UKPSC JE

Electrical Engineering

Paper-2 Mega Mock Test-2

(May 7th - May 8th 2022)

Questions & Solutions

1. When donor atoms are added to semi-conductor, it
    A. Increases the energy band gap of the semiconductor
    B. Decreases the energy band gap of he semiconductor
    C. Introduces a new narrow band gap near the conductor band
    D. Introduces a new discrete energy level below the conduction band

Ans. D

Sol. When donor atoms are added to semi-conductor, it introduces a new discrete energy level below the conduction band.

2. Which oscillator will provide most stable oscillations:
    A. Wein bridge oscillator   B. RC phase shift oscillator
    C. Hartley oscillator   D. Crystal oscillator

Ans. D

Sol. Crystal oscillator does not contain R, L and C element. So, their performance does not deteriorate over time easily. Hence it gives the most stable oscillations.

3. In a BJT, as the base width decreases. Which one of the following parameters will decrease?
    A. Emitter injection efficiency
    B. The base transport factor
    C. Common emitter current gain
    D. The magnitude of the early voltage

Ans. D

Sol. In a BJT, as base width decreases, the magnitude of early voltage (V_A) decreases.

4. IE Rule 35 is related with?
    A. Danger Notices
    B. Accessibility of bare conductors
    C. Earth terminal on consumer's premier
    D. Supply to vehicles, cranes

Ans. A

Sol.

IE Rule	Use for
30	Apart as and service lines on consumers premises
31	Cut-out on consumers premises
32	Identification of earthed conductors
33	Earthed terminal on consumers premises
34	Accessibility of bare conductors
35	Danger Notices
36	M and ling of supply lines
37	Supply to vehicles, cranes

5. A synchronous motor has better power factor than an induction motor. This is due to _____

A. Stator supply is not required to produce magnetic field

B. Synchronous motor has no slip

C. Mechanical load on the rotor remains constant

D. Synchronous motor has large airgap

Ans. A

Sol. Power factors of the machine will be dependent on the how much magnetising current is drawn from the supply. If required magnetising current is low. Then P.f will be good & Vice versa.

In synchronous motor, Rotor is (field is) excited form the source (DC), so, there is no need of drawing the magnetising current form the source. So P.f is improved.

6. According to IE rule colour of earth wire is?

A. Red   B. Yellow

C. Black   D. Green

Ans. D

Sol. According to IE rule colour of earth wire is green.

Supply type	Type of wire	Colour
Single-phase	Phase	Red
	Neutral	Black
	Earth	Green
Three-phase	Phase-1	Red
	Phase -2	Yellow
	Phase -3	Blue
	Neutral	Black
	Earth	Green

7. Thermal runaway is not possible in FET because, as the temperature of FET increases

A. The drain current increases

B. The mobility of charge carriers decreases

C. The mobility of charge carriers increases

D. The trans conductance increases

Ans. B

Sol. Thermal runway is not possible in FET because as $\mu \propto T^{-m}$

Hence mobility decreases due to increase in temperature and as a result drain current decreases.

8. Which one of the following is the correct statement?

Equipotential lines and field lines

A. are parallel

B. are anti-parallel

C. are orthogonal

D. bear no definite relationship

Ans. C

Sol. Equiotantial lines : Suppose scalar potential V is function of Z so for a particular Z, a plance parallel to xy plane will have equipotential lines, we know

that $\vec{E} = -\nabla V$, gradient of scalar potential V will give a line $\perp$ to xy plane so equipotential lines and field lines are orthogonal to each other.

9. For a short line fault without switching resistor the most suitable circuit breaker is

A. Minimum oil Circuit Breaker 　　　B. SF_6 Circuit Breaker

C. Air blast Circuit Breaker 　　　D. None of the above

Ans. B

Sol. In SF_6 circuit breaker, the SF_6 gas is used at low velocity and low pressure due to which current chopping is prevented and capacitive currents are interrupted without restriking. Due to these reasons no switching resistor is required in this circuit breaker. Hence it is most suitable for short line fault without switching resistor.

10. Which of the following type of 1-phase induction motor finds its application in electric toys?

A. Capacitor start motor

B. Permanent split capacitor motor

C. Split phase induction motor

D. Shaded pole motor

Ans. D

Sol. Shaded pole motor following type of 1-phase induction motor finds its application in electric toys.

11. The open loop transfer function G(s) of a unity negative feedback system is:

1. Type-0 then it produces zero steady state error for step input.

2. Type-1 then it produces constant steady state error for ramp input.

3. Type-2 then it produces zero steady state error for ramp input.

4. Type-1 then it produces infinite steady state error state error for step input.

A. 2 and 3 　　　B. 1, 2 and 4

C. 1 and 3 　　　D. 3 and 4

Ans. A

Sol. Steady state error for different inputs are given below:

System	Step Input	Ramp Input	Parabolic Input
Type 0	$\dfrac{A}{1+k}$	∞	∞
Type 1	0	$\dfrac{A}{k}$	∞
Type 2	0	0	$\dfrac{A}{k}$

12. The nanomaterial has _____ dimensions in the nanometer range

A. Atleast one 　　　B. Atmost one

C. Atleast two 　　　D. Atmost two

Ans. A

Sol. Nanomaterials have atleast one dimension of the material in the nanometer range

1nm = 10^{-9} m

13. The most rarely used oscillator is

A. Hartley oscillator   B. Colpitt's oscillator

C. phase-shift oscillator   D. crystal oscillator

Ans. C

Sol. The main problem with phase-shift oscillator is that it cannot be easily adjusted over a large frequency range.

14. What should be the sequence of operation of isolator, circuit breaker and earthing switch during opening of a circuit.

