

SSC JE PYQ 2023

09 October, 2023 (Shift 03)

Electrical Engineering

Q1 A supply of 200 V can be obtained from a source of 600 V by means of a two-winding transformer or an auto transformer. The ratio of weights of conductor material in the auto transformer with respect to the two-winding transformer is _____.

- (A) 1 : 2
(B) 1 : 1.5
(C) 2 : 1
(D) 1.5 : 1

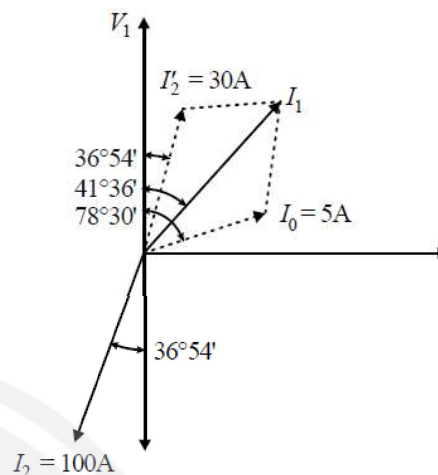
Q2 Choose the most efficient generator for wind power generation.

- (A) Doubly-fed induction generator
(B) Permanent magnet synchronous generator
(C) Induction generators
(D) Squirrel cage induction generators

Q3 Why is the hold-on coil connected in series with the shunt field in a three-point starter of a DC motor?

- (A) To provide the lubricant for the motor
(B) To disconnect the supply when the motor is in normal operation
(C) To control the speed of the motor
(D) To prevent the motor from running away in case of an open-field circuit

Q4 Find the estimated current taken by the primary side if a single-phase transformer with a voltage ratio of 440/110 V takes a no-load current of 5 A at 0.2 power factor lagging and the secondary supplies a current of 120 A at a power factor of 0.8 lagging. Given that $\cos(41^\circ 36') = 0.748$.



- (A) 30 A
(B) $\sqrt{1140.4}$ A
(C) $\sqrt{1149.4}$ A
(D) $\sqrt{1178}$ A

Q5 Which of the following is NOT a type of tender, depending on the type of contract?

- (A) Selected tender
(B) Percentage rate tender
(C) Lum-sum tender
(D) Item rate tender

Q6 In AC series motor, power factor is low because of _____.

- (A) high resistance of the field and armature circuit
(B) high inductance of the field and armature circuit
(C) low inductance of the field and armature circuit
(D) high capacitance of the field and armature circuit

Q7 Which expression is right about EMF equation of a transformer if f = frequency, N_1 = number of turns in primary, ϕ_m = maximum flux in a core, A = iron area, B_m = maximum flux density?

- (A) $E = 4fN_1\phi_m A$
(B) $E = 4.44fN_1\phi_m A$
(C) $E = 4.44fN_1\phi_m$
(D) $E = 4.44fN_1B_m$



Q8 The barrier potential can be calculated by _____ (where, the symbols have their usual meaning).

- (A) $E_0 = \left(\frac{kT}{q}\right) \ln\left(N_D^* N_D / n_i\right)$
 (B) $E_0 = \left(\frac{kT}{q}\right) \ln\left(N_D^* N_A / n_i^2\right)$
 (C) $E_0 = \left(\frac{kT}{q}\right) \ln\left(n_i^2 / N_D^* N_A\right)$
 (D) $E_0 = \left(\frac{kT}{q}\right) \ln\left(N_A^* N_A / n_i^2\right)$

Q9 Reciprocity theorem CANNOT be applied to the circuit having _____.

- (A) bilateral elements
 (B) linear elements
 (C) non-linear elements and multi -sources
 (D) only one independent sources

Q10 The horizontal amplifier should be designed for _____.

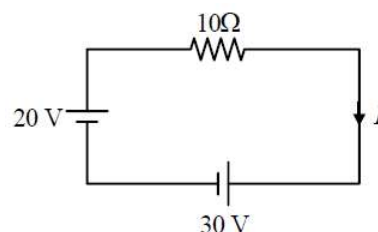
- (A) low amplitude signals with a fast rise time
 (B) high amplitude signals with a fast rise time
 (C) high amplitude signals with a slow rise time
 (D) high frequency signals with a fast rise time

Q11 With respect to measuring the current in a circuit using the CRO, which of the following statements is/are correct?

- I. A low-resistance standard resistor is connected in series with the circuit whose current is being measured.
 II. The CRO is connected across the standard resistor to measure the voltage drop across it.
 III. A high-resistance standard resistor is connected in parallel with the circuit where the current is being measured.
 IV. The CRO is connected in series with the circuit whose current is being measured.

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

Q12 In the circuit shown below, the current I in the circuit is :



- (A) 0 A
 (B) 1 A
 (C) -1 A
 (D) 2 A

Q13 Three-point lighting is usually employed in film lighting schemes. Which of the following does NOT form a part of the scheme?

- (A) Bounce lighting
 (B) Key lighting
 (C) Back lighting
 (D) Fill lighting

Q14 Which of the following statements is NOT correct about active power in an AC circuit?

- (A) Active power is the power dissipated in the pure inductance.
 (B) Active power is the power dissipated in the pure resistance.
 (C) Active power can be measured in terms of kilo watt.
 (D) Active power depends on power factor.

Q15 Repulsion start induction run motors are used in applications such as _____.

- (A) fans
 (B) vacuum cleaners
 (C) hair dryers
 (D) compressors

Q16 A 25 V, 800 W bulb is connected to a 10 V source. The power consumed by the bulb is _____.

- (A) 100 W
 (B) 64 W
 (C) 400 W
 (D) 128 W

Q17 Which of the following statements is accurate regarding wires and cables?

- (A) Wires are made by stranding together many cables.
 (B) Wires and cables are the same thing.
 (C)



Cables are made by stranding together many wires.

(D) Wires and cables are never insulated.

Q18 The deflecting torque in a PMMC instrument is proportional to _____.

- (A) the resistance of the coil
- (B) the area of the coil
- (C) the current flowing through the coil
- (D) the square of the current flowing through the coil

Q19 At the leading power factor, the armature reaction of an alternator is :

- (A) partially cross magnetising and partially magnetising
- (B) partially cross magnetising and partially demagnetising
- (C) wholly magnetising
- (D) wholly demagnetising

Q20 The standard percentage of the tender amount for the security deposit is ____.

- (A) 2.5
- (B) 5
- (C) 10
- (D) 2

Q21 The ability of a capacitor to store charge does NOT depend on the _____.

- (A) distance between the plates
- (B) areas of the plates
- (C) nature of the insulating material
- (D) amount of charge

Q22 A 2500 watts refrigerator works for 4 hours per day. Find the total unit of electricity used in 40 days.

- (A) 400 units
- (B) 10 units
- (C) 40 units
- (D) 400000 units

Q23 Which law gives the direction of induced EMF?

- (A) Maxwell's law
- (B) Gauss's law
- (C) Lenz's law
- (D) Newton's law

Q24 A switched reluctance motor can produce torque at a speed _____.

