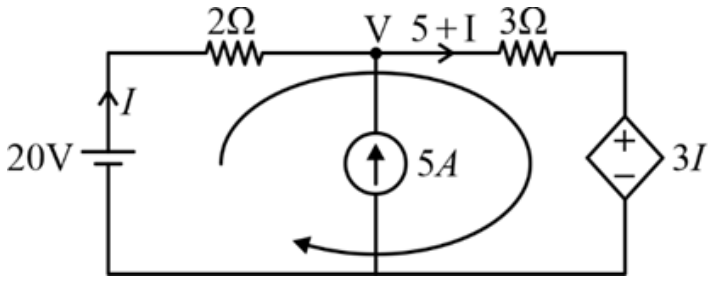
α = common base configuration current

β = common emitter configuration current

$\alpha = \frac{\beta}{1+\beta}$

$\alpha = \frac{50}{51} = 0.98$

Q 68 Text Solution:



20 – 2I – 3 (5 + I) – 3I = 0

20 – 2I – 15 – 3I – 3I = 0

5 = 8I

$I = \frac{5}{8}A$

Q 69 Text Solution:

Bandwidth = $\frac{\text{Resonance frequency}}{\text{Quality factor}}$

Bandwidth = $\frac{170\times10^3}{25} = 6.8$ kHz

Q 70 Text Solution:

According to IS specification 1180-1964 for outdoor type distribution transformer, the tapings shall be provided on hv side is 5 steps.

Q 71 Text Solution:

We perform open-circuit test on LV side by keeping HV side open therefore only no-load current flows. The copper loss due to no load test is negligible since no load current is 5% to 7% of full load current.

Q 72 Text Solution:

(b)

Q 73 Text Solution:

PMMC works an DC so we cannot use it with instrument transformer.

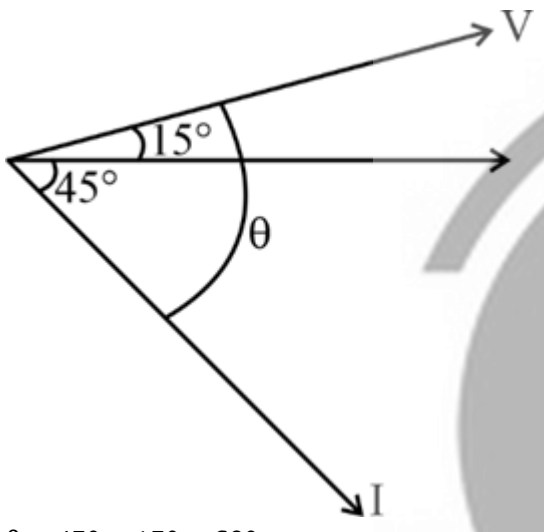
The cost of PMMC is higher than that of moving iron instrument so statement II and IV is incorrect.

Q 74 Text Solution:

Q = VI sin θ

V = 100 ∠15

I = 20 ∠– 45



θ = 45° + 15° = 60°

Q = 100 × 20 sin 60°

$Q = 2000 \times \frac{\sqrt{3}}{2}$

Q = 1732 VAR

Q 75 Text Solution:

In Fleming's right-hand rule thumb represent direction of force (motion)

Forefinger represents direction of magnetic field.

Middle finger represents direction of current.

Q 76 Text Solution:

Since the capacitor is short circuited so there will be no starting torque and as single-phase induction motor is not self-starting, it will not start rotating.

Q 77 Text Solution:

$m = \frac{200}{10 \times 10^{-3}} = \frac{200 \times 10^3}{10} = 20000$

$R_s = \frac{R_m}{(m-1)}$

$R_m = \frac{100\ mV}{10\ mA}$

$= 10\ \Omega$

$R_S = \frac{10}{19999}$

$R_S = 500.02\ \mu\Omega$

Q 78 Text Solution:

High specific gravity is not suitable for the overhead conductor of transmission line.

Q 79 Text Solution:

The field pattern of a magnetic field inside the toriod is non-uniform.

Q 80 Text Solution:

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

$d^2 = \frac{I}{E} = \frac{40}{10} = 4$

$\therefore d = 2m..$

Q 81 Text Solution:

Thermostate is used to detect the temperature changes for the purpose of maintaining the temperature of a enclosed area essentially constant.

So it is used in kettle to stop the flow of electricity through the heating element once the appropiate temperature is reached.

Q 82 Text Solution:

When the rotor reaches to speed about 70% to 80% rated speed than centrifugal switch gets open.

Q 83 Text Solution:

$R_{new} = n^2 \times R$

$= 2^2 \times 88 = 352\Omega$

Q 84 Text Solution:

The wound rotor synchronous generator includes an external mechanism to control the rotor output.

Q 85 Text Solution:

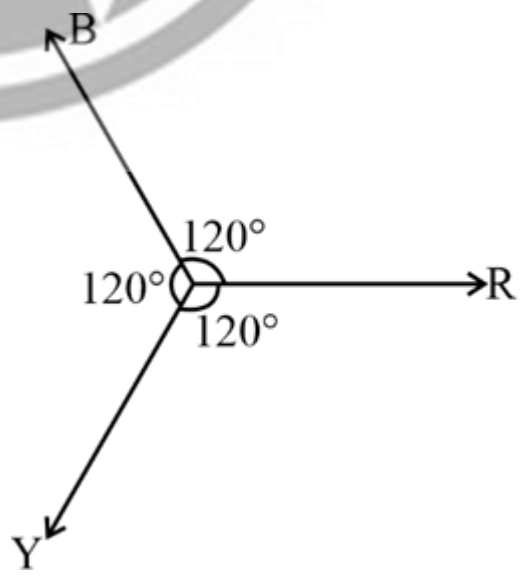
$B = \mu H$

Absolute permeability, $\mu = \frac{B}{H}$

Q 86 Text Solution:

We use high resistance metal electric geyser coil to produce high heat.