A. open isolator open circuit breaker, and then close earthing switch.

B. open earthing switch, close isolator, and then close circuit breaker.

C. open earthing switch, open isolator, and then close circuit breaker.

D. open circuit breaker, open isolator, and then close earthing switch

Ans. D

Sol. Sequence of operation during open of a circuit:

Open circuit breaker, open isolator, and then close earthing switch.

Circuit closing:

Open earthing switch, close isolator, and then close circuit breaker.

15. The diversity factor and demand factor are always

A. Greater than one, greater than one

B. Less than one, greater than one

C. Greater than one, less than one

D. Less than one, less than one

Ans. C

Sol.

Diversity factor = $\dfrac{\text{sum of individual maximum demand}}{\text{Maximum demand of entire group}} > 1$

Diversity factor always greater than one.

Demand factor = $\dfrac{\text{Maximum Demand}}{\text{Connected Load}}$

Always less than one

16. At what temperatures domains lose their ferromagnetic properties?

A. Above ferromagnetic Curie temperature

B. Below paramagnetic Curie temperature

C. Above 4° K

D. At room temperature

Ans. A

Sol. At normal temperature the dipoles are aligned in the magnetic domains that remains distributed in the whole material randomly. But when the materials are heated to Curie temperature and above, ferromagnetic property disappear as the dipoles becomes drastically disordered due to thermal agitation.

17. An example of semi-conductor is :

A. aluminum   B. silicon

C. plastic   D. copper

Ans. B

Sol. 'Silicon' is an example of semi-conductor. It is most abundant electro positive element found in the curst of earth. Its symbol is Si and atomic number is 14. It has very large affinity towards oxygen. Silicon is brittle in nature.

18. Which of the following instrument is needed for both protection and metering?

A. Energy meter

B. Wattmeters

C. Instrument transformance

D. Power factor meter

Ans. C

Sol. The primary winding of the instrument transformer is connected to the high voltage or high current circuit and the meter/relay is connected to the circuit to isolate from higher voltage a higher current level.

19. The crawling in an induction motor is caused by: -

A. Improper design of the machine

B. Low voltage supply

C. High loads

D. Harmonics developed in the motor

Ans. D

Sol. Crawling is associated with squirrel cage induction motor due to which motor has tendency to run at very low speed compared to its synchronous speed. The fundamental runs at synchronous speed and harmonics 3rd, 5th,7th may rotate in backward or forward direction at $\dfrac{Ns}{3}, \dfrac{Ns}{5}, \dfrac{Ns}{7}$ speed respectively.

Hence harmonics torque developed along with fundamental.

20. The single phase induction motor which does not have centrifugal switch is

A. capacitor start single phase IM

B. resistance split single phase IM

C. capacitor start capacitor run single phase IM

D. permanent capacitor run single phase IM

Ans. D

Sol. In permanent capacitor run single phase induction motor the capacitor is always in the circuit and thus this type of motor does not contain any starting switch. The auxiliary

winding is always there in the circuit. Therefore, the motor operates as the balanced two-phase motor. The motor produces a uniform torque and has noise free operation. No centrifugal switch is required. Efficiency is high. As the capacitor is connected permanently in the circuit, the power factor is high. It has a higher pullout torque.

21. The kWh meter can be classified as a ……… instrument:

A. indicating   B. deflecting

C. digital   D. recording

Ans. D

Sol. The kWh meter can be classified as a recording instrument.

22. The Gauss's law for electrostatics can be expressed mathematically as

A. $\Psi = Q_{enclosed}$ B. $\Delta \cdot D = Q_{enclosed}$

C. $D \cdot ds = Q_{enclosed}$ D. $\int \Psi \cdot ds = Q_{enclosed}$

Ans. A

Sol. Gauss law in electrostatics states that total electric flux through a closed surface is equal to the net electric charge enclosed by the surface.

23. For the proper protection of power system, the operating time of a relay should be

A. 10 seconds   B. less than 1 second

C. more than 10 seconds   D. none of the above

Ans. B

Sol. In most of the cases, it is necessary to limit the maximum tripping to 1 second. Otherwise the fault can cause considerable damage to the greater part of the system.

24. Find the value of current in circuit
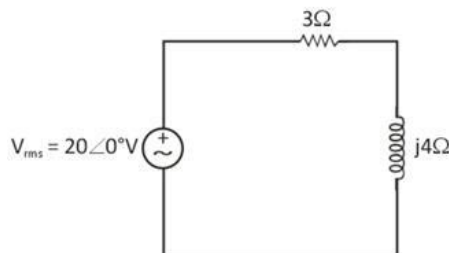
A. 4 ∠53.13 ° A   B. 5 ∠53.13 ° A

C. 6 ∠53.13 ° A   D. 4 ∠−53.13 ° A

Ans. D

Sol. $I = \dfrac{V}{Z} = \dfrac{20\angle 0°}{3 + j4} = 4\angle -53.13°A$

25. The rotor of a stepper motor has no

A. Winding   B. Commutator

C. Brushes   D. All of the above

Ans. D

Sol. The rotor is the rotatory part of the motor of a stepper motor and has no windings, commutator and brushes.

26. Which of the following is correct about divergence theorem?

A. it converts line integral to surface integral

B. it converts surface integral to volume integral

C. it converts line integral to volume integral

D. None

Ans. B

Sol. According to Gauss divergence theorem

$$\oiint (A \cdot ds) = \iiint \nabla . \vec{A} dV$$

It converts spherical integral into volume integral

27. Power transmission lines are transported to reduce

A. Skin effect

B. Ferranti effect

C. Transmission loss

D. Interference with neighbouring communication lines.

Ans. D

Sol. When the power and communication circuits run parallel to each other, interference can be reduced by rtransposing the conductors of the power line and the communication line. The transposition of power line neutralizes the unbalances in the capacitances of the lines that the electrically induced voltages are balanced out in a complete set of transpoaitions.