- (A) equal to synchronous speed
- (B) less than synchronous speed
- (C) double than synchronous speed
- (D) triple than synchronous speed

Q25 What is the use of encoder in the DC servomotor?

- (A) Determines the magnetic field strength inside the motor
- (B) Determines the temperature of the windings of the motor
- (C) Determines the rotational speed of the motor
- (D) Determines the input voltage of the motor

Q26 Which of the following is the correct interrelation between the variables x_1 and x_2 used in the expression to calculate the sag in a transmission conductor with different heights, where, variables x_1 and x_2 represent the horizontal distances of support at lower and higher levels from the lowest point of the conductor, respectively?

- (A) $x_1 < x_2$
- (B) $x_1 >> x_2$
- (C) $x_1 > x_2$
- (D) $x_1 = x_2$

Q27 An LC circuit with inductance $L = 2H$ and capacitance $C = 8 \mu F$ is connected to an AC source. Find the value of the power factor of combination.

- (A) 0
- (B) 10
- (C) 2
- (D) 8

Q28 For providing controlling torque to a horizontally mounted MI instrument, which of the following methods is used?

- (A) Water control
- (B) Spring control
- (C) Eddy current
- (D) Electrostatic field

Q29 A permanent magnetic material has _____ retentivity.

- (A) low
- (B) high



(C) zero (D) constant

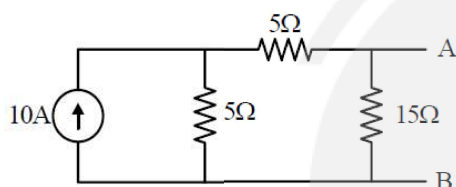
Q30 In the context of electromagnetic induction, if the magnetic fluxes of two coils oppose each other, then the connection is called _____.

- (A) parallel opposing
(B) mutually opposing
(C) series opposing
(D) self-opposing

Q31 The wavelength of a sodium vapour lamp is _____.

- (A) 673 nm
(B) 326 nm
(C) 254 nm
(D) 589 nm

Q32 The Norton's equivalent current between the load terminal A-B will be :



- (A) 5 A (B) 20 A
(C) 10 A (D) 0 A

Q33 Which of the following is the correct expression for eddy current (W_e) loss if B_{\max} = Maximum flux density, f = Frequency of magnetic reversal, t = Thickness of each lamination and V = Volume of the armature core?

- (A) $W_e = k B_{\max}^2 f t^2 V^2$ watts
(B) $W_e = k B_{\max}^2 f^2 t^2 V^2$ watts
(C) $W_e = k B_{\max}^2 f^2 t^2 V$ watts
(D) $W_e = k B_{\max}^2 f^2 t V^2$ watts

Q34 Which of the following lighting calculation methods is handy and quick?

- (A) Watts per square metre method
(B) Point by point method
(C) Flux method
(D) Lumen method

Q35 In case of magnetic circuits, the force that tends to create magnetic flux is called

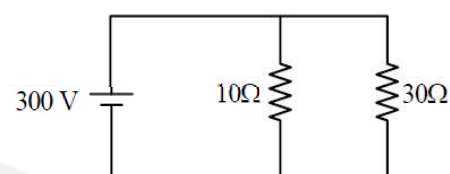
_____.

- (A) absolute permeability
(B) reluctance
(C) relative permeability
(D) MMF

Q36 Which of the following connections is used as distribution transformer?

- (A) Delta-star (B) Star-star
(C) Delta-delta (D) Star-delta

Q37 The power consumed by the 30 Ω resistor is:



- (A) 300 W (B) 9000 W
(C) 10 W (D) 3000 W

Q38 Which phase of the project management lifecycle often takes the longest to wrap up?

- (A) Planning
(B) Estimation
(C) Execution
(D) Conceptualisation

Q39 In an electrical circuit, the current that changes periodically, both in magnitude and direction, at regular intervals of time is called _____.

- (A) phase current
(B) direct current
(C) leading current
(D) alternating current

Q40 What type of rotor is used in alternators driven by hydro-turbines ?

- (A) Shaded pole type
(B) Salient pole type
(C) Non-salient pole type
(D) Smooth cylindrical type

Q41 Identify the correct voltage range of medium transmission line.

- (A) >100 kV < 200 kV
(B) >20 kV < 100 kV



- (C) $>1 \text{ kV} < 5 \text{ kV}$
 (D) $>5 \text{ kV} < 10 \text{ kV}$

Q42 In motor applications, efficiency of the motor is always less than 100% due to conversion of the -----.

- (A) output energy into current
 (B) input energy into heat
 (C) output energy into heat
 (D) input energy into voltage

Q43 Calculate the respective values of magnetising force and flux density at a distance of 10 cm from a long circular conductor carrying a current of $100\pi \text{ A}$, placed in air?

- (A) $6.28 \times 10^{-7} \text{ AT/m}$ and 500 Wb/m^2
 (B) 1500 Wb/m^2 and $3.14 \times 10^{-4} \text{ AT/m}$
 (C) 500 AT/m and $6.28 \times 10^{-4} \text{ Wb/m}^2$
 (D) 50 Wb/m^2 and $6.28 \times 10^{-7} \text{ AT/m}$

Q44 A coal-fired thermal power plant generates 750 MW of electricity with a thermal efficiency of 30%. The coal has a heating value of 30,000 kJ/kg. Find the mass flow rate of the coal required to generate the required electricity.

- (A) 0.833 kg/s
 (B) 83.33 kg/s
 (C) 8.33 kg/s
 (D) 0.0833 kg/s

Q45 The transfer characteristic of JFET is drawn between :

- (A) I_{DSS} and V_{DS}
 (B) I_B and V_{DS}
 (C) I_B and V_{GS}
 (D) V_{GS}

Q46 Consider two MOSFET's A and B with the same overdrive voltage and sizes. MOSFET A is p-type MOSFET while MOSFET B is n-type MOSFET. Which of the following statements is true?

- a) MOSFET A has a higher transconductance
 b) MOSFET B has a higher transconductance
 c) MOSFET A and B have same transconductance due to same dimensions
 d) MOSFET A has a higher transconductance due to less mobility
 (A) Only C
 (B) Only A and D
 (C) Only B
 (D) Only A

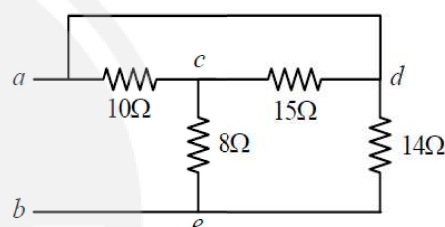
Q47 Which of the following types of steel is used to make the core of a transformer?

- (A) Stainless steel
 (B) Silicon steel
 (C) High-carbon steel
 (D) Tool steel

Q48 Which of the following should NOT be prioritised when making a comparison statement for the tender evaluation sheet/format?

