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RRB JE 2019 Electrical CBT 2

All India Free Live Mock (9th-10th Aug) Questions & Solutions



1. Transformer an electric device is based on which of the following law?
 A. Faraday's law of induction
 B. Law of thermodynamic
 C. Gauss's law
 D. Coulomb's law

Ans. A

Sol. A **transformer** is an electrical device that transfers electrical energy between two or more **circuits** through **electromagnetic induction**. A varying current in one coil of the transformer produces a varying magnetic field, which in turn induces a voltage in a second coil. Power can be transferred between the two coils through the magnetic field, without a metallic connection between the two circuits. **Faraday's law of induction** discovered in **1831** described this effect.

2. In the current transformer burden is _____?
 A. it is excessive primary current
 B. product of voltage and current on secondary side and measured in (VA)
 C. product of voltage and current on primary side and measured in (VA)
 D. wastage of power

Ans. B

Sol. Burden on CT is defined as: It is product of voltage and current on the secondary side when it is supplying its maximum rated value of current is known as the burden and it is measured in volt ampere (VA).

3. Pollution of water is maximally due to____
 A. animal activities
 B. human activities
 C. alien activities
 D. all of the above

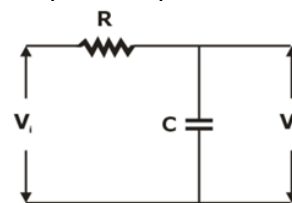
Ans. B

Sol. The water pollution is caused by the addition of organic and inorganic chemicals as well as the biological materials which change the physical and chemical properties of water. Most of these harmful activities are done by human.

4. Which one of the following condition must satisfies to behave low pass RC circuit as integrator.
 A. $RC \ll T$
 B. $RC = T$
 C. $RC \gg T$
 D. None of the above

Ans. C

Sol. The output low pass R-C circuit is



$$V_o = \frac{1}{RC} \int V_i dt$$

For $RC \gg T$

$$V_o \propto \int V_i dt$$

So, for $RC \gg T$ low pass R-C circuit behaves as integrator

5. The current in a solenoid is 20A the number of turns per unit length is 300 turns per meter and the core is made up of material having permeability of $1.5 \mu_0$. Find the magnetic field?
 A. 10.32 mT B. 7.53 mT
 C. 3.2 mT D. 15.8 mT

Ans. B

Sol. The magnetic field due to solenoid is

$$\bar{B} = \frac{\mu NI}{L}$$

$$\bar{B} = \mu n I \left(\frac{N}{L} \right)$$

$$\frac{N}{L} = 300 \text{ turns / meter}$$

$$I = 20A$$

$$\mu = 1.5 \mu_0$$

$$\bar{B} = 4\pi \times 10^{-7} \times 20 \times 300$$

$$\bar{B} = 7.53 \text{ mT}$$

6. In Arc heating, the electrodes used are made up of
 A. copper B. carbon
 C. graphite D. iron

Ans. C

Sol. For the Arc heating, the electrodes are made up of graphite

7. In which type of thermometer two different types of metal wires are joined together at two junctions?
 A. Resistance Thermometer
 B. Bimetal Thermometer
 C. Thermistor Thermometer
 D. Thermocouple Thermometer

Ans. D

Sol. In **Thermocouple Thermometer**, two different types of metal wires are joined together at **two junctions**. A **temperature difference** between the **junctions** actually makes the metals to produce a **small electric current** which moves the **metal needle** across the scale.

8. How many states of India share border with Myanmar?
 A. 5 B. 3
 C. 2 D. 4

Ans. D

Sol. • The **four** northeast Indian states share border with Myanmar.
 • These states share **1,643 km** border with Myanmar.
 • These 4 states are Arunachal Pradesh, Nagaland (215 Km), Mizoram (510 Km) and Manipur (398 Km).
 • **Arunachal Pradesh** (520 Km) shares longest border with Myanmar.
 • Myanmar shares its border with India, China, Bangladesh, Thailand and Laos.

9. Which of the following is correct with respect to sinusoidal waveform?
 A. The rms value is $\sqrt{2}$ times the peak value.
 B. Peak factor is the ratio of peak value to average value.
 C. Form factor is the ratio of average value to Rms value
 D. None of these

Ans. D

Sol. Since rms value = $\frac{\text{Peakvalue}}{\sqrt{2}}$

$$\text{Peak factor} = \frac{\text{Peakvalue}}{\text{rms.value}}$$

$$\text{Form factor} = \frac{\text{rmsvalue}}{\text{Avg.value}}$$

10. The minimum no. of wattmeter required for a 3- ϕ , 4 -wire unbalanced system for power measurement?
 A. 2 B. 3
 C. 4 D. 1

Ans. B

Sol. According to the Blondel theorem if system have 'N' no. of conductor/wire, for power measurement we required total N-1 no. of wattmeter and this theorem is applicable for both balanced and unbalanced load.
 So, for a 3- ϕ , 4-wire unbalanced system we required 4-1=3 wattmeter, for power measurement.

11. A dual trace CRO has
 A. 3-electron gun and two 2-pole switches
 B. one electron gun and one 2-pole switch
 C. 2 electron gun and one 2-pole switch
 D. one electron gun and two, 2-pole switch

Ans. B

Sol. In a dual trace CRO has one electron gun and one two pole switch. The electronic switch passes one channel at a time into the vertical plate of CRO.

12. The core type transformer is generally suitable for
 A. low voltage and high rating
 B. high voltage and low rating
 C. low voltage and low rating
 D. high voltage and high rating

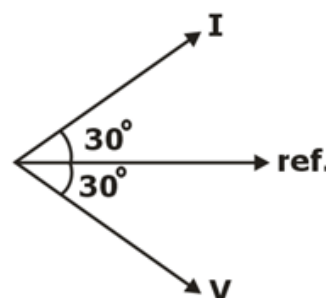
Ans. B

Sol. The core type transformer is suitable for high voltage [due to low insulation cost] and low rating.

13. The voltage and current waveform in a circuit is given by
 $V(t) = 230 \sin(\omega t - 30^\circ)$
 $i(t) = 5 \sin(\omega t + 30^\circ)$
 find the power factor of the circuit
 A. 0.5 B. 0.866
 C. 0.707 D. 1

Ans. A

Sol. Since power factor = cosine angle between the current and voltage waveform.
 Can calculate the phase angle between voltage and current.



$$\phi = 30^\circ + 30 = 60^\circ$$

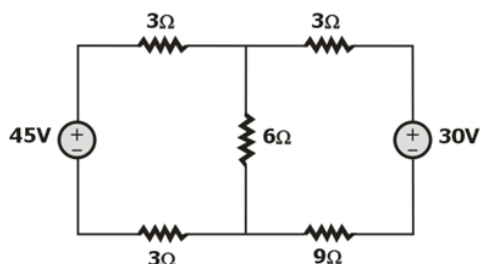
$$\text{P.f.} = \cos \phi = \cos 60^\circ = 0.5$$

14. Which one of following methods would gives a higher than actual value of voltage regulation of an alternator :
 A. mmf method
 B. Emf method
 C. ZPF method
 D. ASA method

Ans. B

Sol. This method gives large value of synchronous reactance. This leads to high value of percentage regulation than the actual results. So this method is called pessimistic method.

15.

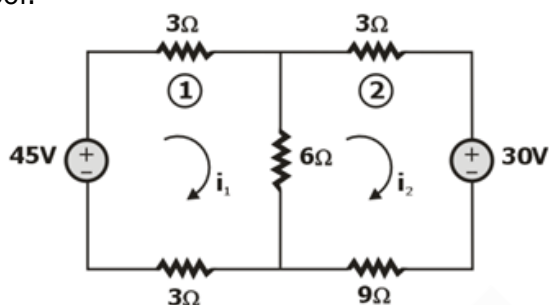


Find the current in 6Ω resistance ?

- A. 3A B. 4A
C. 3.5A D. 2.5A

Ans. B

Sol.



Apply KVL in loop (1)

$$45 = 3i_1 + 6(i_1 - i_2) + 3i_1$$

$$45 = 3i_1 + 6i_1 - 6i_2 + 3i_1$$

$$45 = 12i_1 - 6i_2 \dots(i)$$

Apply KVL in loop (2)

$$-3i_2 - 30 - 9i_2 + 6(i_1 - i_2) = 0$$

$$-3i_2 - 30 - 9i_2 + 6i_1 - 6i_2 = 0$$

$$6i_1 - 18i_2 = 30 \dots(ii)$$

$$i_1 = 3.5A \quad i_2 = -0.5A$$

Current in the 6Ω resistance

$$I = i_1 - i_2$$

$$I = 3.5 - (-0.5)$$

$$I = 4A$$

16. Which of following is known as white vitriol?

- A. Sulphuric acid
B. Ferrous Sulphate
C. Zinc Sulphate
D. Copper Sulphate

Ans. C

Sol. Zinc Sulfate is a white crystalline, water-soluble compound. The hydrated form, zinc sulfate heptahydrate known as "white vitriol" and can be prepared by reacting zinc with aqueous sulfuric acid.

It is used in:-

- * Making lithopone
- * As a mordant in dyeing
- * As a preservative for skins and leather
- * In medicine as an astringent and emetic.

17. The process of removal of environmental pollutants by humans is known as:

- A. Bioremediation
B. Autonomy
C. Pasteurization
D. None of the above

Ans. A

Sol. The term 'Bioremediation' is used for the procedure in which the treatment of pollutants or waste has occurred. This treatment is done through the use of microorganisms which further break down the undesirable substances. In this process, the contaminated soils are also clean up.

18. If the spring in the PMMC ammeter is broken than meter will reads.

- A. full scale reading
B. Zero
C. infinite value
D. half of full-scale reading

Ans. B

Sol. In the PMMC ammeter the spring serves two purpose.

- i. it provides the control torque
 - ii. provide a path for current to the moving coil
- since if spring is broken current in the moving coil will be zero. i.e. No deflecting torque produced. So, the meter will read the zero.

In MI meter spring provides only control torque. So, in MI meter if spring is broken, MI meter will read full scale reading.

19. In a 3-φ phase induction motor, the value of stalling torque.

- A. inversely proportional to the rotor resistance
B. independent of rotor resistance and inversely proportional to the rotor leakage reactance
C. inversely proportional to the square of the voltage
D. None of above

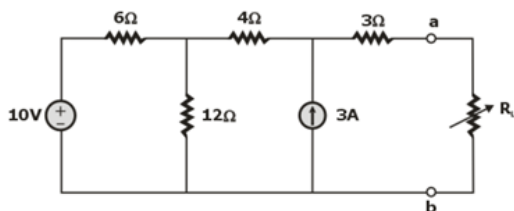
Ans. B

Sol. Stalling torque is also called maximum torque and pull-out torque So the maximum torque value in 3-φ induction motor is

$$T_{max} \propto \frac{3}{\omega_s} \frac{V^2}{2X_1}$$

i.e., T_{max} torque does not depends upon rotor resistance and it is inversely proportional to the rotor reactance.

20.



In the above circuit find the value of load resistance R_L for which maximum power dissipated in the load.

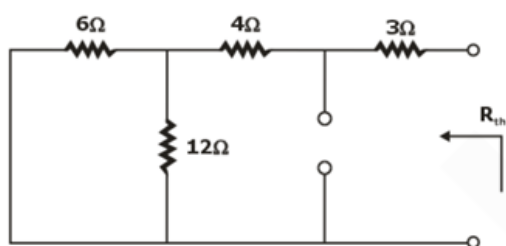
- A. 10Ω B. 6Ω
C. 7Ω D. 11Ω

Ans. D

Sol. For M.P.T

$$R_L = R_{th}$$

For R_{th} : replace all independent voltage source to short circuit and independent current source to open circuit.



$$R_{th} = 3 + 4 + (6 \parallel 12)$$

$$R_{th} = 7 + \frac{6 \times 12}{18}$$

$$R_{th} = 7 + 4 = 11\Omega$$

21. A current $i(t)$ is passed through a moving iron ammeter, find the reading of meter?

$$i(t) = -5 + 6\sin(\omega t + 30^\circ) - 8\cos(\omega t + 60^\circ)$$

- A. -5 B. 0
C. 8.66 D. 7.32

Ans. C

Sol. Since moving iron ammeter reads the rms value of the current.

$$i(t) = -5 + 6\sin(\omega t + 30^\circ) - 8\cos(\omega t + 60^\circ)$$

rms value of the above waveform is

$$= \sqrt{(-5)^2 + \left(\frac{6}{\sqrt{2}}\right)^2 + \left(\frac{-8}{\sqrt{2}}\right)^2}$$

$$= \sqrt{75}$$

$$= 8.66A$$

22. How is mass number of an atom determined?

- A. By total number of protons
B. By total number of neutrons
C. By adding number of protons and neutrons
D. By total number of electrons

Ans. C

Sol. The **number of protons and neutrons combined** to give us the mass number of an atom.

- As both protons and neutrons are present in the nucleus of an atom, they are together called nucleons.
- Atomic mass is expressed in atomic mass units or amu.

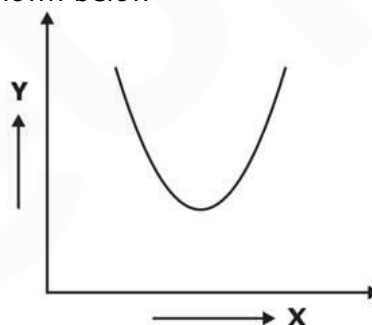
23. In the CRT aquadag carries.