28. Which power plant will have high capital initial cost?

A. Diesel power plant   B. Gas power plant

C. Steam power plant   D. Nuclear power plant

Ans. D

Sol.

Power Plant	Capital Cost (Rs)
Diesel power plant	3000-7000 per kW
Gas power plant	5000-15000 per kW
Steam power plant	4000-5000 per kW
Nuclear power plant	20000-55000 per kW

29. Binary 101010 is equivalent to decimal number

A. 24   B. 42

C. 64   D. 44

Ans. B

Sol. $\rightarrow 101010)_2 = [1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0] = [42]_{10}$

30. Calculate the energy sored in 2H inductor at steady state fig. shown below
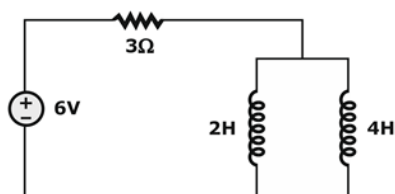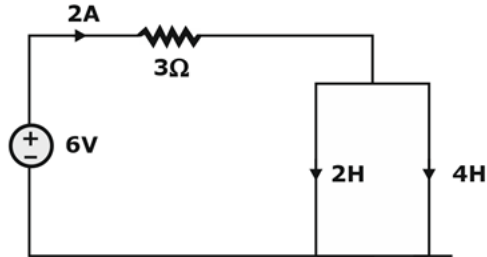
A. $\dfrac{4}{3}$ J

B. 10 J

C. $\dfrac{16}{9}$ J

D. 25 J

Ans. C

Sol. ⇒ at steady state inductor become shot circuit

⇒Current flowing in 2H inductor

$$\Rightarrow \left(\dfrac{2 \times 4}{2+4}\right) = \left(\dfrac{8}{6}\right) = \left(\dfrac{4}{3}\right)$$

⇒ Energy stored in inductor $= \dfrac{1}{2} \times L \times I^2$

$$= \dfrac{1}{2} \times 2 \times \left(\dfrac{4}{3}\right)^2 = \left(\dfrac{16}{9}\right) J$$

31. For a power system having induction motor loads, an overexcited synchronous motor is also attached. The induction motor will now operate a

A. lagging

B. leading

C. reduced power factor

D. increased power factor

Ans. A

Sol. Adding synchronous motor will improve the pf of the system but then the induction motor will still work at lagging pf only.

32. According to the law of electrostatics,

A. a charged body attracts similar charged bodies but repels uncharged bodies.

B. a charged body attracts bodies carrying similar charge and repels bodies possessing opposite charge.

C. a charged body repels bodies possessing similar charge and attracts bodies with opposite charge

D. a charged body attracts all types of charged bodies.

Ans. C

Sol. According to the electrostatics, two charged body attracts and repels each other. The like charges repel and unlike charges attract each other.

Thus, option C is the correct answer.

33. Which statement is correct in case of ideal OPAMP?

A. Infinite input impedance and zero output impedance.

B. Infinite input impedance and infinite output impedance.

C. Zero input impedance and zero output impedance.

D. Zero input impedance and infinite output impedance.

Ans. A

Sol. From an idea circuit of an OPAMP shown, it is noted that Op-amp is nearer to ideal performance which is similar in characteristics of an ideal amplifier with following features:
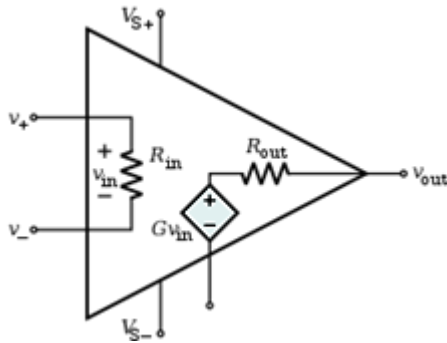
* Infinite voltage gain

* Infinite input impedance

* Zero output impedance

* Infinite bandwidth

* Zero input offset voltage

So from the above options, only option A is correct as in an ideal op-amp, the input impedance is high so it has less input where as output is low with less output loading.

34. The graph shown in the given figure represents a:
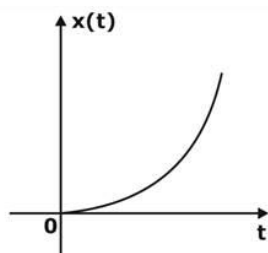
A. unit parabola signal, where $x(t) = t$;for $t \geq 0$

B. unit parabola signal, where $x(t) = \dfrac{t^2}{2}$;for $t < 0$

C. unit parabola signal, where $x(t) = 0$;for $t > 0$

D. unit parabola signal, where $x(t) = \dfrac{t^2}{2}$;for $t \geq 0$

Ans. D

Sol. The given waveform shows unit parabola signal, where $x(t) = \dfrac{t^2}{2}$;for $t \geq 0$.

35. An oxer excited synchronous motor on no-load is known as?

A. Synchronous condenser   B. Generator

C. Induction motor   D. Alternator

Ans. A

Sol. An over excited synchronous motor on no-load is called as synchronous condenser. An over excited synchronous motor works like capacitor and power factor is leading. An under excited synchronous motor works like inductor and power factor is lagging.

Synchronous condenser used for the correction of power factor of transmission line at load end.

36. The most reliable distribution system is

A. interconnected system   B. radial system

C. ring main system   D. none of these

Ans. A

Sol. When a ring main feeder is energized by two or more substations or generating stations, it is called as an interconnected distribution system. This system ensures reliability in an event of transmission failure. Also, any area fed from one generating stations during peak load hours can be fed from the other generating station or substation for meeting power requirements from increased load.