- (A) Cost of packaging and shipping
 (B) Confidence that faulty goods will be replaced
 (C) Conditions of supply
 (D) Supplier's name

Q49 Find the equivalent resistance across terminal a-b :



- (A) 20 Ω
 (B) 14 Ω
 (C) 7 Ω
 (D) 28 Ω

Q50 The following test results were obtained from a 6 kVA, 200/400 V, 50 Hz single-phase transformer: Data for no-load low-voltage side: 200 V, 0.5 A and 50 W. At normal voltage and frequency, determine the magnetising current of the transformer.

- (A) 0 A
 (B) 0.433 A
 (C) 0.569 A
 (D) 0.236 A

Q51 In electromagnetic induction, the energy is supplied to the circuit and a part of this supplied energy is spent to meet -----.

- (A) hysteresis loss
 (B) iron losses
 (C) eddy current loss
 (D) I^2R losses

Q52 Which of the following statements is true about selection of the size of units in electrical energy



generation?

- (A) The size should be selected such that the unit operates close to the load curve of the station.
- (B) The size should be selected independent of both the maximum demand curve and the load curve.
- (C) The size must be selected such that the unit operates close to the maximum demand curve of the station.
- (D) The size of units must match both the maximum demand curve and the load curve.
- Q53** Which of the following is true regarding reciprocity theorem?
- (A) The ratio of the response to the excitation remains the same.
- (B) The sum of response and the excitation remains the same.
- (C) The difference between response and excitation remains the same.
- (D) The product of response and excitation remains the same.
- Q54** Which of the following is NOT a desirable property for the insulating materials used in an underground cable?
- (A) High insulation resistance
- (B) Non-inflammable
- (C) Hygroscopic
- (D) High dielectric strength
- Q55** If V-I characteristics is plotted for forward current by increasing the temperature, it has been seen that plot for V-I characteristics _____ as temperature increases.
- (A) does not change
- (B) is moved to the left
- (C) is moved down
- (D) is moved to the right
- Q56** A balanced star connected load of $4 + j3 \Omega$ per phase connected to a 3-phase, 230 V (phase value) supply. Find the value of active power.
- (A) 25.4 kW (B) 19.13 kW (C) 22.45 kW (D) 15.34 kW
- Q57** In a pure inductive circuit, if the frequency of the AC source is doubled, then its inductive reactance will :
- (A) remain the same
- (B) be halved
- (C) become zero
- (D) be doubled
- Q58** For measuring the earth resistance by the fall-of-potential method, how many auxiliary electrodes are used?
- (A) 2 (B) 1 (C) 3 (D) 4
- Q59** For an ideal short transmission line with zero voltage regulation, if receiving end voltage is 150 kV, then the sending end voltage will be :
- (A) 150 kV (B) 125 kV (C) 200 kV (D) 300 kV
- Q60** If the frequency of supply in a three core underground cable is doubled, the charging current will be _____.
- (A) four times (B) half (C) double (D) three times
- Q61** What is the function of the phosphor-coated screen in a CRT?
- (A) It is the part that moves the direction of the electron beam
- (B) It is the part that generates a beam of electrons
- (C) It is the part that regulates the intensity of the electron beam
- (D) It is the part that emits light
- Q62** Consider the following statements about the working of a hysteresis motor and choose the suitable combination of correct choices.
- (i) The stator of the hysteresis motor has a main winding along with an auxiliary winding.
- (ii) When the stator winding is fed from a single-phase supply, it produces a



synchronously revolving magnetic field.

(iii) The rotor material has low retentivity so hysteresis loss is low.

(iv) The rotor of the hysteresis motor consists of a smooth cylinder of magnetically hard steel, without winding

(A) Only (ii), (iii) and (iv) are correct.

(B) Only (i), (ii) and (iv) are correct.

(C) Only (iv) is correct.

(D) Only (iii) is correct.

Q63 Which of the following is NOT an advantage of shell type transformers over core type transformers?

(A) Less copper requirement

(B) Easy maintenance

(C) Reduced loss

(D) High mechanical strength

Q64 The deflection sensitivity in a cathode ray oscilloscope (CRO) is _____ the mass of electron.

(A) inversely proportional to

(B) directly proportional to

(C) directly proportional to the square root of

(D) inversely proportional to the square root of

Q65 The load on the transformer changes every day, with a daily production of 120 kWh and a cumulative loss of 5 kWh. What is the all-day efficiency of the transformer?

(A) 96%

(B) 95%

(C) 92%

(D) 90%

Q66 Calculate the apparent power of a circuit if the circuit has a power factor of 0.8 and the active power of the circuit is 40 W.

(A) 100 VA

(B) 40 VA

(C) 75 VA

(D) 50 VA

Q67 In the split-phase induction motor, both main winding and starting winding are displaced _____ in space.

(A) 180 degrees

(B) 270 degrees

(C) 90 degrees

(D) 360 degrees

Q68 In an electrical signal waveform, if each value on the curve is proportional to sine of the angle of rotation of the coil, then such a wave is called _____.

(A) ramp wave

(B) square wave

(C) sine wave

(D) triangular wave

Q69 If a power station supplies 1000 MWh of electricity to its consumers for a period of two months, then the average demand during the period will be :

(A) 1.39 MW

(B) 1.39 kW

(C) 0.694 MW

(D) 0.694 kW

Q70 If the synchronous speed of a motor is 1000 rpm and the rotor speed is 970 rpm, then percentage slip is _____.

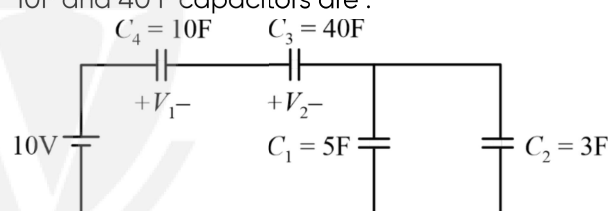
(A) 3%

(B) 7%

(C) 5%

(D) 9%

Q71 For the circuit shown below, the voltage across 10F and 40 F capacitors are :



(A) 10 V and 40 V, respectively

(B) 400 V and 1600 V, respectively

(C) 4 V and 1 V, respectively

(D) 1 V and 4 V, respectively

Q72 A voltage of $230\angle 60^\circ$ is applied to a current offering an impedance of $10 + j10 \Omega$. Find the expression for the current flowing through the circuit in polar form.

(A) $23\angle 45^\circ$ leading

(B) $16.3\angle 15^\circ$ lagging

(C) $16.3\angle 15^\circ$ leading

(D) $23\angle 45^\circ$ lagging

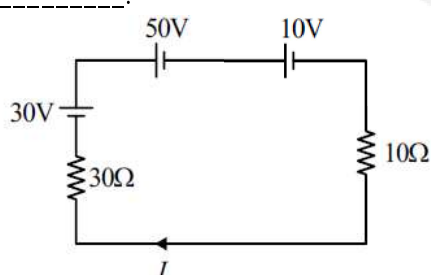
Q73 The height between the two supports of a transmission and distribution overhead line can be determined as :



- (A) $\frac{1}{2} \times$ (Vertical distance between the lower height support point of the conductor and lowest point of the conductor)
- (B) (Vertical distance between tire lower height support point of the conductor and Lowest point of the conductor) + (Vertical distance between tire higher height support point of the conductor and lowest point of the conductor)
- (C) $\frac{1}{2} \times$ (Vertical distance between the higher height support point of the conductor and lowest point of the conductor)
- (D) (Vertical distance between the higher height support point of the conductor and Lowest point of the conductor) – (Vertical distance between the lower height support point of the conductor and lowest point of the conductor)

- Q74** In an electronic circuit, the potential difference across any one resistor is a fraction of the total voltage applied across the series combination. Such a circuit is called _____.
- (A) current divider circuit
- (B) current multiplier circuit
- (C) voltage divider circuit
- (D) voltage multiplier circuit

- Q75** The value of the current I in the circuit is _____.