- A. primary electrons
B. high voltage beam
C. secondary emission of electrons
D. None of the above

Ans. C

Sol. Aquadag. :- It is an aqueous solution of graphite which is deposited inside the screen. It is used to collect the secondary emitted electrons.

24. For a synchronous motor the curve is shown below

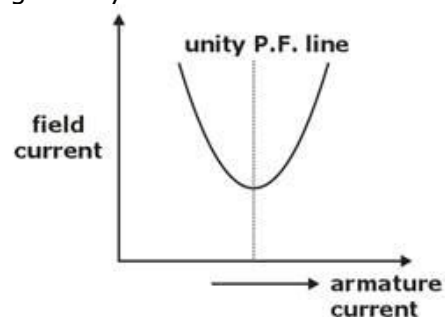


Find the parameter X and Y ?

- A. X = torque Y = power factor
B. X = armature current Y = power factor
C. X = armature current Y = field current
D. X = field current Y = armature current

Ans. C

Sol. For a synchronous motor V-curve is given by



25. Luminous efficiency of fluorescent tube is

- A. 5-10 lumens/watt
B. 15-25 lumens/watt
C. 50-70 lumens/watt
D. None of these

Ans. C

- Sol. The luminous efficiency of fluorescent tube is 50-100 lumens/watt
26. If a memory chip is volatile, it will _____.
- A. Explode if exposed to high temperatures
 - B. Lose its contents if power is turned off
 - C. Be used for data storage only
 - D. Be used to both read and write data
 - E. None of these

Ans. B

Sol. Random-access memory (RAM) is normally associated with **volatile** types of memory, where the stored information is **lost** if **power** is removed.

27. An industrial consumer has a load pattern of 1000 kw at 0.8 p.f. for 8 hours and 1500 kW at unity power factor for 16 hour. The load factor is
- A. 0.8
 - B. 0.88
 - C. 0.93
 - D. 0.72

Ans. B

Sol. Maximum demand in a day is = 1500 kW

$$\text{avg. load} = \frac{\text{energy consumed in a day}}{\text{total time in day}}$$

$$\text{avg. load} = \frac{1000 \times 8 + 1500 \times 16}{24}$$

$$\text{Avg. load} = 1333.33 \text{ Mw}$$

$$\text{load factor} = \frac{\text{avg. load}}{\text{maximum demand}}$$

$$\text{load factor} = \frac{1333.33}{1500} = 0.88$$

28. In the two-wattmeter method. If both wattmeters reads the same value of power but with opposite sign than find the power factor of load?

- A. 0
- B. 1
- C. 0.5
- D. 0.866

Ans. A

Sol.

$$\phi = \tan^{-1} \left[\sqrt{3} \frac{(w_1 - w_2)}{(w_1 + w_2)} \right]$$

Since it has given $w_1 = -w_2$

$$\phi = \tan^{-1} \left[\sqrt{3} \frac{(w_1 - w_2)}{0} \right]$$

$$\phi = \tan^{-1} [\infty]$$

$$\phi = 90^\circ$$

power factor of the load = $\cos \phi$

$$\text{P.F} = \cos 90^\circ = 0$$

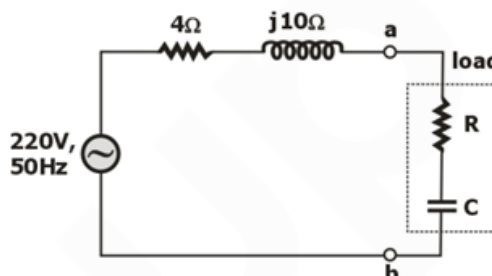
29. A guard ring is provided in a megger to
- A. reduce the power consumption
 - B. protect the circuit
 - C. eliminate the error
 - D. increase the current flow

Ans. C

Sol. The role of a guard ring in a megger is to reduce the errors due to leakage current.

Megger is used to measure the high resistance.

30.

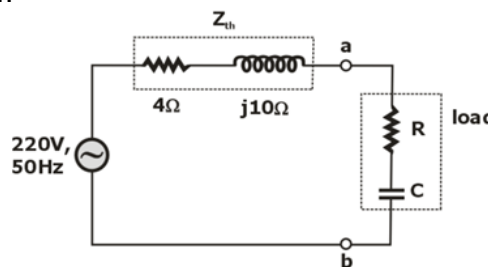


In the above circuit a R-C load is connected at terminal a-b. Find the value of load capacitance C for which maximum power transfer from source to load ?

- A. 318.47 μF
- B. 519.27 μF
- C. 205.32 μF
- D. 580.27 μF

Ans. A

Sol.



From the above circuit

$$Z_{th} = 4 + j10$$

For the MPT in the AC circuit

$$Z_i = Z^*_{th}$$

$$R - jX_C = (4 + j10)^*$$

$$R - jX_C = 4 - j10$$

$$X_C = 10\Omega$$

$$X_C = \frac{1}{\omega C}$$

Since

$$C = \frac{1}{\omega X_C} \quad \omega = 2\pi f$$

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

$$C = \frac{1}{2\pi \times 50 \times 10}$$

$$C = 318.47 \mu\text{F}$$

31. Consider a induction motor has 6 pole and another induction motor has 10 pole are connected in cumulative cascading and operated at 50 Hz. Than find the cumulative speed of operation.

- A. 1500 RPM B. 800 RPM
C. 1200 RPM D. 375 RPM

Ans. D

Sol. Since when two induction motor are connected in cascaded connection, four speed of operation is possible.

(1) when only motor (1), works,
corresponding speed $N_{S1} = \frac{120 \times f}{P_1}$

(2) When only motor (2), works
corresponding speed $N_{S2} = \frac{120 \times f}{P_2}$

(3) For a differential cascading,
speed of operation is $N = \frac{120 \times f}{P_1 + P_2}$

(4) For a cumulative cascading ,
speed of operation is $N = \frac{120 \times f}{P_1 - P_2}$

In the question it has mentioned that motors are connected in cumulative cascading, so the speed of operation is

$$N = \frac{120 \times 50}{10 + 6} = 375 \text{ RPM}$$

32. Oracle is an example of _____ application software.

- A. Database
B. word processing
C. project management
D. presentation graphics

Ans. A

Sol. A **database** is a collection of information that is organized so that it can easily be accessed, managed, and updated. Databases can be classified according to types of content, bibliographic, full-text, numeric and images.

Oracle Database is a multi-model database management system produced and marketed by Oracle Corporation.

33. A salient-pole synchronous generator delivers 50% of rated power to an infinite bus. If its field excitation fails.

- A. generator does not able to deliver the active and reactive power to infinite bus
B. generator delivers reduced active and reactive power to the infinite bus

- C. generator absorbs the reactive power but delivers reduced active power to the infinite bus
D. generator absorbs both the active and reactive power

Ans. C

Sol. since if field excitation is fails in synchronous generator, than it will act as induction generator.

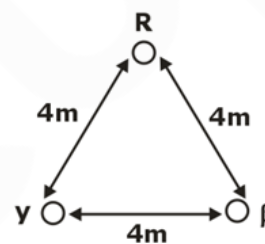
Induction generator absorbs the reactive power from bus but delivers the active power to the bus

34. A 3-φ, 11 kv, 100 km, 50 Hz transmission line has its conductor at the corners of an equilateral triangle with side 4m. The diameter of each conductor is 1.6 cm. Find the line charging current ?

- A. 1.69 A B. 2.8 A
C. 3.54 A D. 0.52 A

Ans. A

Sol.



$$GMD = (d_{RY} \times d_{YB} \times d_{BR})^{\frac{1}{3}}$$

$$(GMD) = (4 \times 4 \times 4)^{\frac{1}{3}} = 4m$$

$$C_{ph} = \frac{0.0556}{\ln \frac{(GMD)}{r}} \mu F / km$$

$$C_{ph} = \frac{0.0556}{\ln \left(\frac{4}{0.8 \times 10^{-2}} \right)}$$

$$C_{ph} = 8.947 \text{ nF/km}$$

For a 100 km line capacitance

$$C_{ph} = 100 \times 8.497 \text{ nF}$$

$$C_{ph} = 0.849 \mu F$$

The line charging current

$$I_c = \omega C_{ph} V_{ph}$$

$$I_c = 2\pi \times 50 \times 0.849 \times 10^{-6} \times \frac{11}{\sqrt{3}} \times 10^3$$

$$I_c = 1.69A$$

35. The method of heating used for non-conducting material is

- A. arc heating
B. dielectric heating
C. resistance heating
D. None of above

Ans. B

Sol. Dielectric heating is also known as electronic heating, is the process in which high frequency alternating electric field or radio wave heats and dielectric material.

For plastic heating, food drying. Dielectric heating are used.

36. Which motor is preferred for the operation of higher speed like greater than 3000 RPM.

- A. hysteresis motor
- B. Universal motor
- C. repulsion motor
- D. shaded pole motor

Ans. B

Sol. At higher speed, greater than 3000 RPM. Usually universal motor is preferred.

37. Why water drops come down spherical in shape?

- A. Due to Surface Tension
- B. Air Friction
- C. Continuous evaporation
- D. None of the above

Ans. A

Sol. •Spherical area has less water surface tension.

•The Surface tension pulls the surface of the drop equally at all points thus produces the spherical shape having the minimum surface area.

38. Who was the first person to measure the speed of light?

- A. Hippolyte Fizeau
- B. Albert A. Michelson
- C. James Bradley
- D. Ole Romer

Ans. D

Sol. **Ole Romer** was a Danish astronomer who in **1676** made the first quantitative measurements of the **speed of light**.

Romer also invented the **modern thermometer** showing the temperature between two fixed points, namely the points at which water respectively boils and freezes.

39. Which type of cable does not require bedding ?

- A. Paper insulated lead covered cables
- B. PVC cables
- C. both A and B
- D. None of these

Ans. B

Sol. Bedding is not required for the PVC cable. Bedding gives high mechanical protection to cable .

40. An equipment has a per unit impedance of 0.4 p.u. to a base of 4 MVA, 33 KV. What will be the per unit impedance to the base of 600 KVA, 11 kV will be _____ ?

- A. 0.54 p.u.
- B. 540 p.u.
- C. 0.62 p.u.
- D. 0.75 p.u.

Ans. A

Sol.

$$(Z_{pu})_{new} = (Z_{pu})_{old} \times \frac{(new\ KVA)_{base}}{(old\ KVA)_{base}} \times \frac{(old\ KV_b)^2}{(new\ KV_b)^2}$$

$$(Z_{pu})_{new} = (0.4) \times \left[\frac{600 \times 10^3}{4 \times 10^6} \right] \times \left[\frac{33 \times 10^3}{11 \times 10^3} \right]^2$$

$$(Z_{pu})_{new} = (0.4) \times \left[\frac{0.6}{4} \right] \times \left[\frac{33}{11} \right]^2$$

$$(Z_{pu})_{new} = 0.54\ p.u.$$

41. In a overhead transmission line the top conductor is generally.

- A. Ground wire and used to protect the line conductor from direct lightning strokes.
- B. pilot wire and used to protect the line conductor from high voltage oscillation due to switching
- C. ground wire and used to protect the line conductor from high voltage oscillation due to switching
- D. None of the above

Ans. A

Sol. In a overhead transmission line the top conductor is generally a ground wire and used to protect the line conductors from direct lightning strokes.

42. Which of the following is not an advantage of rainwater harvesting?

- A. Environment friendly
- B. Increase ground water level
- C. Mitigate drought effects
- D. Contamination

Ans. D

Sol. Rainwater harvesting is a method of collecting rainwater immediately from the surfaces it has fallen directly before it is lost as surface run off. It can help to overcome the inadequacy of surface water, improve groundwater levels and quality, reduces flood hazards and mitigates effects of drought. However, there can be a possibility of contamination without proper cleaning or from poorly constructed containers.

43. In the Sumpner's test, secondary of both transformer are connected in _____ and secondary side wattmeter reading gives _____ ?

- A. parallel, full load copper loss of both transformer
B. series, No-load iron loss of both transformer
C. parallel, No-load iron loss of both transformer
D. series, full load copper loss of both transformer
- Ans. D
- Sol. In the sumpner's test :
Both the transformer's primary are connected in parallel and wattmeter connected in primary side gives the reading of iron loss of both the transformer and both the transformer's secondary are connected in series and wattmeter connected in secondary side gives reading of full load copper loss of both transformer.
44. The cheapest plant in operation and maintenance is
A. thermal power plant
B. Nuclear power plant
C. Hydroelectric power plant
D. Diesel power plant
- Ans. C
- Sol. From the point of view of operation and maintenance the cheapest plant is Hydro-electric power plant. Also the initial cost of this plant is highest.
45. Where is the head office of Central Pollution Control Board located?
A. Noida
B. New Delhi
C. Gandhi Nagar
D. Bangalore
- Ans. B
- Sol. • The Central Pollution Control Board (CPCB) has its head office in New Delhi.
• It was established in 1974 under the Water (Prevention and Control of Pollution) Act, 1974.
• It is the apex organisation in India in the field of pollution control. The board is led by its Chairperson.
46. What is the purpose of providing a Draft folder in an email system?
A. to save unsent emails
B. to store spam emails
C. to save a copy of sent emails
D. to store deleted emails
- Ans. A
- Sol. A **draft** is simply an **email message** you haven't **yet sent**. It's not the same thing as an email waiting to be sent. This act places the message into the **Drafts folder**.