Q 87 Text Solution:



In balance system the three component are equal in magnitude and have 120° phase difference.

Q 88 Text Solution:

The compensation for light load is done by using a metallic strip provided between the central limb of shunt magnet and disc.

Q 89 Text Solution:

C_d = diffusion capacitance

$C_d = \frac{I_{DQ} \times \tau}{2V_T}$

I_{DQ} =Quiescent current of diode

τ = Minority carrier lifetime

V_T = Thermal voltage

∴ Diffusion capacitance of a p-n junction diode increases with increase in the mean lifetime of minority carriers and the diode current.

Q 90 Text Solution:

Node is dual of mesh & vice-versa

Open circuit is dual of short circuit vice-versa.

Q 91 Text Solution:

The input signal of a common drain amplifier is applied to the Gate through the coupling capacitor.

Q 92 Text Solution:

Only one winding.

Q 93 Text Solution:

By changing supply voltage, speed of BLDC motor can be controlled.

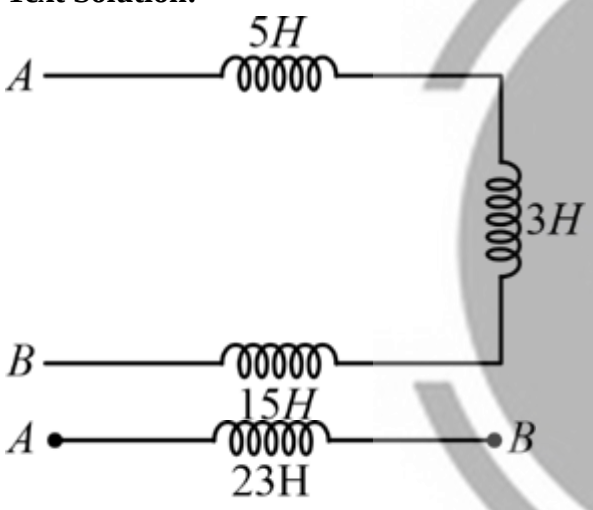
Q 94 Text Solution:

(c)

Q 95 Text Solution:

1 calorie = 4.186 J

Q 96 Text Solution:



L_{eq} = 23 H

Q 97 Text Solution:

$\frac{1}{2}Li^2 = 160$

$\frac{1}{2} \times 5 \times i^2 = 160$

$i = \sqrt{\frac{320}{5}}$

i = 8A

Q 98 Text Solution:

$S = \frac{W\ell^2}{8T}$

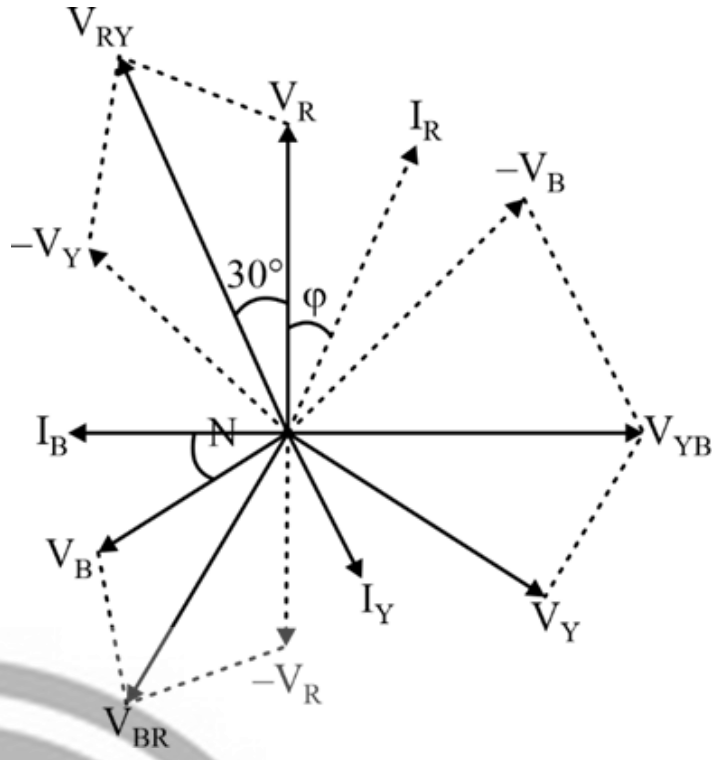
$S \propto \frac{1}{T}$

So, if sag decreased to half of the previous value it's tension is doubled.

Q 99 Text Solution:

The bundled conductors can be formed from two or more stranded conductors, bundled together to increase the current carrying capacity.

Q 100 Text Solution:



The angle between line voltage and phase voltage is 30° (angle between phase V_R and line voltage V_{RY}) as shown above in the above diagram. In star connection line current is equal to phase current. Therefore, angle between line currents and the corresponding line voltages is 30° + ∅ for lagging.