- (A) -0.75 A (B) 0.75 A
- (C) 2.25 A (D) -2.25 A
- Q76** The advantage of the stationary armature of a synchronous machine is :
- (A) stator weight is less compared to rotor weight
- (B)

- perfect mechanical balance is obtained on stator winding
- (C) stator winding voltage rating can be decreased
- (D) commutator is present

- Q77** Which of the following statements accurately describes voltage drop due to armature leakage reactance in an alternator on load?
- (A) The voltage drop due to armature leakage reactance decreases with increasing load.
- (B) The voltage drop due to armature leakage reactance increases with increasing load.
- (C) The voltage drop due to armature leakage reactance is independent of the load.
- (D) The voltage drop due to armature leakage reactance only occurs when the alternator is operating at no load.

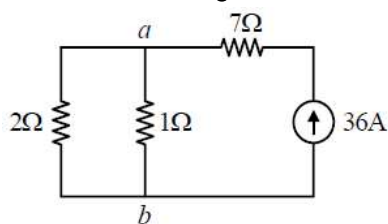
- Q78** In case of thermal efficiency, by using which of the following relations can 1 kWh of electrical energy be converted into joules?
- (A) $1 \text{ kWh} = 36 \times 10^5$ joules
- (B) $1 \text{ kWh} = 3.6 \times 10^3$ joules
- (C) $1 \text{ kWh} = 3.6 \times 10^5$ joules
- (D) $1 \text{ kWh} = 36 \times 10^3$ joules

- Q79** Which of the following overhead conductor materials is preferred for the harmful gas (like ammonia) atmosphere?
- (A) Galvanized steel
- (B) Cadmium copper
- (C) Phosphor bronze
- (D) Aluminium

- Q80** During working of a permanent magnet synchronous motor, _____.
- (A) stator and rotor both produce rotating magnetic field
- (B) rotor produces rotating magnetic field and stator produces constant magnetic field
- (C) stator and rotor both produce constant magnetic field
- (D) rotor produces constant magnetic field and stator produces rotating magnetic field



Q81 The current through the $2\ \Omega$ resistor is :



- (A) 1 A from a to b
- (B) 10 A from b to a
- (C) 12 A from a to b
- (D) 25 A from b to a

Q82 The split-phase induction motor is NOT used for drives that require more than _____.

- (A) 1000 kW
- (B) 100 kW
- (C) 10 kW
- (D) 1 kW

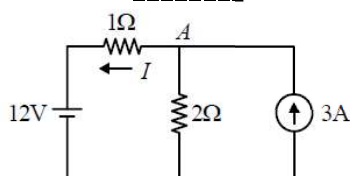
Q83 For an AC circuit, the voltage and the current are given as $V = (100 + j10)\text{ V}$ and $I = (20 - j10)\text{ A}$, respectively. The active power of the circuit is :

- (A) $P = 1800\text{ W}$
- (B) $P = 1000\text{ W}$
- (C) $P = 1900\text{ W}$
- (D) $P = 1500\text{ W}$

Q84 Which of the following is a ferromagnetic material?

- (A) Water
- (B) Oxygen
- (C) Nickel
- (D) Gold

Q85 In the circuit shown below, the value of the current I is _____.



- (A) -2 A
- (B) 4 A
- (C) 0 A
- (D) 2 A

Q86 The change in current through a junction diode is 1.5 mA when the forward bias voltage is changed by 0.6 V. The dynamic resistance is _____.

- (A) $600\ \Omega$
- (B) $500\ \Omega$
- (C) $400\ \Omega$
- (D) $300\ \Omega$

Q87

A substation is a facility that transmits and distributes electricity. It serves as an intermediary between electricity plants and end users. Which of the following statements about substations is INCORRECT?

- (A) Rotary converters are also used in railway substations.
- (B) Domestic consumers may also connect directly to the main transmission network.
- (C) All of the options
- (D) At the point of interconnection between two distinct transmission voltages, transformers may be installed in a substation.

Q88 In an electrical network, if the quantity of a source is controlled by another voltage or current present in the circuit, such a source is called _____.

- (A) ideal source
- (B) dependent source
- (C) non-ideal source
- (D) independent source

Q89 What is the main reason of placing field winding on the stationary rotor?

- (A) Insulation of high voltage is made easy on stator than on rotor.
- (B) Stator is associated with more power.
- (C) Stator is associated with more current.
- (D) Field circuit possesses less power.

Q90 The electrical pressure measured between any two points in an electrical circuit is called _____.

- (A) work done
- (B) energy
- (C) voltage
- (D) resistivity

Q91 In a capacitor-start capacitor-run induction motor, under standstill condition forward and backward voltages are _____.

- (A) infinite
- (B) unequal in magnitude
- (C) zero
- (D) equal in magnitude

Q92



Which of the following statements is/are correct regarding black liquor?

- A) It retains more than 50% of the biomass energy of wood.
 - B) It is a non-toxic substance produced when wood is burned into paper.
 - C) Tall oil is an important by-product separated from black liquor by skimming.
- (A) B and C (B) A and C
(C) Only C (D) A and B

Q93 Which of the following statements is FALSE in association with synchronous motor applications?

- (A) Synchronous motor is used in constant load drive application.
- (B) Voltage regulation can be done using synchronous motor.
- (C) Synchronous motor is expensive in low power output application.
- (D) Synchronous motor is highly suitable for low power output below 40 kW in medium speed range.

Q94 Which of the following statements is NOT correct about the significance of stationary armature alternator?

- (A) The rotating field type alternator has a smaller size than the rotating armature type.
- (B) The armature windings of the rotating field alternator are not subjected to centrifugal forces.
- (C) The output current can be easily taken from rotor winding.
- (D) The armature windings can be braced better mechanically against the high electromagnetic force.

Q95 The actual efficiency of a solar power plant is lower than its theoretical efficiency. Which of the following can be reasons for this?

- (I) Recombination of electrons and holes
 - (II) Internal resistance of the cell
- (A) Neither I nor II
(B) Only I

- (C) Both I and II
- (D) Only II

Q96 Find the electrical energy consumed in $10\ \Omega$ resistance when 100 mA current flows for 2 minutes.

- (A) 100 J (B) 1200 J
(C) 12 J (D) 120 J

Q97 In BJT, for common emitter configuration, the input characteristics are represented by a plot between which of the following parameters?