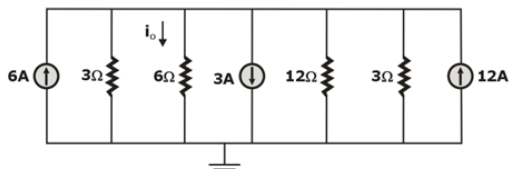
47. Who wrote "Mind without fear" ?
A. Ira Trivedi
B. Twinkle Khanna
C. Khuswant Singh
D. Rajat Gupta
- Ans. D
- Sol. • **Rajat Kumar Gupta** is an Indian-American businessman who was the first foreign-born managing director (chief executive) of management consultancy firm McKinsey & Company from 1994 to 2003.
• Gupta's memoir, Mind Without Fear, was published by Juggernaut Books and released in March 2019.
48. What should be the minimum clearance for laying power cabled near communication lines ?
A. 1.2 m horizontally and vertically
B. 1.5 m horizontally and vertically
C. 0.6 m Horizontally and Vertically
D. 0.2 m Horizontally and Vertically
- Ans. C
- Sol. The minimum clearance between power cable and communication line should be 0.6 m horizontally and vertically.
49. What kind of server converts IP addresses to domain names?
A. DNS
B. MNS
C. UTP
D. RTP
- Ans. A
- Sol. The **Domain Name System** (DNS) is a hierarchical distributed **naming system** for computers, services, or any resource connected to the Internet or a private network.
50. Which gas is responsible for "Global Warming"?
A. Nitrogen (N₂)
B. ethane
C. Carbon dioxide (CO₂)
D. Sulphur dioxide (SO₂)
- Ans. C
- Sol. Global warming is caused by the emission of greenhouse gasses. 72% of the totally emitted greenhouse gases are Carbon dioxide (CO₂).18% methane and 9% nitrous oxide (NO₂). Carbon dioxide emissions, therefore, are the most important cause of global warming.
51. In a double squirrel cage induction motor the outer cage winding has _____

- A. low resistance and low reactance
- B. high resistance and high reactance
- C. low resistance and high reactance
- D. high resistance and low reactance

Ans. D

Sol. In a double squirrel cage induction motor the outer cage offer high resistance and low reactance as compare to inner cage winding. Due to high resistance of outer cage is provides high starting torque.

52.



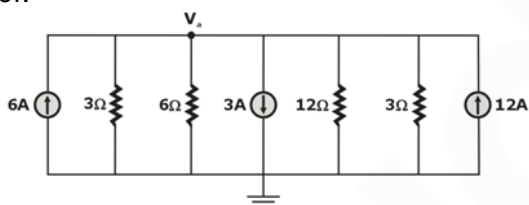
Find the current i_o in the circuit _____ ?

Where [i_o = current in the 6Ω resistance].

- A. 3.23
- B. 4.21
- C. 2.72A
- D. 1.57

Ans. C

Sol.



Apply nodal analysis

$$\frac{V_a - 0}{3} + \frac{V_a - 0}{6} + \frac{V_a - 0}{12} + \frac{V_a - 0}{3} - 6 + 3 - 12 = 0$$

$$V_a \left[\frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \frac{1}{3} \right] = 15$$

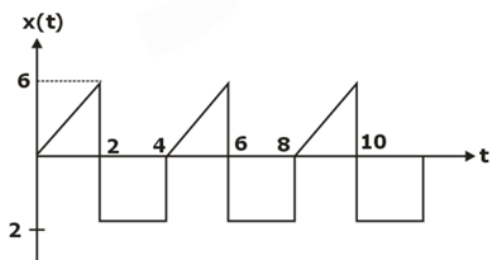
$$V_a \left[\frac{4 + 2 + 1 + 4}{12} \right] = 15$$

$$V_a = \frac{15 \times 12}{11}$$

$$V_a = 16.36 \text{ volt}$$

$$i_o = \frac{V_a}{6} = \frac{16.36}{6} = 2.72A$$

53.

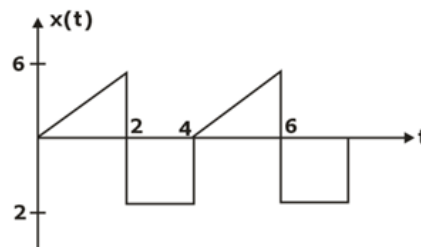


Find the Rms value of the above waveform?

- A. 2
- B. $2\sqrt{2}$
- C. 4
- D. 3.5

Ans. B

Sol.



$$\text{Rms value} = \sqrt{\frac{\text{Area under the square of curve}}{\text{timeperiod}}}$$

Area under the square of triangle =

$$\frac{1}{3} \times \text{base} \times (\text{height})^2$$

$$= \frac{1}{3} \times 2 \times (6)^2 = 24$$

Area of square of rectangle = base × (height)²

$$= 2 \times (2)^2 = 8$$

Total Area under the square of curve = 24 + 8 = 32

Time period = 4

$$\text{Rms value} = \sqrt{\frac{32}{4}} = \sqrt{8} = 2\sqrt{2}$$

54. The gases present in the atmosphere that cause greenhouse effect are__

- A. Carbon dioxide, oxygen, nitrogen
- B. Carbon dioxide, sulphur dioxide, methane
- C. Nitrous oxide, oxygen, water vapours
- D. Methane, water vapours, carbon dioxide

Ans. D

Sol. The gases present in the atmosphere that cause the greenhouse effect are methane, water vapors, carbon dioxide. Greenhouse gasses are those gases which absorb and emits radiant energy within the thermal infrared range.

55. Inverse square law is the law of

- A. current
- B. power
- C. Illumination
- D. Magnetism

Ans. C

Sol. Inverse square law of Illumination : This law state that Illumination (E) at any point on a plane perpendicular to the line joining the point and source is inversely proportional to square of the distance between source and plane.

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

56. The major heat loss in a steam power plant occurs in
 A. Condenser
 B. Boiler
 C. Superheater
 D. Electro-static participator

Ans. A

Sol. More than 50% of total heat of combustion is lost in the condenser. Due to this heat loss the efficiency of thermal power station is low (about 30%)

57. Ideal scheme of protection for over head transmission line is
 A. pilot wire protection
 B. differential protection
 C. distance protection
 D. time-graded over current protection

Ans. C

Sol. Both the time graded and pilot wire system are not suitable for the protection of very long high transmission line. They are too expensive.

The differential protection is used for the protection of stator winding fault of alternator. The distance protection is used for the protection of transmission line

58. A Buchholz relay is
 A. used in oil immersed transformer
 B. connected between main tank and convertor tank
 C. A gas actuated relay
 D. All of the above

Ans. D

Sol. A Buchholz relay is gas actuated relay used in oil immersed transformer against all incipient faults.

It is connected between main tank and conservator tank.

59. According to which article of the Constitution, the executive power of the Union will be vested in the President ?
 A. Article 51 B. Article 56
 C. Article 53 D. Article 50

Ans. C

Sol. **Article 53** of the Constitution says that the executive power of the Union shall be vested in the President and shall use it according to this constitution either by himself or by his subordinate officer.

• **Article 52** of the Constitution stipulates a President for India .

60. Verification of a login name and password is known as_____.

- A. configuration
 B. accessibility
 C. authentication
 D. logging in
 E. None of these

Ans. C

Sol. **Authentication** is a process in which the **credentials** provided are compared to those on file in a **database** of authorized users' information on a local **operating system** or within an **authentication server**.

61. Filament of electric bulbs are generally made of
 A. tungsten B. copper
 C. Aluminum D. Nichrome

Ans. A

Sol. Tungsten is used to make the filament of electric bulb due to very high melting point.

62. Find the energy stored at t = 2 sec. if a voltage

$$v(t) = \begin{cases} 20t^2 & t > 0 \\ 0 & t < 0 \end{cases}$$

$$i(t) = 0 \quad t < 0$$

is applied across the inductor having inductance of 5 H ?

- A. 250.72 J B. 360 J
 C. 150.44 J D. 284.44J

Ans. D

Sol. For inductor

$$V = L \frac{di}{dt}$$

$$i(t) = \frac{1}{L} \int_0^t v dt$$

$$i(t) = \frac{1}{L} \int_0^t v(t) dt$$

$$i(t) = \frac{1}{L} \int_0^t 20t^2 dt$$

$$i(t) = \frac{20}{L} \left[\frac{t^3}{3} \right]$$

$$i(t) = \frac{20}{5} \left[\frac{t^3}{3} \right]$$

$$i(t) = \frac{4}{3} t^3$$

At $t = 2$ sec

$$i(2) = \frac{4}{3} \times (2)^3 = \frac{32}{3} \text{ A}$$

Since energy stored in the inductor

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

$$E = \frac{1}{2} \times 5 \times \left(\frac{32}{3}\right)^2$$

$$E = 284.44 \text{ J}$$

63. Unit of the reluctance is _____?

- A. ohms
- B. A/m
- C. H^{-1} [henry] $^{-1}$
- D. weber per ampere-turns

Ans. C

Sol. Reluctance $R_L = \frac{\text{mmf}}{\text{flux}}$

$R_L =$ ampere-turn per weber
ohm is unit of resistance.

Unit of magnetic field strength $H =$
A/m

Unit of reluctance is ampere turn per weber or H^{-1} [henry] $^{-1}$

64. Baron Johns Jacob Berzelius discovered which of following?

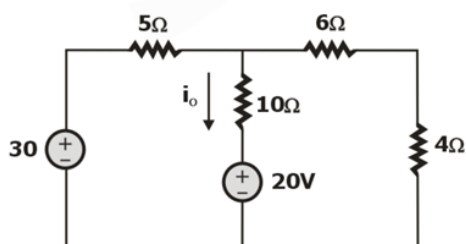
- A. Catalysis
- B. Ions
- C. Valency
- D. Oxidation

Ans. A

Sol.

- **Catalysis** was discovered by **Baron Jöns Jacob Berzelius**.
- Berzelius himself discovered and isolated several new elements, including **cerium (1803)** and **thorium (1828)**.
- He developed classical analytical techniques, and investigated isomerism and catalysis, phenomena that owe their names to him.
- Catalysis is a term which used for the **reactions/ processes** which occur in the presence of certain substances that increase the rate of the reaction without being consumed.

65.

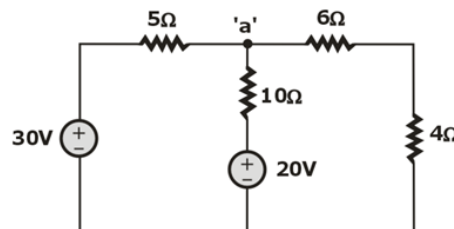


Find the current I_0 ?

- A. 2A
- B. 1A
- C. 3A
- D. 0A

Ans. D

Sol.



Apply KCL at node 'a'

$$\frac{V_a - 30}{5} + \frac{V_a - 20}{10} + \frac{V_a}{6 + 4} = 0$$

$$\frac{V_a}{5} + \frac{V_a}{10} + \frac{V_a}{10} = \frac{30}{5} + \frac{20}{10}$$

$$V_a \left(\frac{2 + 1 + 1}{10} \right) = 6 + 2$$

$$V_a = 20\text{V}$$

$$I_0 = \frac{V_a - 20}{10}$$

$$I_0 = \frac{20 - 20}{10} = 0\text{A}$$

$$I_0 = 0\text{A}$$

66. What is the other name used for Terylene polyester fibre?

- A. Dacron
- B. Teflon
- C. Nylon
- D. Rayon

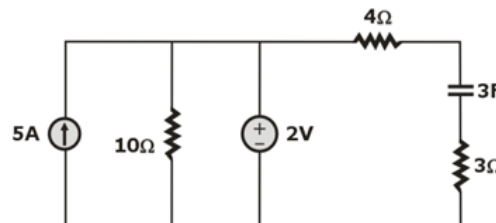
Ans. A

Sol. * **Dacron** or **Terylene** is the best known example of polyesters.

* The fibre was first created in 1941 by chemist J R Whinfield.

* Dacron fibre is elastic in nature and crease resistant and is used in blending with cotton and wool fibre and also as glass reinforcing materials in safety helmets.

67.



Find the time constant of the above circuit ?

- A. 21 sec
- B. 24 sec
- C. 51 sec
- D. 54 sec

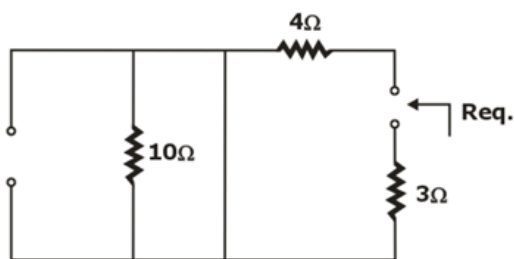
Ans. A

Sol. For finding the time constant

$$\tau = RC$$

$R =$ equivalent resistance across capacitor terminals

For $R =$ replace the voltage source to short circuit and current source to open circuit



$$R = 4\Omega + 3\Omega = 7\Omega$$

$$R = 7\Omega$$

[Due to short circuit of voltage source, effect of 10Ω Resistance in the circuit is neglected]

$$\tau = RC$$

$$\tau = 7 \times 3 = 21 \text{ sec}$$

68. India Africa Field Training Exercise (IAFTX)- 2019 was conducted in which state of India?
- West Bengal
 - Goa
 - Maharashtra
 - Kerala

Ans. C

Sol.

- **Indian Africa Field Training Exercise (IAFTX)** was held at **Aundh Military Station and College of Military Engineering, Pune, Maharashtra.**
- It was held from 18th March to 27th March 2019.
- The exercise was conducted with an aim to synergise United Nations peacekeeping operations.