37. Bundled conductor in transmission lines will not reduces:

A. reactance of electric transmission line

B. voltage gradient

C. radio interference

D. transmission distance

Ans. D

Sol. Bundled conductors are used to optimize flow of current in transmission system upto 220 KV by reducing reactance of electric transmission line along with voltage gradient, corona loss, radio interference and surge impedance.

38. An energy meter makes 10 revolutions in 15 seconds for a load. The meter constant of energy meter is 600 rev/kWh. The load in kW is

A. 1 kW   B. 2 kW

C. 3 kW   D. 4 kW

Ans. D

Sol. Revolution made in 15 seconds = 10

Revolution made in 60 seconds = 10 × 4 = 40

Revolution made in 1 hr = 40 × 60 = 2400 rev

Now, meter constant

$$= \frac{\text{No. of revolutions in 1hr}}{\text{Load in kw}}$$

$$600 = \frac{2400}{P}$$

P = 4 kW

Hence, power consumed by the load is 4 kW

39. Which of the following types of errors come under systematic errors?

1) Irregular spring tension.

2) Improper readings of an instrument.

3) Loading effects.

4) Error due to the presence of electric field or magnetic field.

A. 1 and 2   B. 2 and 3

C. 3 and 1   D. 4 and 1

Ans. C

Sol. Systematic errors are divided into three categories

1) Instrumental errors:

These errors occur due to

(a) Instrument short comings in the instrument.

(b) Misuse of the instruments.

(c) Loading effects of instruments.

2) Environmental errors.

3) Observational errors.

Hence, option (C) is correct.

40. The relative permeability of diamagnetic materials is _____.

A. Greater than 1   B. Greater than 10

C. Less than 1   D. Greater than 100

Ans. C

Sol. A diamagnetic material has a constant relative permeability slightly less than 1. When a diamagnetic material, such as bismuth, is placed in a magnetic field, the external field is partly expelled, and the magnetic flux density within it is slightly reduced. A paramagnetic material has a constant relative permeability slightly more than 1. When a paramagnetic material, such as platinum, is placed in a magnetic field, it becomes slightly magnetized in the direction of the external field. A ferromagnetic material, such as iron, does not have a constant relative permeability. As the magnetizing field increases, the relative permeability increases, reaches a maximum, and then decreases.

41. To compute the current in the 12Ω resistor in the given network, which of the following theorem is not applicable?
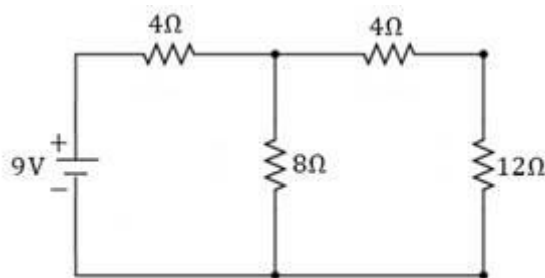
A. Reciprocity theorem   B. Norton theorem

C. Superposition theorem   D. Thevenin theorem

Ans. C

Sol. Superposition theorem is applicable when there are two or more independent sources present in the network. Since, the given network consists of only one independent source (9V voltage source), hence, superposition theorem is not applicable to this network.

42. Which of the following wiring system is used in almost all modern residential, commercial, and public buildings.

A. Cleat wiring

B. Wood casing wiring

C. Batten wiring

D. Concealed conduit wiring

Ans. D

Sol. **System of Wiring:**

Electricity supply authority, i.e., the State Electricity Boards provide electric supply up to a point outside the consumer's premises to supply power to different types of electrical load like lights, fans, refrigerators, room coolers, heaters, etc. There are different types of wires used. The choice of wiring will depend upon a number of factors.

The various types of internal wirings are

(i) Cleat wiring

(ii) Wood casing wiring

(iii) Conduit wiring

Cleat wiring: Cleats are made of porcelain and are fixed on walls or ceiling at intervals of 0.6 m. Thus, the cleats support the wire, such a cleat wiring is cheap and is used for temporary installation.

Wood casing wiring: In wood casing wiring, the cable is run through a wood casing having grooves. The wood casing of a required length is fixed on the walls or ceiling with screws. The cables are placed inside the grooves of the casing. A capping, also made of wood with grooves, is used to cover the cables.

The casing and capping are made from well-seasoned teak wood. The casing should be fixed with flat-headed wooden screws to wooden plugs at an interval of 90 cm. After all the insulated cables are laid inside the grooves of the casing, the capping should be attached to the casing by rust-resistant screws; care should be taken in fixing the screws on the capping so that the insulation of the cables inside is not damaged. Wood casing—capping wiring system is used in dry places like Rajasthan.

Batten wiring: In batten wiring, insulated wires are run on wooden battens. PVC wires are run on well-seasoned straight teak wood battens. The battens are fixed on the walls or ceilings by plugs and screws. The cables are held on the batten by means of tinned brass link clips. The clips are fixed on the battens with rust-resistant nails. Batten wiring is widely used for indoor installations. Batten wiring is cheap and takes comparatively less time to install.

Conduit wiring: Conduit wiring consists of PVC wires taken through either steel conduit pipes or through PVC conduit pipes. Conduits are run over the surface of walls and ceiling or are concealed under masonry work.

When conduits are run over the surface of walls, the wiring is called surface conduit wiring. When the conduits are run inside the walls, the wiring is called concealed conduit wiring. Surface conduit wiring is used in factories for installation of heavy motors and other electrical equipment. The system is water proof and replacement of defective wires is easy. In concealed conduit wiring, a chase or groove is cut on the wall to place the conduit pipes. In case of buildings under construction the chase should be provided on the wall and ceilings for laying the conduit pipes before plastering of walls and ceiling is done. Suitable inspection boxes are provided to permit the inspection and replacement of wires, if necessary. Concealed conduit wiring is used in almost all modern residential, commercial, and public buildings. The appearance of buildings from inside look good with concealed conduit wiring as compared to batten wiring.