- (A) V_{EE} and I_B (B) V_{CE} and I_C
(C) V_{BE} and I_B (D) V_{BE} and I_E

Q98 A rectifier type instrument uses a bridge rectifier and has its scale calibrated in terms of rms value of a sine wave. It indicates a voltage of 3.33 V when measuring a voltage of a triangular wave shape. Calculate the peak value of the applied voltage?

- (A) 6.66 Volts (B) 9 Volts
(C) 6 Volts (D) 9.99 Volts

Q99 The phasing out test on a three-phase transformer is carried out to find _____.

- (A) primary winding belonging to the same phase
- (B) primary and secondary windings belonging to a different phase
- (C) primary and secondary windings belonging to the same phase
- (D) secondary winding belonging to a different phase

Q100 The admittance of an electric circuit is represented by $Y = (3 + j4)$. What is the value of resistance in this circuit?

- (A) $\frac{4}{25}\ \Omega$ (B) $\frac{2}{25}\ \Omega$
(C) $\frac{3}{25}\ \Omega$ (D) $\frac{1}{25}\ \Omega$



Answer Key

Q1 (B)
Q2 (A)
Q3 (D)
Q4 (C)
Q5 (A)
Q6 (B)
Q7 (C)
Q8 (B)
Q9 (C)
Q10 (C)
Q11 (D)
Q12 (C)
Q13 (A)
Q14 (A)
Q15 (D)
Q16 (D)
Q17 (C)
Q18 (C)
Q19 (A)
Q20 (C)
Q21 (D)
Q22 (A)
Q23 (C)
Q24 (A)
Q25 (C)
Q26 (A)
Q27 (A)
Q28 (B)
Q29 (B)
Q30 (C)

Q31 (D)
Q32 (A)
Q33 (C)
Q34 (A)
Q35 (D)
Q36 (A)
Q37 (D)
Q38 (C)
Q39 (D)
Q40 (B)
Q41 (B)
Q42 (B)
Q43 (C)
Q44 (B)
Q45 (D)
Q46 (C)
Q47 (B)
Q48 (D)
Q49 (C)
Q50 (B)
Q51 (D)
Q52 (A)
Q53 (A)
Q54 (C)
Q55 (B)
Q56 (A)
Q57 (D)
Q58 (A)
Q59 (A)
Q60 (C)



Q61 (D)
Q62 (B)
Q63 (B)
Q64 (D)
Q65 (A)
Q66 (D)
Q67 (C)
Q68 (C)
Q69 (C)
Q70 (A)
Q71 (C)
Q72 (C)
Q73 (D)
Q74 (C)
Q75 (A)
Q76 (B)
Q77 (B)
Q78 (A)
Q79 (C)
Q80 (D)

Q81 (C)
Q82 (D)
Q83 (C)
Q84 (C)
Q85 (A)
Q86 (C)
Q87 (B)
Q88 (B)
Q89 (A)
Q90 (C)
Q91 (D)
Q92 (B)
Q93 (D)
Q94 (C)
Q95 (C)
Q96 (C)
Q97 (C)
Q98 (C)
Q99 (C)
Q100 (C)



Hints & Solutions

Q1 Text Solution:

$$a_{\text{auto}} = \frac{600}{200} = 3$$

$$\therefore \frac{\text{Weight of conductor in auto T/F}}{\text{Weight of conductor in 2-winding}} = 1 - \frac{1}{a_{\text{auto}}}$$

$$= 1 - \frac{1}{3} = \frac{2}{3} = \frac{1}{1.5}$$

Q2 Text Solution:

Most efficient generator for wind power generation is doubly-fed induction generator.

Q3 Text Solution:

Hold-on coil is connected in series with shunt field in a three point starter to provide field failure prevention i.e., prevent the motor from running away in case of open-field circuit.

Q4 Text Solution:

Here

$$\alpha = 78.3 - 36.54$$

$$\alpha = 41.76^\circ$$

$$I_1 = I_0 + I_2'$$

$$|I_1| = \sqrt{I_0^2 + I_2'^2 + 2I_0I_2' \cos \alpha}$$

$$= \sqrt{5^2 + 30^2 + 2 \times 5 \times 30 \cos 41.76^\circ}$$

$$= \sqrt{1148.78} \text{ A}$$

Q5 Text Solution:

Type of contract

- Item rate contract

Lump-sum contract

- Percentage rate contract

Cost plus percentage rate contract

- All in one contract

Target contract

- Labour contract

Negotiated contract

- Turn key contract

Selected tender is not a type of tender depending on the type of contract.

Q6 Text Solution:

AC series motor has low power factor because of large reactance of field and armature winding.

Q7 Text Solution:

EMF equation of transformer

$$E_1 = 4.44 f \phi_m \cdot N_1$$

Q8 Text Solution:

Barrier potential for PN junction is given by

$$V_{bi} = V_T \ln \frac{N_D \times N_A}{n_i^2}$$

$$\therefore V_T = \frac{kT}{q}$$

$$\therefore V_{bi} = \left(\frac{kT}{q} \right) \ln \frac{N_D \times N_A}{n_i^2}$$

Q9 Text Solution:

Reciprocity theorem is not applicable for network having non linear elements and multiple sources.

It is applicable for reciprocal network.

Q10 Text Solution:

Horizontal amplifier should be designed for high amplitude signal with a slow rise time.

Q11 Text Solution:

- To measure current in a circuit by CRO, a low-resistance standard resistor is connected in series with the circuit whose current is being measured.
- To measure voltage drop across it, CRO is connected across the standard resistor.

Q12 Text Solution:

Apply KVL

$$-20 + 10I + 30 = 0$$

$$10I = -10$$

$$I = -1 \text{ A}$$

Q13 Text Solution:

Three point lighting is a method for illuminating a subject in a scene with light sources from three different position. There are three types of lights in this scheme.

1. Key light
2. Fill light
3. Back light

Q14 Text Solution:

Active power is the power dissipated by pure resistor.



$$P = I^2 R = VI \cos \phi$$

It is measured in watt or kW.

It depends on power factor of load.

Power absorbed by pure inductor or capacitor is called as reactive power.

Q15 Text Solution:

Application of repulsion start induction run motors are in hoists, air compressors, lifts etc.

Q16 Text Solution:

$$V_1 = 25 \text{ V}, P_1 = 800 \text{ W}$$

$$V_2 = 10 \text{ V}, P_2 = ?$$

$$\therefore P \propto V^2$$

$$\frac{P_2}{P_1} = \left(\frac{V_2}{V_1} \right)^2$$

$$\Rightarrow P_2 = \left(\frac{10}{25} \right)^2 \times 800 = 128 \text{ W}$$

Q17 Text Solution:

Cables are made by stranding together many wires.

Q18 Text Solution:

Deflecting torque in PMMC instrument

$$T_d = BINA$$

$$\therefore T_d \propto I$$

Q19 Text Solution:

At leading P.f

Armature reaction of alternator is partially magnetising and partially cross magnetising.

At lagging p.f.