69. Which of the following is also known as hydrated lime?
- Sodium Hydroxide
 - Calcium carbonate
 - Calcium oxide
 - Calcium hydroxide

Ans. D

- Sol. • Hydrated Lime, also known as **calcium hydroxide.**
- It is traditionally called slaked lime.
 - It is an inorganic compound.
 - Its molecular formula is Ca(OH)_2 .

70. Plug-setting multiplier is
- it is the ratio of pick up current to fault current in the relay coil
 - It is the ratio fault current in relay coil to product of rated secondary current and current setting
 - It is the ratio of current setting to product of fault current and rated secondary current of C.T
 - It is the ratio of rated secondary current of C.T. to fault current in the relay coil

Ans. B

Sol.

PSM (Plug Setting Multiplier)

$$= \frac{\text{Fault current in relay coil}}{\text{Pick up current}}$$

Pick up current = rated secondary current of CT × current setting

$$\text{PSM} = \frac{\text{fault current in relay coil}}{\text{rated secondary current} \times \text{current setting}}$$

71. The inductance of single phase two wire power transmission line per kilometer get double when the
- radius of wire is doubled
 - distance between the wire is half
 - distance between the wire is increased to 4 times
 - distance between the wire is increased to square of original distance

Ans. D

Sol. Inductance of 1-φ two wire power transmission line is

$$L = 0.2 \ln\left(\frac{d}{r'}\right) \text{ mH / km}$$

When the distance is square of original distance

$$L \propto \ln d$$

$$L_2 \propto \ln d^2$$

$$L_2 \propto 2 \ln d$$

$$L_2 \propto 2L$$

72. A 20 KVA step-down auto - transformer has voltage ratio of 0.8. The power transfer inductively is

- 4KVA
- 16 KVA
- 10 KVA
- 8 KVA

Ans. A

Sol. In a step-down auto-transformer power transfer inductively = $(1 - a) \times \text{input power}$

$$a = 0.8$$

$$= (1 - 0.8) \times 20 = 0.2 \times 20 = 4 \text{ KVA}$$

73. The inductance of a certain moving iron ammeter is expressed as

$$L = \left(2 + 2\theta - \frac{\theta^2}{4}\right) \mu\text{H} \text{ where } \theta \text{ is the}$$

deflection in radians from the zero position. The control spring torque is $30 \times 10^{-6} \text{ N-m}$.

The deflection of pointer in radian when the meter carrier a current of 6A is.

- 0.68 rad.
- 0.2 rad.
- 1.2 rad.
- 0.38 rad.

Ans. A

Sol. In the moving iron ammeter.

$$T = \frac{1}{2} I^2 \frac{dL}{d\theta}$$

$$L = \left(2 + 2\theta - \frac{\theta^2}{4} \right) \mu\text{H}$$

$$\frac{dL}{d\theta} = \left(2 - \left(\frac{\theta}{2} \right) \right) \mu\text{H/rad.}$$

$$T = 30 \times 10^{-6} = \frac{1}{2} \times 61^2 \times \left[2 - \frac{\theta}{2} \right] \times 10^{-6}$$

$$1.66 = 2 - \frac{\theta}{2}$$

$$\frac{\theta}{2} = 0.34$$

$$\theta = 0.68 \text{ rad.}$$

74. Artificial Intelligence is associated with which generation?

- A. First
- B. Fifth
- C. Third
- D. Any of the above

Ans. B

Sol. This **fifth generation** is based on parallel processing hardware and **Artificial Intelligence** software. **Note:-** AI is an emerging branch in computer science, which interprets means and method of making computers think like human beings.

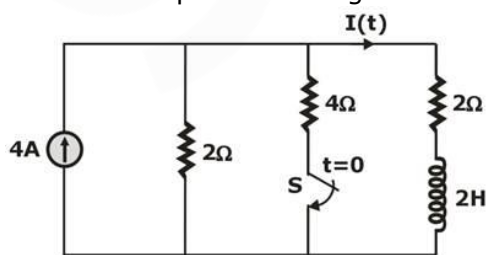
75. Copyrighted software that can be used for free is _____.

- A. Commercial software
- B. freeware
- C. groupware
- D. e-mail

Ans. B

Sol. Freeware is copyrighted computer software which is made available for use free of charge, for an unlimited time.

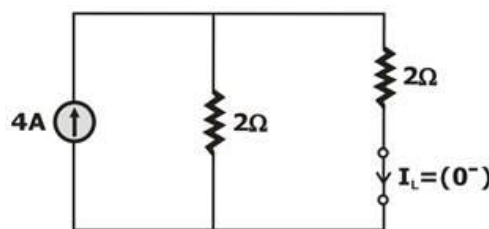
76. Find the current for $t > 0$. When at $t = 0$ switch is closed? Before $t = 0$ switch is open for a long time?



- A. $1.6 (1 - e^{-1.66t})$
- B. $0.4 (1 - e^{-2t})$
- C. $1.6 + 0.4e^{-1.66t}$
- D. $0.4 + 1.6e^{-2t}$

Ans. C

Sol. Before $t = 0$ circuit is - Since at the steady state inductor behaves as short circuit.

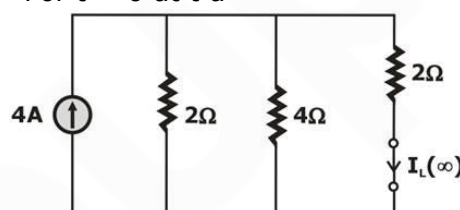


$$I_L(0^-) = \left[\frac{2}{2+2} \right] \times 4$$

[according to current division principal]

$$I_L(0^-) = 2\text{A}$$

For $t > 0$ at $t \rightarrow \infty$

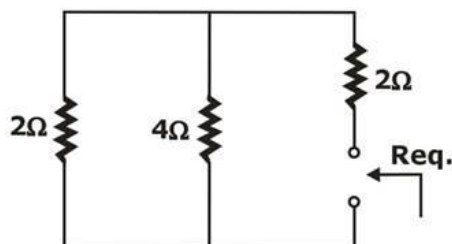


$$I_L(\infty) = \left(\frac{\frac{1}{2}}{\frac{1}{2} + \frac{1}{4} + \frac{1}{2}} \right) \times 4$$

[according to current division principal]

$$I_L(\infty) = \left(\frac{2}{2+1+2} \right) \times 4$$

$$I_L(\infty) = \frac{8}{5} \text{A} = 1.6\text{A}$$



$$R_{eq} = 2 + (4 || 2)$$

$$R_{eq} = 2 + 1.33$$

$$R_{eq} = 3.33 \Omega$$

$$\tau = \frac{L}{R_{eq}} = \frac{2}{3.33} = 0.60$$

$$I(t) = I_L(\infty) + [I_L(0^-) - I_L(\infty)] e^{-t/\tau}$$

$$I(t) = 1.6 + (2 - 1.6) e^{-\frac{t}{0.6}}$$

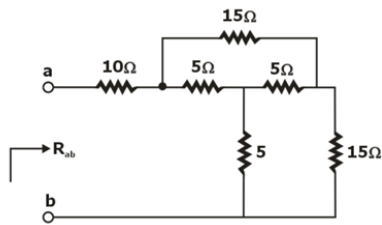
$$I(t) = 1.6 + 0.4 e^{-1.66t}$$

77. Which of the following is not a greenhouse gas?
 A. Water vapour
 B. O₂
 C. O₃
 D. CO₂

Ans. B

Sol. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Hence from the given options O₂ is the only gas which is not a green house gas.

78.

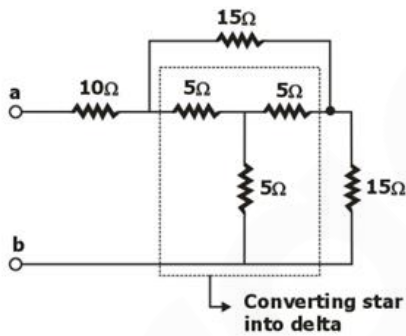


Find the R_{ab} _____ ?

- A. 17.5 Ω B. 20 Ω
 C. 15 Ω D. 12 Ω

Ans. A

Sol.

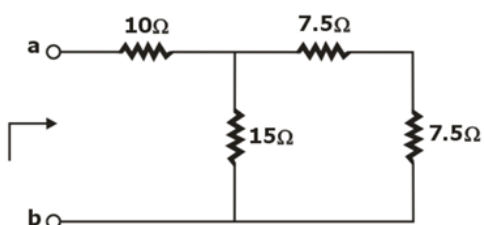
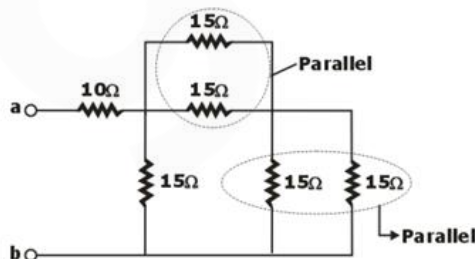


If the resistance having the same value.

$$R_Y = \frac{R_\Delta}{3}$$

$$R_\Delta = 3R_Y$$

$$R_\Delta = 3 \times 5 = 15 \Omega$$



$$R_{ab} = 10 + 15 \parallel (7.5 + 7.5)$$

$$R_{ab} = 10 + 15 \parallel 15$$

$$R_{ab} = 17.5 \Omega$$

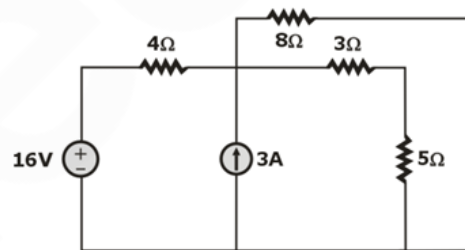
79. If an induction type energy meter runs fast, it can be slowed down by.
 A. Adjusting the position of break magnet and moving it closer from the centre of disc.
 B. drilling two diametrically opposite holes in the rotating disk.
 C. Adjusting the position of breaking magnet and moving it away from the centre of disc.
 D. None of the above

Ans. C

Sol. In the induction type energy meter, the breaking torque increases when magnet is moved outward radially, and it reduces when magnet is moved inward radially.

So, to slow down the meter, breaking torque must be increases.

80.

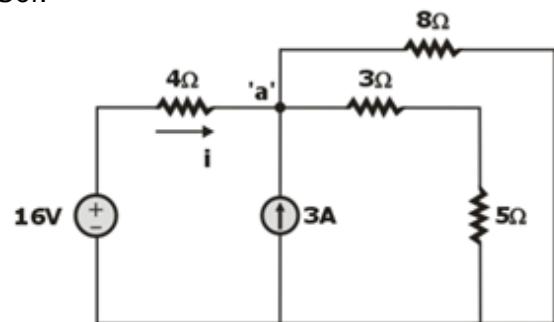


Find the power dissipated in the circuit ?

- A. 40W B. 50W
 C. 35W D. 60W

Ans. B

Sol.



Apply KCL at node a

$$\frac{V_a - 16}{4} + \frac{V_a - 0}{5 + 3} + \frac{V_a - 0}{8} - 3 = 0$$

$$V_a \left[\frac{1}{4} + \frac{1}{8} + \frac{1}{8} \right] = 3 + 4$$

$$V_a \left[\frac{2 + 1 + 1}{8} \right] = 7$$

$$V_a = 14V$$

According to tellgon theorem.

$$P_{dissipated} \text{ Or } P_{absorbed} = P_{supplied}$$

Power supplied by source = power supplied by voltage source + power supplied by current source

$$i = \frac{16 - V_a}{4} = \frac{16 - 14}{4} = 0.5A$$

Power supplied by voltage source

$$P = V \times I = 16 \times 0.5 = 8W$$

Power supplied by current source

$$P = V \times I = 14 \times 3 = 42 W$$

Total power supplied in the circuit = 42 + 8 = 50W

So total power absorbed or dissipated = 50 W

81. Holes in n-type semiconductor are
- majority carrier that are produced by doping
 - Minority carrier that are produced by thermal energy
 - Majority carrier that are produced by thermal energy
 - Minority carrier produced by doping

Ans. B

Sol. Holes are in the n-type semiconductor are the minority carrier. Since minority carrier are not produced by the doping they are produced by the thermal energy. Majority carrier are produced by the doping.

82. At the resonance series L-C circuit and parallel L-C circuit behaves as respectively.

- open circuit, Short circuit
- short circuit, Open circuit
- short circuit, short circuit
- open circuit, open circuit

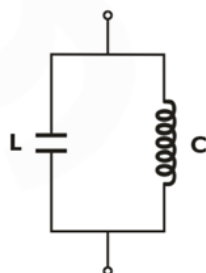
Ans. B

Sol. Series L-C circuit

At resonance $X_L = X_C$

$$Z = j X_L - jX_L = 0 \Omega$$

i.e. series L-C circuit behaves as short circuit at resonance.



at resonance

$$X_L = X_C$$

Admittance of the circuit $y = \frac{1}{X_C} - \frac{1}{X_L}$ at

resonance $X_L = X_C$

$$y = \frac{1}{X_C} - \frac{1}{X_C} = 0$$

Admittance $y = 0$ i.e. impedance

$$Z = \frac{1}{y} = \infty$$

So, the parallel L-C circuit behaves as open circuit at resonance.

83. The direction of rotation of field in a 3- ϕ induction motor depends upon
- rotor resistance
 - magnitude of supply voltage
 - phase sequence of supply voltage
 - supply frequency

Ans. C

Sol. In a 3- ϕ induction motor the direction of rotation of field is depends upon the phase sequence of supply voltage.

By changing the phase sequence of supply voltage, we can reverse the direction of rotation of field in induction motor.