43. Which of the following is an inferential type of flow meter?

A. Rotameter   B. Magnetic flowmeter

C. Laser doppler   D. Purge flow regulator

Ans. A

Sol. Inferential type of flow meters does not measure volume, mass, or velocity. Instead, they measure the flow of a fluid by inferring its value from other measured parameters such as differential pressure. Rotameter consists of a tapered tube; as fluid passes through that tube, it raises the float. Greater volumetric flow exerts more pressure on the float, lifting it higher.

44. When reading is taken under the measurement one time, at half scale of the instrument, the error is

A. exactly equal to half to full-scale error   B. equal to full-scale error

C. less than full-scale error   D. more than full-scale error

Ans. D

Sol. Accuracy is defined as 'percentage of true value'. As we done a less number of measurement & which is already at half scale then the probability of error will be more in comparison to full-scale error.

45. The no load current in transformer is less than induction motor because of

A. air gap in an induction motor

B. space oriented winding in induction motor

C. Both A and B

D. None of these

Ans. A

Sol. Presence of air gap in an induction motor required more mmf to create appropriate flux to rotate the machine that why induction motor no load current is more than transformer.

46. Consider the following statements regarding pinch off voltage (V_p) of JFET

1. V_p depends on doping concentration of the channel.

2. V_p depends on channel width

3. V_p depends on channel length

Which of the following statements is/are correct?

A. 1 only   B. 2 and 3 only

C. 1 and 2 only   D. 1, 2 and 3

Ans. C

Sol. V_p is independent of channel length.

47. Numerical distance scheme relay is used to protect which transmission lines?

A. 220 kv transmission line   B. 400 kv transmission line

C. 132 kv transmission line   D. 33 kv transmission line

Ans. B

Sol. Numerical distance scheme relay is used to protect 400 kv transmission line.

48. Zener diode is used for

A. producing oscillations in an oscillator

B. amplification

C. stabilisation

D. rectification

Ans. C

Sol. Zener diode is a silicon crystal diode having an unusual reverse current characteristic which is particularly suitable for voltage regulating purposes. Due to this characteristic, it is used as voltage stabilizer in many applications in electronics.

49. The critical magnetic field (H_c) of the super conductor

A. Varies linearly with temperature

B. Increase with increasing temperature

C. Decrease with increasing temperature

D. Independent of temperature

Ans. C

Sol. Graph of H_c V_s T of superconductor is given below

Variation in Critical
Magnetic Field with The
Temperature
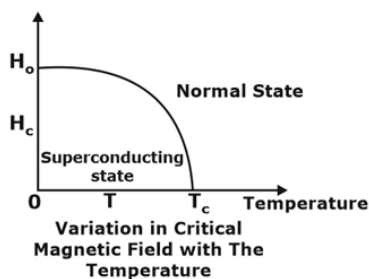
50. Which of the following is correct for a salient pole synchronous machine?

A. $X_q < X_d$ B. $X_q = X_d$

C. $X_q > X_d$ D. $x_q = 0$

Ans. A

Sol. Since reluctance on the q axis is higher, owing to the larger air gap, hence $X_q < X_d$

51. Which of the following method is used to measure high value of resistance?

A. Wheatstone bridge   B. Substitution method

C. Loss of charge method   D. Potentiometer

Ans. C

Sol. Loss of charge method is used to measure high resistance.

Wheatstone bridge and substitution method is used to measure medium resistance.

Potentiometer is used to measure low resistance.

52. The induction-type single-phase energy meter is

A. An ampere-hour meter
B. True watt-hour meter

C. Wattmeter
D. Volt-ampere-reactive meter

Ans. B

Sol. From the phasor diagram of single-phase energy meter, the driving torque is given as:

$T_d \propto VI \cos \phi \propto$ true power

Hence, an induction type single-phase energy meter is true watt-hour meter.

53. **Statement (I):** The resistance of a FET in non-conducting region is very high.

Statement (II): The FET is semiconductor device.

A. Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I).

B. Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I).

C. Statement (I) is true but Statement (II) is false.

D. Statement (I) is false but Statement (II) is true.

Ans. B

Sol. In nonconducting region of FET current is very low hence it offers very high resistance.

54. If the transformer frequency is changed from 50 Hz to 60 Hz, the ratio of eddy current loss at 50 Hz to 60 Hz at constant voltage will be:-

A. 5 / 6
B. 6 / 5

C. 25 / 36
D. 36 / 25

Ans. C

Sol. $P_e \alpha f^2$

$$\frac{(P_e) \text{at} 50 \text{Hz}}{(P_e) \text{at} 60 \text{Hz}} = \frac{(50)^2}{(60)^2} = \frac{25}{36}$$

55. Which of the following is NOT a category of electrical wiring system?

A. Cleat wiring
B. Conduit wiring

C. Clipboard wiring
D. Concealed wiring

Ans. C

Sol. Types of electrical wiring system:

1. Cleat wiring

2. Casing and capping wiring

3. Batten wiring (CTS or TRS)

4. Lead sheath wring

5. Conduit wiring

- Concealed conduit wiring

- Surface conduit wiring

56. The maximum efficiency of a 200 kVA transformer having an iron loss of 1800 W and full

load copper loss of 3200 W occurs at: -

A. 100 kVA   B. 150 kVA

C. 200 kVA   D. 125 kVA

Ans. B

Sol. $(KVA)_{maximum \eta} = \frac{3}{4} \times (KVA)_{fullload} = \frac{3}{4} \times 200 = 150KVA$

57. Which of the following systems of wiring has poor durability?

A. Cleat wiring   B. Lead sheathed wiring

C. Conduit wiring   D. TRS wiring

Ans. A

Sol. Comparison of durability in various system of wiring

	Durability
Cleat wiring	Very short
Wood casing-capping wiring	Fairly long
TRS wiring	Long
Lead sheathed wiring	Long
Conduit wiring	Very long

58. Which of the following is NOT true about diamagnetic materials-

A. These materials are repelled by a magnet.

B. Susceptibility small and negative.

C. Relative permeability is more than unity.

D. Atomic orbitals are completely filled.

Ans. C

Sol. Relative permeability is always less than 1. Rest statements are correct about

diamagnetic materials.