It is partially demagnetising and partially cross magnetising in an alternator

Q20 Text Solution:

As per DPS standard, security depositive amount is 10% of tender amount

Q21 Text Solution:

$$\therefore C = \frac{\epsilon_0 \epsilon_r A}{d}$$

Where **A** = area of plates

d = distance between plates

ϵ_r = relative permittivity of dielectric

\therefore Ability of capacitor to store charge does not depends on the amount of charge.

Q22 Text Solution:

$$\begin{aligned} &\text{Number of units} \\ &= \frac{\text{Watt} \times \text{day} \times \text{hours}}{1000} = \frac{2500 \times 40 \times 4}{1000} = 400 \text{ units} \end{aligned}$$

Q23 Text Solution:

Lenz's Law:

It states that, the effect always opposes its cause.

The direction of statically induced emf is given by Lenz's law.

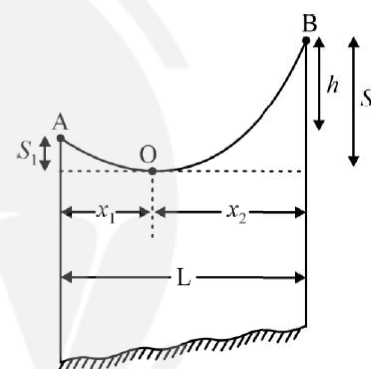
Q24 Text Solution:

Switched reluctance motor can produce torque at synchronous speed.

Q25 Text Solution:

In DC servomotor, econders determines rotational speed of motor, rotation angle, and send positional feedback to the controller.

Q26 Text Solution:



L = Length of span

O = Lowest point

h = difference in height level

T = Tension in conductor

W = Weight per unit length of conductor.

$$x_1 = \frac{L}{2} - \frac{Th}{WL}$$

$$x_2 = \frac{L}{2} + \frac{Th}{WL}$$

$$\therefore x_2 > x_1$$

Q27 Text Solution:

$$\therefore R = 0$$

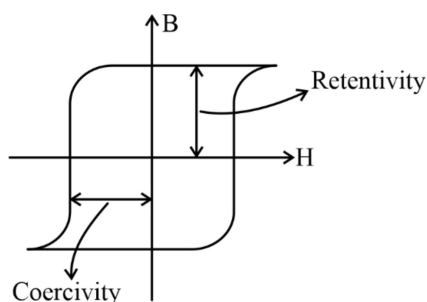
$$\therefore \cos \phi = \frac{R}{Z} = 0$$

Q28 Text Solution:

Spring control is used to provide controlling torque in horizontally mounted MI instrument.

Q29 Text Solution:





Permanent magnetic material has broad B.H curve, i.e., it can not get easily demagnetised.

Q30 Text Solution:

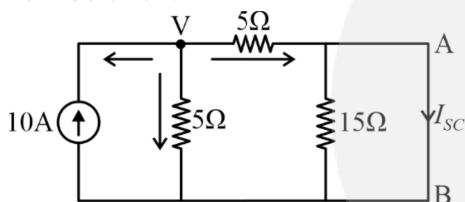
If magnetic fluxes of two coils oppose each other, then the connection is called series opposing.

Q31 Text Solution:

Colour of light in sodium vapour lamp is monochromatic yellow.

∴ Wavelength is 589nm or $5890 \text{ \AA} \approx 5900 \text{ \AA}$

Q32 Text Solution:



$$-10 + \frac{V}{5} + \frac{V}{5} = 0$$

$$-50 + 2V = 0$$

$$V = 25 \text{ Volt}$$

$$\therefore I_{SC} = \frac{V}{5} = \frac{25}{5} = 5 \text{ A}$$

Q33 Text Solution:

Eddy current loss

$$W_e = k_e B_m^2 f^2 t^2 V \text{ watt}$$

Q34 Text Solution:

Watt/m² method is handy and quick for lighting calculation.

Q35 Text Solution:

$$\text{MMF} = NI = \phi \cdot S = Hl$$

It is a force that tends to create magnetic flux. Its unit is ampere – turns.

Q36 Text Solution:

The transformer of secondary distribution circuit is connected in delta-star.

Q37 Text Solution:

Power consumed by 30 Ω resistor

$$P = \frac{V^2}{30} = \frac{300 \times 300}{30} = 3000 \text{ W}$$

Q38 Text Solution:

Project management life cycle has seven phases that make up the path that takes your project from start to finish. Intake → Initiation → planning → product selection → execution-implementation → monitoring and control → close. Execution also known as implementation phase. This is the longest phase of project management cycle where most resources are applied.

Q39 Text Solution:

Alternating current are those current which change both magnitude and direction.

Q40 Text Solution:

Salient pole type rotor is used in alternator driven by hydro-turbines called as hydrogenerators.

It has large diameter and small axial length. Suitable for low speed generation.

Q41 Text Solution:

Short transmission line – < 20 kV

Medium transmission line – 20 kV – 100 kV

Long transmission line – > 100 kV

Q42 Text Solution:

Efficiency of motor is always less than 100% due to losses i.e., conversion of input energy into heat.

Q43 Text Solution:

Magnetising force

$$H = \frac{I}{2\pi x} = \frac{100\pi}{2\pi \times 0.1} = \frac{1000}{2} = 500 \text{ AT/m}$$

$$B = \mu_0 H$$

$$B = 4\pi \times 10^{-7} \times 500 = 6.28 \times 10^{-4} \text{ Wb/m}^2$$

Q44 Text Solution:

Units generated per hour = 750 MWh = 750 × 3600 MJ

Thermal efficiency = 30% = 0.3

$$\therefore \text{Heat input} = \frac{750 \times 3600 \times 10^6}{0.3} = 9 \times 10^{12} \text{ J}$$



$$\begin{aligned} \text{Coal consumption per hour} &= \frac{\text{Heat input}}{\text{Calorific value of coal}} = \frac{9 \times 10^{12}}{3 \times 10^7} \\ &= 3 \times 10^5 \text{ kg/hr} \\ &= 83.33 \text{ kg/s} \end{aligned}$$

Q45 Text Solution:

I_D and V_{GS}

Q46 Text Solution:

n-type MOSFET has a higher transconductance than p-type MOSFET

Q47 Text Solution:

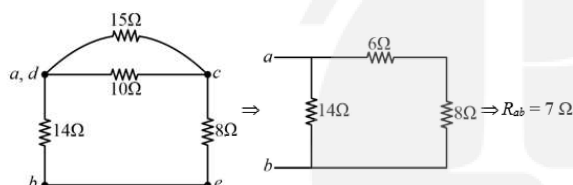
Si-steel is used to make the core of transformer.

Q48 Text Solution:

While making a comparison statement for tender evaluation sheet, supplier's name should not be prioritised

Q49 Text Solution:

Redraw the circuit



Q50 Text Solution:

$$\begin{aligned} \therefore P_{OC} &= V_{OC} I_O \cos \phi_0 \\ \cos \phi_0 &= \frac{50}{200 \times 0.5} \\ \cos \phi_0 &= \frac{1}{2} \Rightarrow \phi_0 = 60^\circ \end{aligned}$$

Magnetising current

$$\begin{aligned} I_m &= I_0 \sin \phi_0 \\ &= 0.5 \sin 60^\circ \\ &= \frac{\sqrt{3}}{4} = 0.433 \text{ A} \end{aligned}$$

Q51 Text Solution:

In electromagnetic induction, the energy is supplied to the circuit and a part of this supplied energy is spent to meet I^2R losses.