84. Which session of the Indian National Congress approved Gandhi Irwin Pact?

- Lahore Session
- Calcutta Session
- Kanpur Session
- Karachi Session

Ans. D

Sol.

- The Gandhi Irwin Pact was endorsed by the Congress in the Karachi Session of 1931, that was held from March 26-31. Gandhi was nominated to represent Congress in the Second Round Table Conference. Just a week back, Bhagat Singh, Sukhdev and Rajguru had been executed. So, there was anger in the public whose point was that why Gandhi did accept to sign the pact.

85. In the CRO the deflecting factor.

- directly proportional to the distance of screen from deflecting plate
- inversely proportional to the distance between the deflecting plates
- directly proportional to potential of accelerating anode
- directly proportional to the potential difference between deflection plates.

Ans. C

Sol. In the CRO the deflection factor

$$= \frac{1}{\text{Deflection sensitivity}}$$

$$\text{Deflection factor} = \frac{2V_a \times d}{L \times I_d}$$

Where V_a = potential of accelerating anode.

d = distance between deflecting plates

L = distance of screen from deflection plates

86. JFET is a
- current controlled current device
 - Current controlled voltage device
 - voltage controlled current device
 - Voltage controlled voltage device

Ans. C

Sol. Since JFET is a voltage control current device.

Output current in a JFET is

$$I_D = I_{DSS} \left(1 - \frac{V_{GS}}{V_p} \right)^2$$

Since in above equation output current is controlled by the input voltage V_{GS} . So it is a voltage controlled current device. While BJT is a current controlled current device.

87. The working of a rocket is based on the principle of
- Conservation of momentum
 - Conservation of mass
 - Conservation of energy
 - Conservation of angular momentum

Ans. A

Sol.

- Rocket engines are reaction engines, obtaining thrust in accordance with **Newton's second law (Conservation of momentum)**.
- Rocket thrust results from the high speed ejection of material and does not require any "push against". Conservation of momentum dictates that if material is ejected backward, the forward momentum of the remaining rocket must increase since an isolated system cannot change its net momentum. The hot gases acquire momentum in the backward direction & the rocket acquires an equal amount of momentum in the forward direction.
- Hence option A is the right answer.

88. Who among the following has invented Java?
- James Gosling
 - Dannis Retchie
 - Bill Gates
 - Steve Jobs

Ans. A

Sol. **James Arthur Gosling** is a Canadian computer scientist best known as the father of the **Java programming** language.

89. Which is the most severe fault on an alternator ?
- failure of prime mover
 - loss of excitation
 - stator winding fault
 - unbalanced loading

Ans. C

Sol. The stator winding faults are the most sever fault on an alternator. The main types of stator winding faults is

- faults between phase and ground
- faults between phases
- inter-turn fault

90. Normally the human body resistance in totally wet condition is
- 1 Ω
 - 0.1 Ω
 - 1 k Ω
 - 100 k Ω

Ans. C

Sol. In the totally wet condition the human body resistance are around 1 k Ω and in dry condition it is about 100 k Ω

91. Which of the following factors adversely affect the characteristics of the surface water?
- Vegetation
 - Soil type
 - Degree of weathering
 - All of the above

Ans. D

Sol. Factors that adversely affect the characteristics of surface water is the extent of surface pollution that in turn depends on the hydrological characteristics, vegetation, soil type, and degree of weathering of rocks. Various physical, chemical and biological characteristics of waste emitted in the surface water are also critical factors. Techniques for the treatment of domestic wastewater and disposal systems also play a crucial role in determining the characteristics of surface water.

92. Noise can be recorded in –
- Ammeter
 - Hygrometer
 - Barometer
 - Decibel meter

Ans. D

Sol. Noise is 'unpleasant and unwanted sound'. It can be recorded in Decibel meter. Different Decibel (dB) units for various activities.

93. During the boot process, the _____ looks for the system files.
- CD
 - BIOS
 - CPU
 - DVD

Ans. B

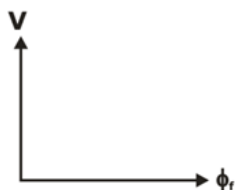
Sol. BIOS (basic input/output system) is the program a personal computer's microprocessor uses to get the computer system started after you turn it on. It also manages data flow between the computer's operating system and attached devices such as the hard disk, video adapter, keyboard, mouse and printer.

94. A synchronous motor is operating at a zero power factor lagging. The armature reaction in the synchronous motor is _____ ?

- A. purely demagnetizing
- B. partly cross magnetizing and partly demagnetizing
- C. purely cross magnetizing
- D. purely magnetizing

Ans. D

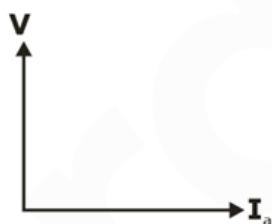
Sol. In case of synchronous motor



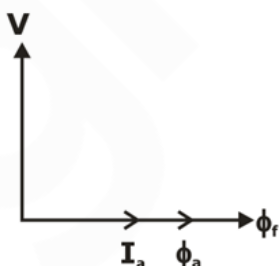
Where V = terminal voltage

ϕ_f = main field flux

For a zero power factor lagging, the armature current is lagging 90° by voltage.



So,



So armature flux is in the direction of main field flux, so armature reaction is purely magnetizing for this case.

95. A moving coil instrument gives full scale deflection with 10mA. The resistance of the meter is 10Ω . The value of resistance _____ should be connected in _____ with the meter to read 0.5 A?

- A. 490Ω , series
- B. 0.2Ω , parallel
- C. 490Ω parallel
- D. 0.2Ω , series

Ans. B

Sol. To extend the range of ammeter, we should connect the shunt resistance in parallel with meter
 m = multiplying factor

$$m = \frac{I}{I_m}$$

$$m = \frac{0.5}{10 \times 10^{-3}}$$

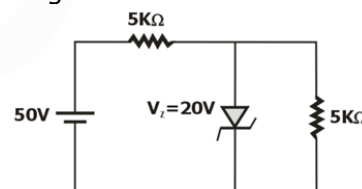
$$m = 50$$

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

$$R_{sh} = \frac{10}{(50-1)}$$

$$R_{sh} = \frac{10}{49} = 0.20\Omega$$

96. In the given circuit, the Zener diode is ideal. What is the current following through the Zener diode ?



- A. 2 mA
- B. 0 mA
- C. 10 mA
- D. 5 mA

Ans. C

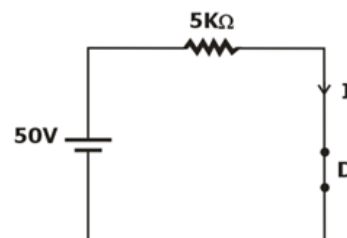
Sol. Since in the above circuit diode is in forward bias condition.

Zener diode works the voltage regulator only in the reverse bias condition.

In the forward bias condition Zener diode behaves as normal p-n junction diode.

Since it has also given that the Zener diode is ideal. So in ideal diode in forward bias condition it offers zero resistance.

So the circuit is



Current through diode

$$I = \frac{50}{5k} = 10\text{ mA}$$

97. In Swinburne's method of testing DC machines the shunt machine is runs as a
- A. motor at full load, rated speed and half of the rated voltage
 - B. generator at full load, half the rated speed and rated voltage
 - C. motor at no-load at rated speed and rated voltage
 - D. generator at no-load at rated speed and rated terminal voltage

Ans. C

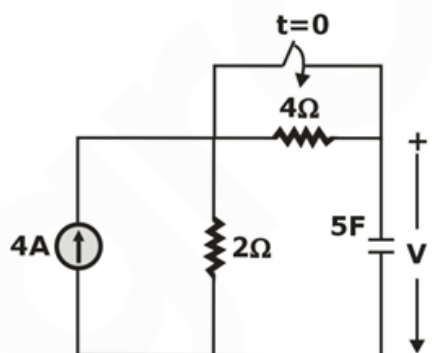
Sol. Swinburne's test : As this is a no-load test. It cannot performed on DC series motor. In this method the machine whether it is a motor or a generator is runs as no-load shunt motor at rated speed and rated terminal.

98. Direction of the rotation of the shaded pole motor is
- A. always shaded pole to unshaded pole
 - B. depends upon the supply frequency
 - C. always unshaded pole to shaded pole
 - D. None of the above

Ans. C

Sol. The direction of rotation of shaded pole motor is always unshaded pole to shaded pole.

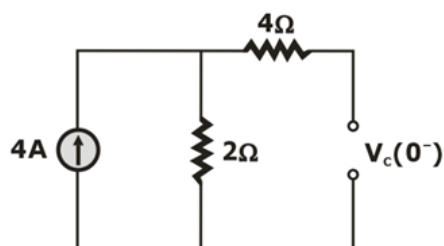
99. At $t = 0$, switch is closed, find the voltage across the capacitor is $t = 2$ sec ?



- A. 8V
- B. 10V
- C. 11.2V
- D. 5.38 V

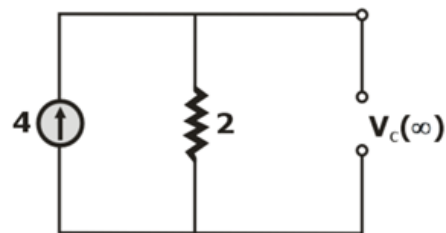
Ans. A

Sol. Before $t = 0$ circuit is



$V_c(0) = 4 \times 2 = 8$ volt

After switch is closed at $t = 0$ at $t \rightarrow \infty$



Req. = 2Ω

$V_{C(\infty)} = 8$ volt

$V_C(t) = V_{C(\infty)} + [V_{C(0^-)} - V_{C(\infty)}] e^{-t/\tau}$

$V_C(t) = 8 + [8 - 8] e^{-t/\tau}$

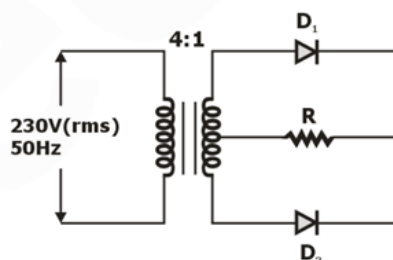
$V_C(t) = 8$ Volt

So, for $t > 0$, voltage across the capacitor is 8V and remain same for all time.

So, for $V_C(2) = 8$ volt

$V_C(2) = 8$ V

100.



In the rectifier circuit shown above, what is the peak inverse voltage across the diode ?

- A. 162.63 V
- B. 650.53 V
- C. 115 V
- D. 460 V

Ans. A

Sol. Since the above circuit is mid-point full wave rectifier.

In the mid-point rectifier the peak inverse voltage across the diode

$(PIV) = 2V_m$

Where V_m = maximum voltage in secondary of the transformer

In the transformer

$\frac{N_1}{N_2} = \frac{V_1}{V_2}$

$V_2 = \left(\frac{N_2}{N_1}\right) V_1$

$V_2 = \left(\frac{1}{4}\right) \times 230$

$V_{2(rms)} = \frac{230}{4} = 57.5$ volt

$V_{2(peak)} = \sqrt{2} \times 57.5 = 81.31$ volt

So PIV across the diode = $2 \times 81.31 = 162.63$ V

101. The Gulf of Aden connects Arabian Sea to which Sea?
 A. Red Sea
 B. South China Sea
 C. Caspian Sea
 D. Andaman

Ans. A

Sol. • The **Gulf of Aden** connects the **Arabian Sea to the Red Sea.**

• The Gulf of Aden connects the Arabian Sea and the Red Sea through the strait of **Bab-el-Mandeb.**

• The Gulf of Aden connects with the **Indian Ocean** through the **Guardafui Channel.**

• The Arabian Sea is a region of the northern Indian Ocean bounded on the north by **Pakistan and Iran.**

102. Which section in the IE act deals with the "theft of energy" ?
 A. section 59
 B. section 39
 C. section 45
 D. None of these

Ans. B

Sol. I.E. (Indian Electricity) Act :
 Section 39 : Theft of energy : whoever dishonestly abstracts, consumes energy shall be punishable.

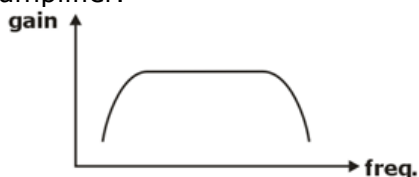
103. Which of the following coupling can be used for the amplification of DC and very low frequency ?
 A. Transformer coupling
 B. Direct coupling
 C. R-C coupling
 D. None of these

Ans. B

Sol. Since for a direct coupling gain frequency curve is



So for DC i.e., $f = 0$ and very low frequency
 Only direct-coupling can be used.
 R-C coupling is used for the audio amplifier.



104. What is the capital of Cyprus?
 A. Asgabat B. Phnom Penh
 C. Ankara D. Nicosia

Ans. D

Sol. * Capital of Cyprus is **Nicosia.**
 * Cyprus is an island in the Eastern Basin of the Mediterranean Sea.
 * It is the third largest island in the Mediterranean and world's 80th largest island by area.