So, option C is correct.

59. As per IE rules the permissible variation of voltage at the consumer end is:

A. ±6%   B. ±10%

C. ±12%   D. ±2%

Ans. A

Sol. Indian Electricity Rules

As per Rule 54. Declared voltage of supply to consumer:

Except with the written consent of the consumer or with the previous sanction of the

State Government a supplier shall not permit the voltage at the point of commencement

of supply as defined under rule 58 to vary from the declared

voltage-.

1. in the case of low or medium voltage, by more than 6 per cent; or

2. in the case of high voltage, by more than 6 per cent on the higher side or by more

than 9 per cent on the lower side; or

3. in the case of extra high voltage, by more than 10 per cent on the higher side or by more than 12.5 per cent on the lower side:]

PROVIDED that in the case of high voltage, the voltage variation limit of 12.5 per cent may continue till the 31st March, 1974.]

60. Indicating instruments should be

   A. undamped   B. critically damped
   C. over damped   D. under damped

Ans. B

Sol. Indicating instruments should be critically damped.

61. In which of the following circuit breaker current chopping mainly occurs?

   A. Air blast circuit breaker   B. Vacuum circuit breaker
   C. SF_6 Circuit breaker   D. Oil circuit breaker

Ans. A

Sol. Air blast circuit breakers retain the same distinguish power irrespective of the magnitude of the current to be interrupted. When breaking low current with such breakers, powerful de-ionising effect of air blast causes. The current to fall abruptly to zero before the natural current zero is reached. This phenomenon is known as current chopping and result in the production of high voltage transient across the contact of the circuit breaker.

62. The bridge shown in the figure represents
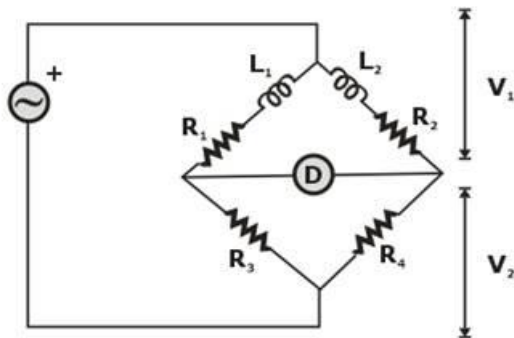
   A. Maxwell's bridge   B. Wien's bridge
   C. Anderson's bridge   D. Hay's bridge

Ans. A

Sol. The given figure represents Maxwell's bridge which measures inductances.

63. In flux meter instrument the damping provided is –

   A. Air friction   B. eddy current
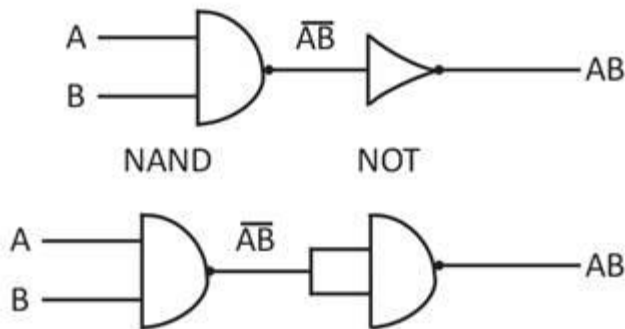   C. Electromagnet damping   D. Fluid friction damping

Ans. C

Sol.

Instruments	Type of Damping
Moving Iron, EDM	Air friction damping
Electrostatic instruments	Fluid Damping
PMMC, induction type	Eddy current Damping
Flux meter	Electromagnet Damping

64. How many NAND gates are required to implement AND gate?

A. 2　　　　　　　　　　　　　　　　B. 3

C. 4　　　　　　　　　　　　　　　　D. 5

Ans. A

Sol.

65. Welding Spatter is

A. Welding Defect　　　　　　　　　B. Flux

C. Electrode Coating　　　　　　　　D. Welding Coating

Ans. A

Sol. Weld spatter consists of droplets of molten metal or non-metallic material that are scattered or splashed during the welding process. These small bits of hot material may fly and fall on the workbench or on the floor, while others may stick to the base .

66. Main advantage of hexadecimal number system is:

A. ease of conversion from hexadecimal to decimal and vice-versa

B. ease of conversion from hexadecimal to binary and vice-versa

C. ease of conversion from hexadecimal to gray code and vice-versa

D. use of number and alphabets

Ans. B

Sol. Hex numbers are very easy to be changed to binary. Each hexadecimal digit represents four binary digits (bits), and the primary use of hexadecimal notation is a human-friendly representation of binary-coded values in computing and digital electronics. That is why they are used by programmers.

67. A power plant where the heat required to make steam to drive turbines to make electricity is obtained by burning fuels is called

A. Hydro electric power plant　　　　B. Thermal power plant

C. Solar power plant　　　　　　　　D. Nuclear power plant

Ans. B

Sol. → Hydro electric power plant ⇒ Potential energy of water converted into mechanical energy of turbine then into electrical energy.

→ Thermal power plant ⇒ Chemical energy of coal converted into heat energy of stream which then converted into electricity.

→ Solar power plant ⇒ solar energy is converted into electricity by solar panel made up of silicon cell.