Q52 Text Solution:

The size should be selected such that the unit operates close to the load curve of the station.

Q53 Text Solution:

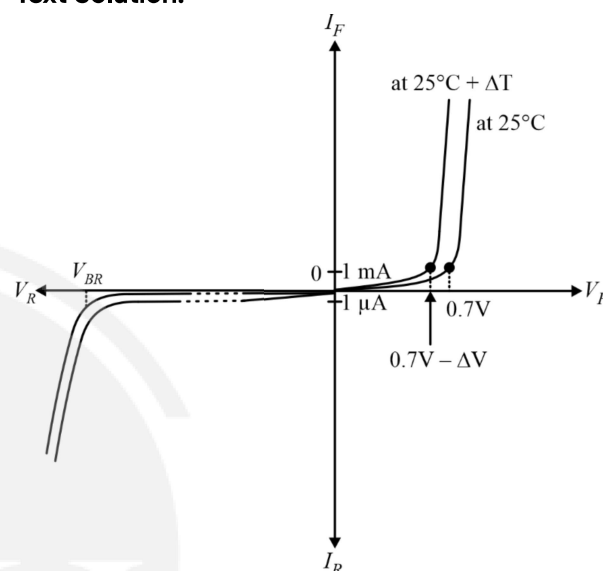
According to reciprocity theorem, the ratio of excitation to the response remains same if internal circuit configuration remain unchanged.

Q54 Text Solution:

Desirable property of insulation material used in underground cable

- High insulation resistance
- High dielectric resistance
- Non-hygroscopic
- Non-inflammable
- Unaffected by acids and alkalis.

Q55 Text Solution:



If V-I characteristics is plotted for forward current by increasing the temperature, it has been seen that plot for V-I characteristics is moved to left as temperature increases.

Q56 Text Solution:

$$\begin{aligned} Z &= 4 + j3, \quad V = 230 \text{ V (phase value)} \\ \therefore I_{ph} &= I_L = \frac{V}{Z} = \frac{230}{4 + j3} = \frac{230 \angle 0^\circ}{5 \angle 36.87^\circ} \\ &= 46 \angle -36.87^\circ \end{aligned}$$

$$\begin{aligned} \therefore \text{Active power,} \\ P &= 3V_{ph}I_{ph} \cos \phi = 3 \times 230 \times 46 \cos 36.87^\circ \\ &= 25.391 \text{ kW} \end{aligned}$$

Q57 Text Solution:

$$\therefore X_L = 2\pi fL$$

If the frequency of the AC source is doubled, then its inductive reactance will be doubled.

Q58 Text Solution:

Fall-of-potential method is used to measure the earth resistance. There are two auxiliary electrodes are used in this method.

Q59 Text Solution:



Voltage regulation for short transmission line is given by

$$V_{\text{Reg}} = \frac{V_S - V_R}{V_R}$$

If $V_{\text{Reg}} = 0$ then $V_S - V_R = 0$

$$\Rightarrow V_S = V_R = 150 \text{ kV}$$

Q60 Text Solution:

\therefore Charging current, $I_C = 2\pi f C_{ph} V_{ph}$

If the frequency of supply in a three core underground cable is doubled, the charging current will be doubled.

Q61 Text Solution:

In CRO, the screen is coated with phosphor material in order to convert kinetic energy of electron beam into light energy.

Q62 Text Solution:

The stator of the hysteresis motor has a main winding along with an auxiliary winding. When the stator winding is fed from a single-phase supply, it produces a synchronously revolving magnetic field. The rotor of the hysteresis motor consists of a smooth cylinder of magnetically hard steel, without winding. As no teeth and no winding in the rotor, no mechanical vibrations take place during its operation. It is suitable to accelerate inertia loads. It is used in noiseless operation such as electric clocks, tape recorders etc.

Q63 Text Solution:

Advantage of shell type transformers over core type transformers

- Less copper requirement
- Reduced loss
- High mechanical strength
- Higher efficiency

Disadvantage of shell type transformers

- Difficult maintenance
- Heat dissipation is not easy

Q64 Text Solution:

(d)

Q65 Text Solution:

All day efficiency of transformer
 $= \frac{120}{120+5} \times 100 = 96\%$

Q66 Text Solution:

$$\cos \phi = 0.8$$

Active power, $P = 40 \text{ W}$

$$\therefore S = \frac{P}{\cos \phi} = \frac{40}{0.8} = 50 \text{ VA}$$

Q67 Text Solution:

In the split-phase induction motor, both main winding and starting winding are displaced 90° in space.

Q68 Text Solution:

In an electrical signal waveform, if each value on the curve is proportional to sine of the angle of rotation of the coil, then such a wave is called sine wave.

Q69 Text Solution:

$$\text{Average demand} = \frac{1000 \times 10^6}{60 \times 24} = 0.694 \text{ MW}$$

Q70 Text Solution:

Synchronous speed, $N_S = 1000 \text{ rpm}$

Rotor speed, $N = 970 \text{ rpm}$

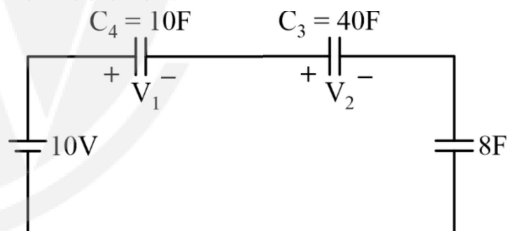
\therefore

$$s = \frac{N_S - N}{N_S} = \frac{1000 - 970}{1000} = \frac{30}{1000} = 0.03$$

$$\therefore \% \text{ slip} = 3\%$$

Slip,

Q71 Text Solution:



$$\frac{1}{C_{eq}} = \frac{1}{10} + \frac{1}{40} + \frac{1}{8} = \frac{4+1+5}{40}$$

$$C_{eq} = 4 \text{ F}$$

$$\therefore Q = C_{eq} V = 4 \times 10 = 40 \text{ V}$$

$$\therefore V_1 = \frac{Q}{C_4} = \frac{40}{10} = 4 \text{ V}$$

$$V_2 = \frac{Q}{C_3} = \frac{40}{40} = 1 \text{ V}$$

Q72 Text Solution:

$$V = 230 \angle 60^\circ$$

$$Z = 10 + j10 \Omega$$

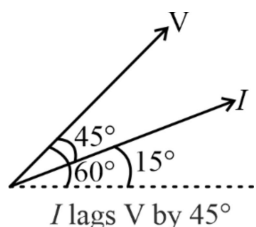
$$I = \frac{V}{Z} = \frac{230 \angle 60^\circ}{10 + j10} = \frac{230 \angle 60^\circ}{10\sqrt{2} \angle 45^\circ}$$

$$= \frac{23}{\sqrt{2}} \angle 15^\circ \text{ A}$$

$$= 16.3 \angle 15^\circ \text{ A}$$

$$\therefore I = 16.3 \angle 15^\circ \text{ A lagging}$$

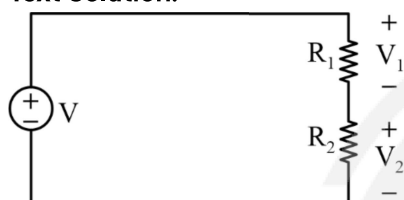




Q73 Text Solution:

The height between the two supports of a transmission and distribution overhead line = (Vertical distance between the higher height support point of the conductor and Lowest point of the conductor) – (Vertical distance between the lower height support point of the conductor and lowest point of the conductor)

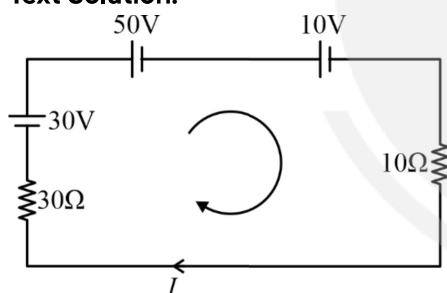
Q74 Text Solution:



According to voltage divider rule

$$V_1 = \frac{V \times R_1}{R_1 + R_2}, V_2 = \frac{V \times R_2}{R_1 + R_2}$$

Q75 Text Solution:



$$30I - 30 + 50 + 10 + 10I = 0$$

$$40I = -30$$

$$I = -\frac{3}{4} = -0.75A$$

Q76 Text Solution:

The advantage of the stationary armature of a synchronous machine

- The output current can be taken directly from the fixed terminals on the stationary armature without using slip rings, brushes, etc.
- The armature windings of the rotating field alternator, being stationary, are not subjected to vibration and centrifugal forces.

- When the stationary armature is used, the armature windings can be braced better mechanically against the high electromagnetic forces due to large short circuit currents.
- The rotating field is supplied with the direct current. Thus, only two slip rings are required to provide direct current for the rotating field.

Q77 Text Solution:

In an alternator, the voltage drop due to armature leakage reactance increases with increasing load.

Q78 Text Solution:

$$1 \text{ kWh} = 36 \times 10^5 \text{ joules}$$

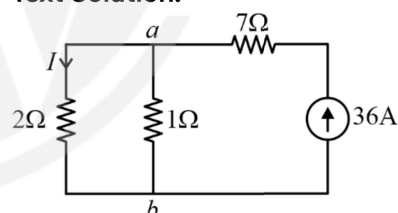
Q79 Text Solution:

Phosphor bronze is most suitable material for the harmful gas (like ammonia) atmosphere in overhead line.

Q80 Text Solution:

During working of a permanent magnet synchronous motor, rotor produces constant magnetic field due to permanent magnet and stator produces rotating magnetic field.

Q81 Text Solution:



$$I = \frac{36 \times 1}{2+1}$$

$$I = 12A$$

From **a** to **b**

Q82 Text Solution:

The split-phase induction motor is not used for drives that require more than 1 kW.

Q83 Text Solution:

Apparent power,

$$S = VI^*$$

$$= (100 + j10)(20 + j10)$$

$$S = 1900 + j300$$

$$\therefore S = P + jQ$$

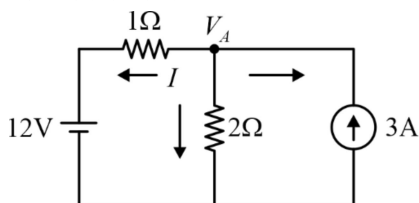
$$\therefore P = 1900 \text{ W}$$



Q84 Text Solution:

Ferromagnetic materials are Ni, Co, Fe, Gd.

Q85 Text Solution:



$$\frac{V-12}{1} + \frac{V}{2} - 3 = 0$$

$$2V - 24 + V - 6 = 0$$

$$3V = 30$$

$$V = 10 \text{ volt}$$

$$\therefore I = V - 12 \Rightarrow I = 10 - 12 = -2 \text{ A}$$

Q86 Text Solution:

$$\text{Dynamic resistance} = \frac{0.6}{1.5 \times 10^{-3}} = \frac{600}{1.5} = 400 \Omega$$

Q87 Text Solution:

- A substation is a facility that transmits and distributes electricity. It serves as an intermediary between electricity plants and end users.
- Rotary converters are also used in railway substations.
- At the point of interconnection between two distinct transmission voltages, transformers may be installed in a substation.
- Domestic consumers can't be connected directly to the main transmission network.

Q88 Text Solution:

In an electrical network, if the quantity of a source is controlled by another voltage or current present in the circuit, such a source is called dependent source.

Q89 Text Solution:

Question statement is wrong

If the question statement is given as, what is the main reason of placing armature winding on stator then option (a) will be correct.

Q90 Text Solution:

Voltage is the electrical pressure measured between any two points in an electrical circuit. The voltage is defined as work done per unit charged.

Q91 Text Solution:

In a capacitor-start capacitor-run induction motor, under standstill condition forward and backward voltages are equal in magnitude.

Q92 Text Solution:

Black liquor retains more than 50% of the biomass energy of wood. Tall oil is an important by-product separated from black liquor by skimming.

Q93 Text Solution:

Synchronous motor is used in constant load drive application. Synchronous motor is expensive in low power output application therefore, it is not suitable for low power output application below 40 kW in medium speed range.

Q94 Text Solution:

The advantage of the stationary armature of a synchronous machine

- The output current can be taken directly from the fixed terminals on the stationary armature without using slip rings, brushes, etc.
- The armature windings of the rotating field alternator, being stationary, are not subjected to vibration and centrifugal forces.
- When the stationary armature is used, the armature windings can be braced better mechanically against the high electromagnetic forces due to large short circuit currents.
- The rotating field is supplied with the direct current. Thus, only two slip rings are required to provide direct current for the rotating field.

Q95 Text Solution:

The actual efficiency of a solar power plant is lower than its theoretical efficiency due to recombination of electron and holes and internal resistance of cell.

Q96 Text Solution:

$$\begin{aligned} \text{Energy consumed} \\ = I^2 R t \end{aligned}$$



$$= (0.1)^2 \times 10 \times 120 = 12 \text{ J}$$

Q97 Text Solution:

If BJT, input characteristics of CE configuration is represented by a plot between I_B and V_{BE} .

Q98 Text Solution:

(c)

Q99 Text Solution:

The phasing out test on a three-phase transformer is carried out to identify primary and secondary windings belonging to the same phase.

Q100 Text Solution:

$$Y = (3 + j4)$$

$$Z = \frac{1}{Y} = \frac{1}{3+j4} \times \frac{3-j4}{3-j4} = \frac{3-j4}{3^2+4^2}$$

$$Z = \frac{3}{25} - j\frac{4}{25}$$

\therefore Real part of impedance is $R = \frac{3}{25} \Omega$





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