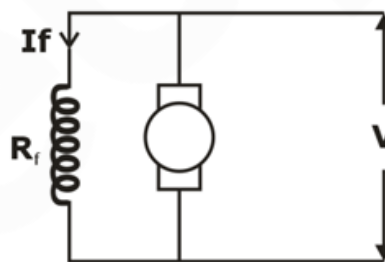
105. A DC shunt motor having unsaturated magnetic circuit runs at 1200 rpm with rated voltage. If the applied voltage is reduced to half of rated voltage, the motor will run at
 A. 1500 rpm B. 600 rpm
 C. 1200 rpm D. 2400 rpm

Ans. C

Sol. Since speed of a D.C. motor is

$$N = \frac{V - I_a R_a}{k\phi}$$

$$N \propto \frac{V}{k\phi}$$



$$\phi \propto I_f \quad \phi = I_{f1} = \frac{V}{R_f}$$

When we apply the half of rated voltage

$$I_{f2} = \frac{V}{2} = \frac{V}{2R_f}$$

$$\frac{I_{f1}}{I_{f2}} = 2 \quad \text{i.e.,} \quad \frac{\phi_2}{\phi_1} = \frac{1}{2}$$

$$\frac{N_1}{N_2} = \frac{V_1}{V_2} \times \frac{\phi_2}{\phi_1} \quad V_2 = \frac{V_1}{2}$$

$$\frac{N_1}{N_2} = \frac{V_1}{\frac{V_1}{2}} \times \frac{1}{2} = \frac{2}{2} = 1 \quad \text{i.e.,} \quad \frac{N_1}{N_2} = 1$$

$$N_1 = N_2$$

So speed will remain same at 1200 RPM.

106. A plant have the load factor of 0.7 and plant capacity factor 0.5. The maximum demand on the plant is 500 Mw. Find the reverse capacity of the plant ?
 A. 100 MW B. 200 MW
 C. 300 MW D. 400 MW

Ans. B

Sol.

$$\text{Plant load factor} = \frac{\text{avg. load}}{\text{maximum demand}}$$

$$\text{Plant capacity factor} = \frac{\text{avg. load}}{\text{plant capacity}}$$

$$\text{Plant capacity} = \frac{\text{Maximum demand} \times \text{load factor}}{\text{capacity factor}}$$

$$\text{Plant capacity} = \frac{500 \times 0.7}{0.5} = 700 \text{ Mw}$$

$$\begin{aligned} \text{Reserve capacity} &= \text{plant capacity} - \\ &\text{maximum demand} \\ &= 700 - 500 = 200 \text{ MW} \end{aligned}$$

107. A 3- ϕ induction motor draws 100 KVA at a P.F. of 0.8 lag. A synchronous condenser is connected in parallel to drawn an additional 70 KVA at 0.6 P.F. lead. Find the power factor of the total load supplied by the mains is
- 0.999 lag
 - 0.89 lag
 - 0.92 lag
 - 0.82 lag

Ans. A

Sol. Power of induction motor

$$S_1 = 100 \text{ KVA at } 0.8 \text{ lag}$$

$$S_1 = P_1 + jQ_1$$

$$P_1 = S_1 \cos \phi_1$$

$$P_1 = 100 \times 0.8 = 80 \text{ kW}$$

$$Q_1 = S_1 \sin \phi$$

$$Q_1 = 100 \times 0.6 = 60 \text{ KVAR}$$

Power of synchronous condenser

$$S_2 = 70 \text{ KVA at } 0.6 \text{ P.F. leading}$$

$$S_2 = P_2 - jQ_2$$

$$P_2 = S_2 \cos \phi_2$$

$$P_2 = 70 \times 0.6 = 42 \text{ kw}$$

$$Q_2 = S_2 \sin \phi_2$$

$$Q_2 = 70 \times 0.8 = 56 \text{ KVAR}$$

$$S_2 = (42 - j56)$$

$$S_1 = 80 + j60$$

Total power at load end

$$S = S_1 + S_2$$

$$S = 80 + j60 + 42 - j56$$

$$S = 122 + j4$$

$$\text{Power factor angle } \phi = \tan^{-1} \left(\frac{4}{122} \right)$$

$$\phi = 1.87^\circ$$

$$\text{P.F.} = \cos \phi = \cos(1.87^\circ) = 0.999$$

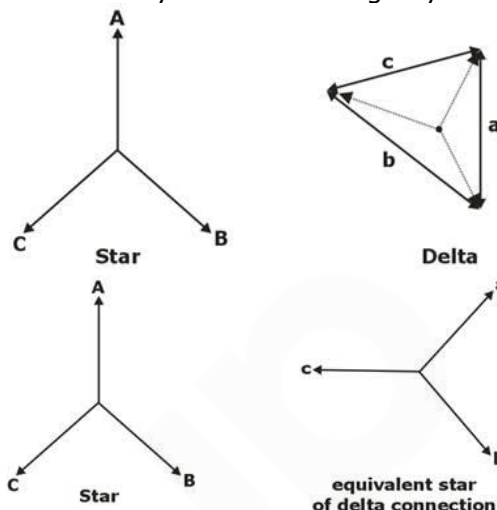
lag

108. In a 3- ϕ star-delta transformer which of the following is correct.
- primary side line voltage lags 30° by secondary side line voltage
 - primary side and secondary side line voltage are in same phase
 - primary side line voltage leads 30° by secondary side line voltage
 - secondary side line voltage leads 15° by primary side line voltage

Ans. C

Sol. In a Y- Δ transformer

Primary side line voltage leads secondary side line voltage by 30° .



109. The type of 1- ϕ induction motor having the highest power factor at full load is
- split phase type
 - shaded-pole type
 - capacitor start type
 - capacitor start, capacitor run

Ans. D

Sol. Capacitor start, capacitor run motor has the highest power factor at full load.

110. The objective of earthing or grounding is _____ ?
- to provide as low resistance possible to the ground
 - to match the load impedance as earth impedance
 - to provide as high resistance possible to the ground
 - to provide a path for zero sequence current.

Ans. A

Sol. Earthing or grounding provides a low resistance path for current and protect the equipment to damage also protect the human being near to equipment against the electric shock.

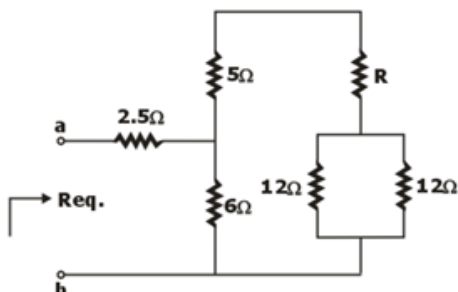
111. The apparent weight of a man in a lift is less than the real weight when _____
- The lift is going down with an acceleration
 - The lift is going up with uniform speed
 - The lift is going down with uniform speed
 - The lift is going up with an acceleration

Ans. A

Sol.

- The apparent weight of a man in a lift is less than the real weight **when the lift is going down with an acceleration.**
- The lift falls freely under gravity. The man also falls freely under gravity that's why the man feels that he has lost his weight.

112.



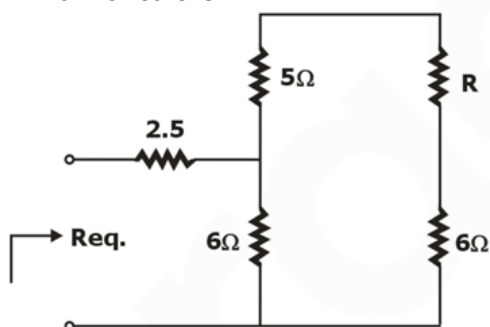
If $R_{eq} = 7\Omega$, in the circuit, Find the value of R _____ ?

- A. 7Ω B. 0.6Ω
 C. 5Ω D. 8Ω

Ans. A

Sol. Since $(12\Omega || 12\Omega) = \frac{12 \times 12}{12 + 12} = 6\Omega$

Now circuit is



$$R_{eq} = 2.5 + 6 || (5 + 6 + R)$$

$$7 = 2.5 + \frac{6 \times [11 + R]}{6 + 11 + R}$$

$$4.5 = \frac{6 [11 + R]}{17 + R}$$

$$17 + R = \frac{6}{4.5} [11 + R]$$

$$17 + R = 1.333 [11 + R]$$

$$2.33 = 0.333R$$

$$R = 7\Omega$$

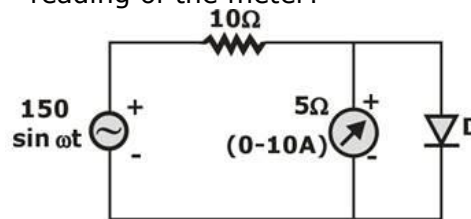
113. What is the normal life of a fluorescent lamp ?

- A. 2000 hr B. 3500 hr
 C. 7500 hr D. 10000 hr

Ans. C

Sol. Normal life of a fluorescent lamp is 7500 hr.

114. The diode is ideal A centre-zero PMMC ammeter is connected across the diode shown in the fig. Find the reading of the meter?



- A. 3.18A B. 10A
 C. 7.07A D. -3.18A

Ans. D

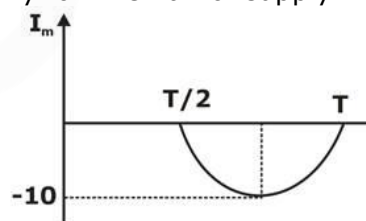
Sol. Since it has been given that diode is ideal.

So, for +ve half cycle of supply diode will conduct and no current flows through meter.

For -ve half cycle of supply diode will be in reversed bias condition and current flows through the meter.

$$I = \frac{150 \sin \omega t}{(10 + 5)} = \frac{150 \sin \omega t}{150} = \sin \omega t$$

Only for -ve half of supply.



Since PMMC meter reads the average value. So the average value of meter current is

$$I_{m(ava)} = \frac{-I_m}{\pi} = \frac{-10}{\pi} = -3.184A$$

115. Who is selected for the prestigious 'Sangita Kalanidhi' award 2019?

- A. M.S. Sheela
 B. Rajkumar Bharathi
 C. S. Sowmya
 D. Seetha Narayanan

Ans. C

Sol. • **Dr. S Sowmya** will be conferred the prestigious 'Sangita Kalanidhi' award during the 'Margazhi Music Festival' early next year (2020).

• She will preside over the **93rd annual** conference of The Music Academy to be held from **December 15th, 2019 to January 1st, 2020.**

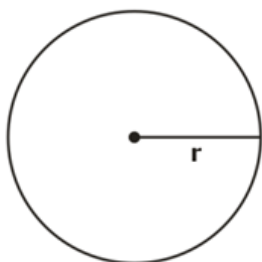
• She is known for her intellectual approach to music.

• She is also part of the Academic Council of the Tamil Nadu Music and Fine Arts University.

- Sangita Kalanidhi Award is an annual award presented by **Madras Music Academy** (MMA).
- It is considered as the highest accolade in field of **Carnatic music**.
- It comprises of **gold medal** and a **birudu patra** (citation).

116. Find the magnetic field intensity at the centre of circular conducting loop having diameter of 5cm and carrying a current of 10A.
- A. 200 A/m B. 69.29 A/m
C. 30.76 A/m D. 40.20 A/m

Ans. A
Sol.



Due to conducting circular wire, the magnetic field at the centre of wire is

$$H = \frac{I}{2r}$$

$$H = \frac{10}{2 \times \frac{5}{2} \times 10^{-2}} = 200 \text{ A/m}$$

117. A technique of controlling noise pollution by planting green plants or trees is known as –
- A. Afforestation
B. Green muffler
C. Decibel meter
D. None of the above

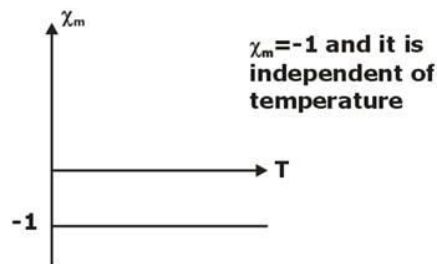
Ans. B

Sol. In this technique, we can control noise pollution by planting green plants, normally 4-5 rows of plants are grown near noisy areas like roadsides and industrial areas so that these trees can create some obstruction for noise to reach to residents.

118. For a diamagnetic material which of the following is correct?
- A. susceptibility is directly proportional to the temperature
B. susceptibility is inversely proportional to the temperature
C. Susceptibility is independent of temperature
D. None of these

Ans. C

Sol. For diamagnetic material



$\chi_m = -1$ and it is independent of temperature

119. Wastes should always be ____
- A. recycled and reused
B. should be dumped in environment
C. should be stored in house
D. should be dumped in neighbors house

Ans. A

Sol. We have to return our organic waste where it belongs the soil rather than sending banana peels, grass clipping etc. to the municipal dump, and start a compost pile instead. If you recycle your yard and garden waste, you will reduce the amount of energy used to send this waste to the dump.

120. In what context was "Nari Tu Narayani" used by Nirmala Sitharaman in Budget 2019-20?
- A. Maternity Benefits
B. Women Empowerment
C. Self Help Groups
D. Mahila Shakti Kendras

Ans. B

Sol. * **Union Finance Minister Nirmala Sitharaman** quotes "Nari Tu Narayani" in her maiden budget speech in the context of women empowerment.

* Nirmala Sitharaman is a member of Rajya Sabha.

* She is currently serving as the Minister of Finance and Minister of Corporate Affairs. She is the second female Finance Minister after Indira Gandhi.

121. In which book is the 'Sanyasi revolt' mentioned?
- A. Discovery of India
B. Anandamath
C. Geetanjali
D. None of these

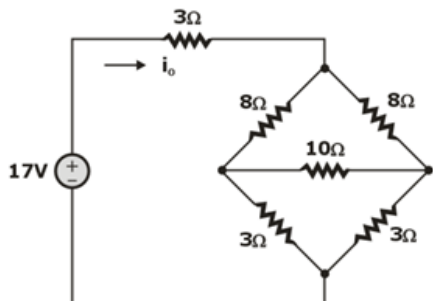
Ans. B

Sol. Under the Sanyasi revolt (1763-1800), people were banned from coming to pilgrimage places.