→ Nuclear power plant ⇒ Mass energy of element is converted into nuclear energy, nuclear energy converted into thermal energy of steam, Thermal energy into mechanical energy and finally into electrical energy.

68. Mechanical flow meter, which does not incorporate an impeller for the purpose of flow measurement in a fluid medium consisting of water is :

A. Paddle wheel meter   B. Multiple jet meter

C. Variable area meter   D. All of these

Ans. C

Sol. The variable area (VA) meter, also commonly called a rotameter, consists of a tapered tube, typically made of glass, with a float inside that is pushed up by fluid flow and pulled down by gravity.

69. Barletts Bisection Theorem is applicable to _____

A. Unsymmetrical networks

B. Symmetrical networks

C. Both unsymmetrical and symmetrical networks

D. Neither to unsymmetrical nor to symmetrical networks

Ans. B

Sol. A symmetrical network can be split into two halves. So the z parameters of the network are symmetrical as well as reciprocal of each other. Hence Barletts Bisection Theorem is applicable to Symmetrical networks

70. Which of the following distribution system is used for combined power and lightning load?

A. Single phase 2-wire AC system

B. Three phase, 3-wire AC system

C. Three phase, 4-wire system

D. None of these

Ans. C

Sol.

Three phase, 4 – wire system is preferred due to safety purpose. A neutral wire allows the three phase system to use a higher voltage while still supporting lower voltage single phase appliances.

71. The maximum voltage regulation in a transformer is occurs at?

A. $\tan \theta = R/Z$ B. $\tan \theta = X/Z$

C. $\tan \theta = R/X$ D. $\tan \theta = X/R$

Ans. D

Sol. Transformer Voltage Regulation = $(E_2 - V_2)/E_2$

V_2 = Secondary Terminal Voltage at any load

E_2 = Secondary Terminal Voltage at no load

The voltage regulation up is expressed mathematically by

$$V.R. = \frac{I_2(R_{02}\cos\theta \pm X_{02}\sin\theta)}{V_2} \times 100$$

Maximum voltage regulation can be obtained for lagging power factor.

For maximum voltage regulation we have,

$$\frac{d}{d\theta}\left[\frac{I_2(R_{02}\cos\theta + X_{02}\sin\theta)}{V_2}\right] = 0$$

$-R_{02}\sin\theta + X_{02}\cos\theta = 0$

$$\tan\theta = \frac{X_{02}}{R_{02}}$$

This is satisfied only when the power factor of the load is lagging. The regulation is maximum when the load power factor angle is equal to the impedance angle of the transformer.

72. Temperature at which antiferromagnetic material converts to paramagnetic material is known as _____ temperature.

A. Curie
B. Curie-Weiss
C. Neel
D. Debye

Ans. C

Sol. Temperature at which antiferromagnetic material converts to paramagnetic material is known as Neel temperature.

73. A composite system consists of

A. A combination of diesel engine and dc series motor

B. Single phase power received is converted into dc or three phase power ac system

C. A combination of diesel engine and AC single phase motor

D. Use of combination of dc and ac motors on the same locomotive

Ans. B

Sol. 1-φ AC system is preferable in the view of distribution cost and distribution voltage can be stepped up to high voltage with the use of transformers, which reduces the transmission losses. Whereas in DC system, DC series motors have most desirable features and for the 3-φ system, 3-φ induction motor has the advantage of automatic regenerative braking, So, it is necessary to combine the advantages of the DC/AC and 3-φ/1-φ systems. The above cause leads to the evolution of the composite system.

• Single-phase to the Three-phase system also called Kando system
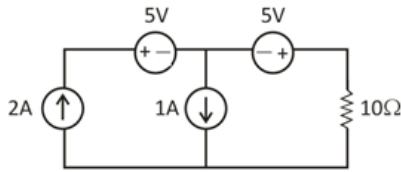
• Single-phase to dc system.

74. In electric arc welding process, welders use :

A. Direct current
B. Alternation current
C. A & B both
D. None of the above

Ans. C

Sol. Arc welders can use either direct current an alternating current.

75. The current though 10Ω resistor in the circuit shown in figure is _____

A. 2 A   B. 0 A

C. 3 A   D. 1 A

Ans. D

Sol. at node A

2 − 1 − I_1 = 0

I_1 = 1 A

76. The method suitable for heating of conducting medium is.

A. Induction heating   B. Indirect arc heating

C. Eddy current heating   D. Radiant heating

Ans. A

Sol. Induction heating is most suitable method for heating of conducting medium. Induction heating is the process heating an electrically conducting object by electromagnetic induction.

77. For series RL circuit, If R = 1 Ω and L = 1 H then time constant is

A. 1 sec   B. 1 m sec

C. 2 sec   D. 2 m sec

Ans. A

Sol. For RL series circuit, time constant τ is equal to L/R

τ = 1/1 = 1 sec

78. NAND and NOR gates are called 'Universal' gates primarily because

A. They are available everywhere

B. They are widely used in I.C. packages

C. They can be combined to produce AND, OR and NOT gate

D. They can be manufactured easily

Ans. C

Sol. Universal gates are those gates which can perform the function of AND, OR and NOT gate. NAND and NOR gate can do this, hence they are called universal gates.

79. The temperature first rises by 18 degree Celsius and then falls by 23 degree Celsius. If the initial temperature is 27 degree Celsius, what is the final temperature?

A. 22 degree Celsius   B. 23 degree Celsius

C. 24 degree Celsius   D. 25 degree Celsius

Ans. A

Sol. The temperature first rises by 18 degree Celsius and then falls by 23 degree Celsius.