- From 1763 onwards, the Sanyasi Revolt or uprising had engulfed the area of Bengal, Bihar and Uttar Pradesh.

- Religious people were very upset due to restrictions on pilgrimages.
- This rebellion could be suppressed after a long campaign of Warren Hastings.
- This monstrous revolt has been mentioned by Bankim Chandra Chattopadhyay in his novel Anandmath.

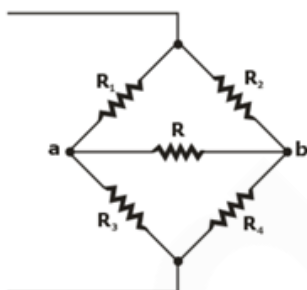
122.



Find the power supplied by the voltage source?

- A. 51W B. 34W
C. 64W D. 40W

Ans. B
Sol.



If $R_1R_4 = R_2R_3$ then bridge is said to be in balanced condition.

Since in the balanced condition of bridge $V_a = V_b$

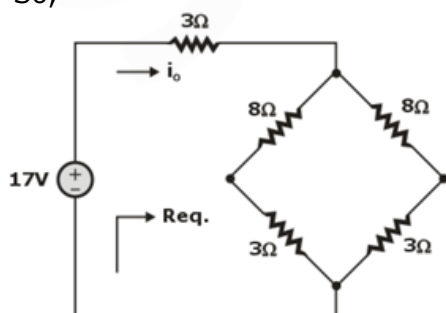
No current will flow through resistance R.

In our case $R_1 = 8$ $R_3 = 3$

$R_2 = 8$ $R_4 = 3$

$R_1R_4 = R_2R_3$

Since bridge is in balanced condition So,



$$Req = 3 + (8 + 3) \parallel (8 + 3)$$

$$Req = 3 (11 \parallel 11)$$

$$Req = 3 + 5.5$$

$$Req = 8.5\Omega$$

Current supplied by source

$$I'_o = \frac{V}{Req} = \frac{17}{8.5} = 2A$$

So power delivered by source

$$P = V_{sio}$$

$$P = 17 \times 2 = 34 W$$

123. Low resistance method for the Arc extinction is used for
- A. only DC
B. only AC
C. Both DC and AC
D. None of these

Ans. B

Sol. Arc extinction methods are two types
(i) High Resistance method
(ii) Low resistance method

In high resistance method we increases the resistance of arc so that the arc current can be reduce.

Low resistance method is applicable only for AC circuit and it is possible these because of presence of natural zero of current. The arc get extinguished at the natural zero of AC wave.

124. The efficiency of a DC shunt generator is maximum when

- A. stray load loss equals to mechanical loss
B. field ohmic loss equals to the constant loss
C. iron loss equals to the copper loss
D. armature circuit loss is equals to the sum of no-load rotational loss and field circuit loss

Ans. D

Sol. For maximum efficiency of a DC shunt motor

Variable loss = constant loss

In the variable loss only armature circuit is considered.

In the constant loss = iron loss + rotational loss + field circuit loss

In the transformer, there are not rotating part so No rotational loss, so in the transformer for maximum efficiency occurs when

Iron loss = copper loss

But in case of D.C. shunt generator condition for maximum efficiency is slightly different due to rotational losses.

125. In a unbalanced system having a phase sequence following currents are following

$$I_R = 30\angle -60^\circ \quad I_Y = 20\angle 30^\circ$$

$$I_B = 30\angle 45^\circ$$

Find the negative sequence current

- A. $13.56\angle-110^\circ$
- B. $40.69\angle-110^\circ$
- C. $30.32\angle-150^\circ$
- D. $25.68\angle-150^\circ$

Ans. A

Sol.

$$\begin{bmatrix} I_0 \\ I_1 \\ I_2 \end{bmatrix} = \frac{1}{3} \begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha & \alpha^2 \\ 1 & \alpha^2 & \alpha \end{bmatrix} \begin{bmatrix} I_R \\ I_Y \\ I_B \end{bmatrix}$$

$$I_2 = \frac{1}{3} [I_R + \alpha^2 I_Y + \alpha I_B]$$

$$I_2 = \frac{1}{3} [30\angle-60^\circ + (1\angle240^\circ)(20\angle30^\circ) + (1\angle120^\circ)(30\angle45^\circ)]$$

$$I_2 = \frac{1}{3} [30\angle-60^\circ + 20\angle270^\circ + 30\angle165^\circ]$$

$$I_2 = \frac{1}{3} [15 - j25.98 + 0 - j20 - 28.97 + j7.76]$$

$$I_2 = \frac{1}{3} [-13.97 - j38.22]$$

$$I_2 = \frac{1}{3} [40.69\angle-110.07^\circ]$$

$$I_2 = 13.56\angle-110.07^\circ$$

126. A 22 kV/11kV 1- ϕ transformer having a load of 200 kW at 0.8 P.F. at low voltage side. Find the current at high voltage side.

- A. 11.36A
- B. 22.72A
- C. 45.44A
- D. 15.73A

Ans. A

Sol. Since voltage at low voltage side is = 11 KV

$$P = VI \cos\phi$$

$$200 \times 10^3 = 11 \times 10^3 \times I \times 0.8$$

$$I = 22.72 \text{ A}$$

$$\text{i.e., } I_2 = 22.72$$

$$\frac{I_2}{I_1} = \frac{V_1}{V_2}$$

$$\frac{I_2}{I_1} = \frac{22}{11} \Rightarrow \frac{I_1}{I_2} = \frac{1}{2}$$

$$I_1 = \frac{1}{2} \times 22.72$$

$$I_1 = 11.36\text{A}$$

127. Where is the tradition of Birha, Rasiya and Hori folk songs?

- A. Rajasthan
- B. Madhya Pradesh
- C. Uttar Pradesh
- D. Gujarat

Ans. C

Sol. **Birha, Rasiya and Hori** are the popular Folk song genre of Uttar Pradesh.

• **Birha** genre is mood based and the basic theme revolves around the separation of lover and his beloved.

• **Rasiya** is the form of folk music that is mostly sung in this region on Holi. The Lathmar or 'Stick Beating' Holi of Braj is very famous for its numerous Rasiya.

• **Hori** is a genre of semi-classical singing, which is popular in Uttar Pradesh and Bihar. It comes under the category of season songs.

128. Which one of the following is correct with respect to Darlington pair ?

- (i) it is cascaded connection of CE-CB.
 - (ii) it increases input resistance
 - (iii) it increases the voltage gain
 - (iv) it increases the current gain
- A. (ii) and (iii) is correct
 - B. (i), (ii) and (iii) is correct
 - C. (ii) and (iv) is correct
 - D. (i), (ii) and (iv) is correct

Ans. C

Sol. (i) Darlington pair is the cascaded connection of CC-CC.

(ii) Darlington pair also called high input impedance circuit

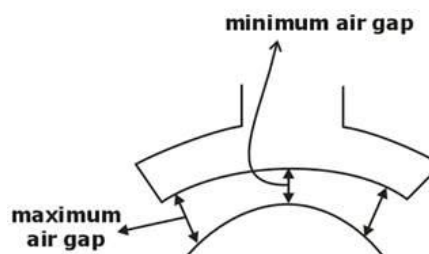
(iii) It improves the current gain and input impedance of emitter follower

129. In salient-pole machines, the air-gap length under the poles is not kept constant so as to

- A. obtain as sinusoidal distribution of armature flux
- B. Minimize the effect of armature mmf on the main field flux
- C. to increase the excitation
- D. obtain a sinusoidal distribution of main field flux.

Ans. D

Sol. To make the main field flux distribution sinusoidal under the poles, the air-gap length is not kept constant.



The minimum air gap at the pole centre and maximum air gap at the corner of poles.

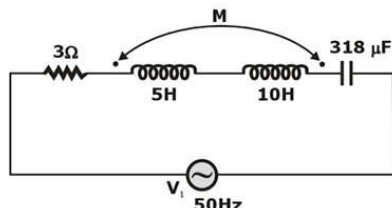
130. In a spreadsheet, a _____ is a number you will use in a calculation.

- A. label
- B. cell
- C. Field
- D. value
- E. None of these

Ans. D

Sol. **Spreadsheets** are useful at **home** and in **business applications**. Spreadsheets make it easy to view and **exhibit data** in a number of manners. **Values** are one of the **primary types** of data used in **spreadsheets**.

131.



The coefficient of coupling between inductor is $k = 0.9$. Find the resonance freq. of the circuit?

- A. 8.32 Hz B. 154.5 Hz
C. 5.91 Hz D. 68.3 Hz

Ans. C

Sol. $C = 318 \mu\text{f}$
 $L_1 = 5\text{H}$ $L_2 = 10\text{H}$

$$M = k\sqrt{L_1 L_2}$$

$$M = 0.9\sqrt{5 \times 10} = 6.36$$

Since inductor are connected in opposite polarity

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

$$L_{eq} = 5 + 10 - 2 \times 6.36$$

$$L_{eq} = 2.28\text{H}$$

Resonance Freq.

$$\omega = \frac{1}{\sqrt{L_{eq} C_{eq}}}$$

$$\omega = \frac{1}{\sqrt{2.28 \times 318 \times 10^{-6}}}$$

$$\omega = \frac{10^3}{\sqrt{2.28 \times 318}} = 37.14 \text{ rad/sec}$$

$$\omega = 2\pi f \quad f = \frac{37.14}{2\pi} = 5.91 \text{ Hz}$$

132. Wein Bridge is used for measurement of

- A. Inductance of High Q - coil
B. capacitance
C. frequency and mainly for fundamental component of frequency
D. harmonics component

Ans. C

Sol. Hay's bridge is used for the measurement of inductance of high Q coil.

For capacitance measurement

i. De-Sauty's Bridge.

ii. Schering bridge

Wien Bridge is used for measurement of fundamental frequency.

133. A 30 KW, 3- ϕ , 50 Hz, 4-pole induction motor is running at 1440 rpm, at full load 0.8 lagging P.F. Motor has 1200 W friction and windage losses. Neglect the stator losses. Find the efficiency of Induction motor.

- A. 80.27% B. 92.30%
C. 72.5% D. 85%

Ans. B
Sol.

Since mechanical loss = friction and windage loss

$$P_{out} = 30 \text{ KW}$$

$$\text{Mechanical power developed} = 30 \times 10^3 + 1200 = 31.2 \text{ KW}$$

$$N_s = \frac{120 \times 50}{4} = 1500$$

$$N_r = 1400 \text{ rpm}$$

$$s = \frac{1500 - 1440}{1500} = 0.04$$

$$\text{Rotor } C_4 \text{ loss} = P_{cu} = \left(\frac{s}{1-s}\right) \times P_{mech}$$

$$P_{cu} = \left(\frac{0.04}{0.96}\right) \times 31.2 = 1.3 \text{ KW}$$

$$P_{in} = P_{mech} + P_{cu}$$

$$P_{in} = 31.2 + 1.3 = 32.5 \text{ KW}$$

$$\text{Efficiency of motor} = \eta = \frac{P_{out}}{P_{in}}$$

$$\eta = \frac{30}{32.5} = 0.9230 = 92.30\%$$

134. Hardness of river water is because it contains.

- A. Sodium Chloride
B. Salts of Calcium and Magnesium
C. Both A and B
D. None of These

Ans. B

Sol. **River water** is **harder** than rain water because it contains **salts of Calcium and Magnesium**. As the river water seeps through the ground, it is naturally purified and picks up minerals from the rocks it seeps through. Typical minerals are **sulfur, lime, magnesium and calcium**. After it soaks up enough of these minerals to have a concentration of at least **one grain per gallon**, or GPG, the water is said to be **hard**.

135. What are the ores of Lead (Pb)?

- A. Zincite (ZnO) and Zinc blende (ZnS)
B. Cinnabar (HgS)
C. Galena (PbS) and Cerrusite (PbCO₃)
D. Haematite (Fe₂O₃) and Magnetite (Fe₃O₄)

Ans. C

Sol. **Galena (PbS)** and **Cerrusite (PbCO₃)** are the ores of Lead (Pb). **Lead** is the most abundant of the transition metal elements (**Greenwood and Earnshaw 1984**).

Lead is a chalcophile metallic element forming several important minerals, including **galena PbS, anglesite PbSO₄, Cerrusite PbCO₃** and **minimum Pb₃O₄**.

Lead is a chemical element with symbol **Pb** (from the Latin Plumbum) and atomic number **82**. It is a heavy metal that is denser than most common materials.

136. Who has been appointed as the Governor of Chhattisgarh?

- A. Anandiben Patel
- B. Anusuiya Uikey
- C. Raman Singh
- D. Deepak Mishra

Ans. B

Sol. • Rajya Sabha member **Anusuiya Uikey** has been appointed as Governor of **Chhattisgarh**.

• She has replaced **Anandiben Patel**.

• She was previously holding the post of Minister of Women and Child Development in the Madhya Pradesh government.

• She is the **first tribal women** to hold the post of Governor of Chhattisgarh since the formation of state in **2000**.

• She was appointed as Governor of Chhattisgarh on **16th July 2019**.

• She is the **sixth** Governor of Chhattisgarh.

137. Which of the following Bird Sanctuary is located in Gujarat?

- A. Nal Sarovar Bird Sanctuary
- B. Harike Bird Sanctuary
- C. Kanjirankulam Bird Sanctuary
- D. Great Indian Bustard Sanctuary

Ans. A

Sol. • **Nal Sarovar Bird Sanctuary is situated in Ahmedabad, Gujarat**.