Then,

$27^oC + 18^oC - 23^oC$

$= 45^oC - 23^oC$

$= 22^oC$

80. Delayed commutation takes place in DC machine because of

A. Compensating windings   B. Pole chamfering

C. Reactance voltage   D. All of the above

Ans. C

Sol. The leakage inductance L_C of the coil under going commutation induces a reactance

voltage in it which is given by $LC\left(\dfrac{di_c}{dt}\right)$, which opposes the change in current thereby

delaying commutation.

81. Using KVL determine the voltage drop across the resistor R_2 in the given circuit.
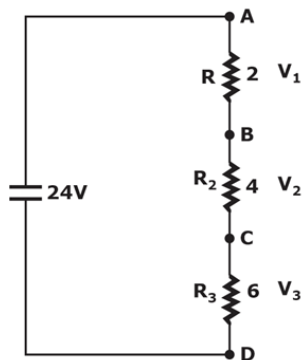
A. 4 V   B. 24 V

C. 8 V   D. 12 V

Ans. C

Sol. Apply KVL in the loop,

$-24 + 2I + 4I + 6I = 0$

$I = 2A$

Voltage drop in the resistor $R_2 = 4 \times 2 = 8$ V

82. A half wave diode rectifier and full wave diode rectifier both have an input frequency of 50

Hz. The frequencies of outputs respectively are:

A. 100 Hz and 50 Hz   B. 50 Hz and 100 Hz

C. 100 Hz each   D. 50 Hz each

Ans. B

Sol. For Half wave rectifier

$f_0 = f_i$ so, $f_0 = 50$ Hz

For Full wave rectifier

$f_0 = 2f_i$ so, $f_0 = 2 \times 50 = 100$ Hz

83. The short-circuit ratio of a typical synchronous machine is obtained from the OCC and SCC curves of Fig.2 as

Fig.2
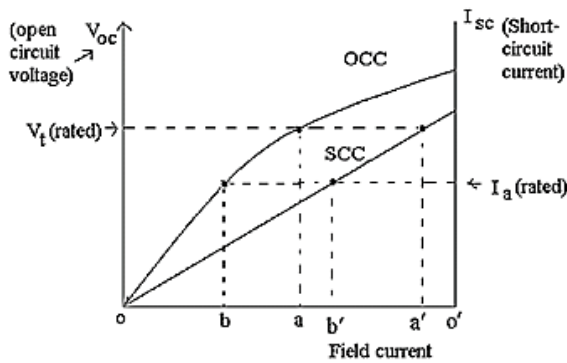
A. $\dfrac{oa}{ob}$

B. $\dfrac{oa'}{ob'}$

C. $\dfrac{oa}{ob'}$

D. $\dfrac{oc'}{ob}$

Ans. B

Sol. As shown in SCC curve the ratio of two field currents

84. Which one of the heating method has maximum power factor?

A. Dielectric heating

B. Arc lamp

C. induction heating

D. Resistance heating

Ans. D

Sol. Resistance heating is based on I2R effect and highly resistive in nature that's why it has maximum pf.

85. Electrostatic voltmeters are particularly suitable for measuring high voltage because the construction is simplified due to

A. large electrostatic forces

B. small electrostatic forces

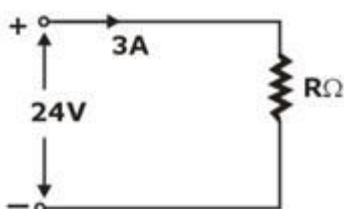C. large value of current

D. small value of current

Ans. D

Sol.

86. Determine the resistance (in Ohms) of resistor when the potential difference between the ends of the resistor is 24 V and the current flowing through the resistor is 3 A.

A. 12

B. 10

C. 8

D. 4

Ans. C

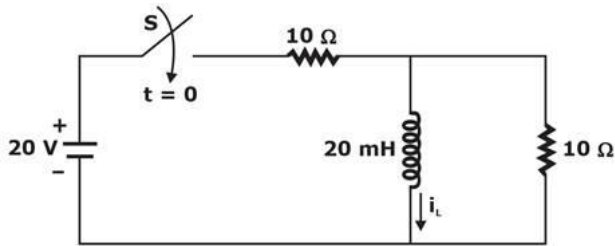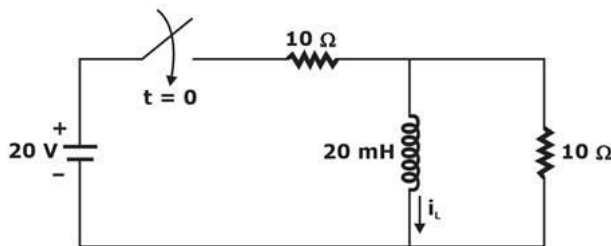Sol.

$R = \dfrac{24}{3} = 8\,\Omega$

87. For the circuit shown, the initial inductor current is 2 A, then at t > 0, i_L is _____ A .

A. 0   B. 1

C. 2   D. ∞

Ans. C

Sol.

$i_L + i_{Lf} + i_{Ln}$

$i_{Lf} = 20/10 = 2$

∴ $i_L = 2 + i_{Ln} = 2 + Ae^{-t/\tau}$

t = 0; i_L = 2 A

∴ $2 = 2 + Ae^{-t/\tau}$

So, i_L = 2 for t > 0 always

88. If $(152)_8 = (211)_X$, Then X = ____

A. 6   B. 7

C. 8   D. 9

Ans. B

Sol. $(211)_X = (2x^2 + 1.x + 1.x°)_{10}$

$(152)_8 = (1.8^2 + 5.8 + 2.8°)_{10} = (106)_{10}$

$2x^2 + x + 1 = 106$

$2x^2 + x - 105 = 0$

$2x^2 - 14x + 15x - 105 = 0$

$2x(x - 7) + 15(x - 7) = 0$

$(x - 7)(2x + 15) = 0$

Gives x = 7

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