• It is the largest wetland bird sanctuary in Gujarat, and one of the largest in India.

• Nalsarovar was declared as a Ramsar site on 24th September 2012.

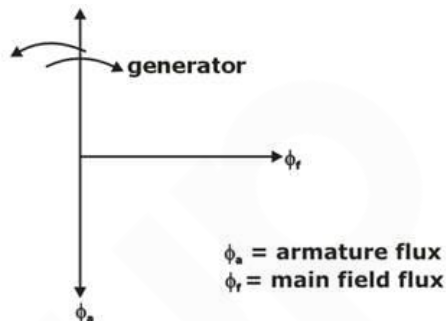
• Since 2005 it is the only lake that has been declared as Ramsar site in India.

138. In a loaded DC motor, if brushes are given a shift from the interpolar axis in the direction of rotation, then commutation will

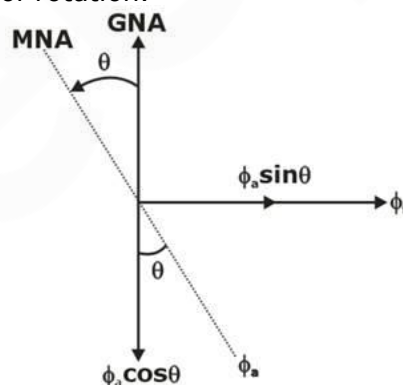
- A. improves and speed rises
- B. deteriorate and speed falls
- C. improve and speed fall
- D. deteriorate and speed rises

Ans. B

Sol.



Since brush is shifted in the direction of rotation.



Now total flux $\phi = \phi_f + \phi_a \sin \theta$
i.e., flux $\phi \uparrow$

$$V = I R$$

So the speed will fall.

Since for a DC motor to improve commutation brush must be shift in the opposite direction of rotation. But in our case brush is shifted in the direction of rotation, so commutation will be deteriorate.

139. What should be the insulation resistance in case of PVC wire ?

- A. 12.5 MΩ/number of outlet
- B. 60 MΩ/number of outlet
- C. 3 MΩ/number of outlet
- D. None of above

Ans. A

Sol. Insulation resistance in case of PVC wire is 12.5 MΩ/number of outlet.

140. In which year Hima Das was honored with the Arjuna Award by the President of India?

- A. 2017
- B. 2014
- C. 2018
- D. 2019

Ans. C

Sol. • Hima Das was conferred with **Arjuna Award** by the President of India on **25th September 2018**.

• The Arjuna Awards are given by the **Ministry of Youth Affairs and Sports**, Government of India to recognize outstanding achievement in sports.

• It was started in **1961**.

• The award carries a cash prize of **₹500,000**, a bronze statue of **Arjuna** and a scroll.

• **Hima Das** is the first Indian athlete to win a **gold medal** in a track event at the **IAAF World U20 Championships**.

141. Which gas is present in highest amount in natural gas?

- A. Methane
- B. Ethane
- C. Propane
- D. Butane

Ans. A

Sol. • The Highest amount of gas present in Natural gas is **Methane**.

• The composition of gases in natural gas is :

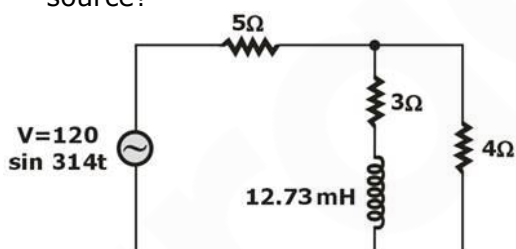
Methane = 60-90%

Ethane = 0-20%

Propane = 0-20%

Butane = 0-20%.

142. Find the reactive power delivered by source?



- A. 105 VAR
- B. 132 VAR
- C. 152 VAR
- D. 160 VAR

Ans. B

Sol. Supply is $V = 120 \sin 314 t$

$\omega = 314$

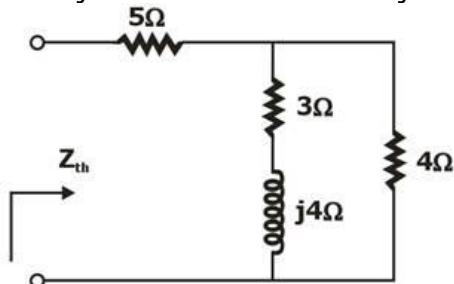
$\omega = 2\pi f = 314$

$f = 50 \text{ Hz}$

The inductive reactance

$X_L = j\omega L$

$X_L = j314 \times 12.73 \times 10^{-3} = j4\Omega$



$$Z_{th} = 5 + (3 + j4) \parallel 4$$

$$Z_{th} = 5 + \frac{4[3 + j4]}{3 + j4 + 4}$$

$$Z_{th} = 5 + \frac{12 + j16}{7 + j4} \left[\frac{7 - j4}{7 - j4} \right]$$

$$Z_{th} = 5 + \frac{(12 + j16)[7 - j4]}{49 + 16}$$

$$Z_{th} = 5 + \frac{148 - j64}{65}$$

$$Z_{th} = 5 + 2.27 - j0.984$$

$$Z_{th} = 7.33 \angle -7.70^\circ$$

$$I = \frac{V}{Z_{th}}$$

Current

$$I = \frac{120 \angle 0^\circ}{7.33 \angle -7.70^\circ}$$

$$I = 16.37 \angle 7.70^\circ$$

$$I = 16.37 \sin(\omega t + 7.70^\circ)$$

$$\text{Reactive power } Q = V_r I_r \sin \phi$$

$$\phi = 7.70^\circ$$

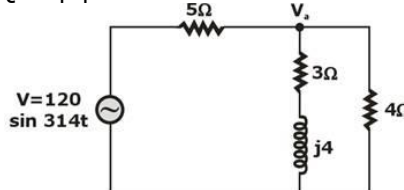
$$Q = \frac{120}{\sqrt{2}} \times \frac{16.37}{\sqrt{2}} \times \sin(7.70^\circ)$$

$$Q = 131.60 \text{ VAR}$$

Alternate Solution Method: Since in the circuit only one energy storage element is present.

So, the reactive power delivered by source is equals to the reactive power absorbed by inductor reactive power of inductor

$$Q = |I|^2 \times L$$



Apply KCL at node 'a'

$$\frac{V_a - 120 \angle 0^\circ}{5} + \frac{V_a - 0}{(3 + j4)} + \frac{V_a - 0}{4} = 0$$

$$V_a \left[\frac{1}{5} + \frac{1}{3 + j4} + \frac{1}{4} \right] = \frac{120 \angle 0^\circ}{5}$$

$$V_a \left[\frac{1}{5} + \frac{3 - j4}{9 + 16} + \frac{1}{4} \right] = 24 \angle 0^\circ$$

$$V_a [0.2 + 0.12 - j0.16 + 0.25] = 24 \angle 0^\circ$$

$$V_a [0.57 - j0.16] = 24 \angle 0^\circ$$

$$V_a = \frac{24 \angle 0^\circ}{0.57 - j0.16} = \frac{24 \angle 0^\circ}{0.59 \angle 15.67^\circ} = 40.67 \angle -15.67^\circ \text{ V}$$

$$I = \frac{V_a}{3 + j4} = \frac{40.67 \angle -15.67^\circ}{3 + j4} = \frac{40.67}{5} = 8.134$$

$$I_{rms} = \frac{8.134}{\sqrt{2}} = 5.75 \text{ A}$$

$$Q = |I_{rms}|^2 X_L = 132 \text{ VAR}$$

143. Which one of the following is a bad thermal conductor?
 A. Aluminum B. Copper
 C. Glass D. Silver

Ans. C

Sol.

- **Glass**, wood and plastic are all excellent insulators and bad thermal conductors.
- In glass, there is no flow of free electrons and hence it doesn't conduct heat but it is a good insulator which allows electricity and heat to pass through it by radiation following the law of optics.

144. A circuit breaker have voltage and current ratings of 33 kV and 5 kA. Find the making capacity of circuit breaker ?
 A. 285.78 MVA B. 165 MVA
 C. 428.67 MVA D. 728.76 MVA

Ans. D

Sol. Since for the circuit breaker
 Making capacity = $2.55 \times$
 symmetrical breaking capacity
 Symmetrical breaking capacity = $\sqrt{3} \times V_L I_L \times 10^{-6}$ MVA
 $= \sqrt{3} \times 33 \times 10^3 \times 5 \times 10^3 \times 10^{-6}$ MVA
 $= \sqrt{3} \times 33 \times 5 = 285.78$ MVA
 Making capacity is = 2.55×285.78
 $= 728.76$ MVA

145. Voltage and current wave across a load element is given below
 $V(t) = 115 \sin (314t + 15^\circ)$
 $i(t) = 23 \sin (314 t - 45^\circ)$
 Which of the following statement is current with respect to the load?
 A. load having resistance of 2.5Ω and a inductor in series.
 B. Load having resistance at 3Ω and capacitor in series
 C. load having resistance of 2.5Ω only
 D. load is purely inductive

Ans. A

Sol. Since $V(t) = 115 \sin (314 t + 15^\circ)$
 $i(t) = 23 \sin (314 t - 45^\circ)$
 Since current lags by voltage by angle
 $\phi = 15^\circ - (-45^\circ) = 60^\circ$
 So the load must be R-L load.
 In the R-L load the current lags voltage by angle of ' ϕ '.

$$|Z| = \frac{|V|}{|I|}$$

$$|Z| = \frac{115}{23}$$

$$|Z| = 5\Omega$$

$$Z = |Z| \angle \phi$$

$$Z = 5 \angle 60^\circ$$

$$Z = 5 \cos 60^\circ + j 5 \times \sin 60^\circ$$

$$Z = (2.5 + j4.33)\Omega$$

So the load having resistance of 2.5Ω and inductor in series.

146. Main function of the conservation in transformer ?
 A. it provides cooling of the transformer
 B. it limits the temperature of transformer
 C. It provides space for transformer oil to expand
 D. It connect outer world to internal world of transformer

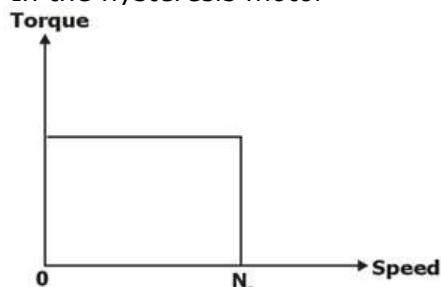
Ans. C

Sol. When the transformer is loaded and temperature inside the transformer raises. Due to increases in temperature results in increment of volume of transformer oil. A conservator tank of transformer provides space for transformer oil to expand.

147. The main reason for using a hysteresis motor for high quality tape reorders and record players is that
 A. It does not requires any centrifugal switch
 B. speed is vary as load vary
 C. for all speed operation it provides constant torque
 D. None of these

Ans. C

Sol. In the hysteresis motor



It provides the constant torque for all speed.

148. In a potier triangle method for voltage regulation of synchronous machine, the height of the triangle gives-
 A. synchronous reactance drop
 B. magnetizing reactance drop
 C. leakage reactance drop
 D. armature resistance drop

Ans. C

Sol. In a potier triangle method for voltage regulation of synchronous machine, the height of the triangle gives the leakage reactance drop.

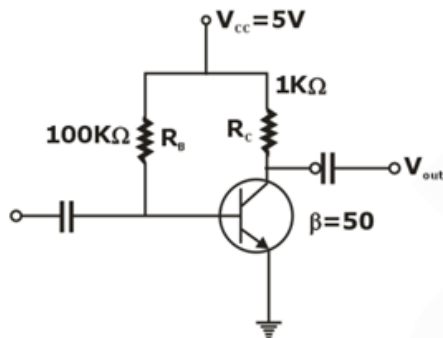
149. If the load is connected first in star and then in delta, find which of the following is correct?

- A. Power consumed in delta is $\sqrt{3}$ times power consumed in star.
- B. Power consumed in star is $\sqrt{3}$ times power consumed in delta
- C. Power consumed in star equal to the power consumed in delta
- D. Power consumed in delta is $\frac{1}{3}$ times power consumed in star

Ans. C

Sol. Whether the load is delta connected or star connected, Power consumed by load is always same.

150.

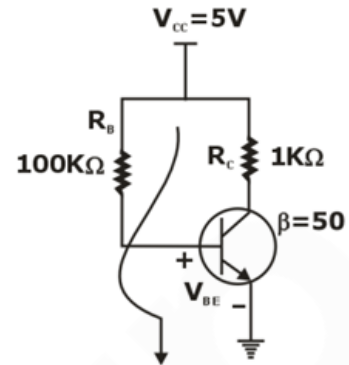


In the amplifier circuit shown above, find the V_{out} ? take $V_{BE} = 0.7$

- A. 3.5 volt
- B. 2.85 volt
- C. 1.5 volt
- D. 5V

Ans. B

Sol. In the d.c. equivalent, replace the capacitor as open ckt.



Apply KVL in the input loop

$$I_B = \frac{5 - V_{BE}}{100k}$$

$$I_B = \frac{5 - 0.7}{100k} = \frac{4.3}{100k}$$

$$I_B = 43 \mu A$$

$$I_C = \beta I_B$$

$$I_C = 50 \times 43 \times 10^{-6} = 2.15 \text{ mA}$$

$$V_{out} = V_{CC} - I_C R_C$$

$$V_{out} = 5 - 2.15 \times 10^{-3} \times 1 \times 10^3$$

$$V_{out} = 5 - 2.15 = 2.85 \text{ volt}$$

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