BYJU'S EXAM PREP

BEL Trainee & Project Engineer

Electrical Engineering

Sample Full Mock Test - 1

Questions & Solutions

1. Direction: Ram and Ravi start together from a point in opposite direction on scooters. Ram's speed is 21 km/h and Ravi's speed is 15 km/h. What will be the distance between them after 20 minutes?

A. 25km

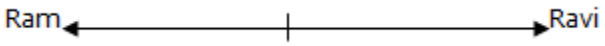
B. 16km

C. 12km

D. 45km

Ans. C

Sol.



Ram's speed = 21 km/h = 21/ 60 km/m = 7/20 km/m Ravi's speed = 15 km/h = 15/60 km/m = 1/4 km/h Distance travel by Ram in 20 minutes = 20×7/20 = 7 km Distance travel by Ravi in 20 minutes = 20×1/4 = 5 km Hence the distance between Ram and Ravi after 20 minutes = 7+5 =12 km

2. Which of the following word willappear second last in the dictionary order?

A. nephric

B. neurism

C. nepehthe

D. nervine

Ans. D

Sol. Correct order is. nepehthe, nephric, nervine, neurism.

3. Select the most appropriate meaning of the given idiom.

To speak one's mind.

A. Express one's opinions frankly

B. To think aloud

C. To talk about one's ideas

D. To express one's thoughts

Ans. A

Sol. The idiom 'To speak one's mind' means to express one's opinions, ideas and virtues frankly; say what one really thinks, talk freely and fearlessly.

Hence, option A is the correct Answer

4. Select the most appropriate meaning of the given idiom.

To call on

A. To criticize

B. To visit

C. To abuse

D. To consider

Ans. B

Sol. The phrase 'to call on' means to pay a visit to someone. Thus, option B is the correct answer.

5. The product of two numbers is 4107 if the HCF of the numbers is 37, the greatest number is

A. 185

B. 111

C. 107

D. 101

Ans. B

Sol. Let the numbers be 37a and 37b.

Then, 37a x 37b = 4107

$\Rightarrow$ ab = 3.

Now, co-primes with product 3 are (1, 3).

So, the required numbers are (37 x 1, 37 x 3) i.e., (37, 111).

$\therefore$ Greater number = 111.

6. Select the most appropriate meaning of the given idiom.

A storm in a tea cup

A. unexpected event

B. a singal of danger

C. a great noise

D. much excitement over something trivial

Ans. D

Sol. The idiom "a storm in a teacup" means to have great outrage or excitement about a trivial matter.

E.g. :- I feel strongly that it is a storm in a teacup.Hence, option D is the correct answer.

7. Ten years ago, the average age of P and Q was 20 yr. Average age of P, Q and R is 30 yr now. After 10 yr, the age of R will be

A. 35 yr

B. 40 yr

C. 30 yr

D. 45 yr

Ans. B

Sol. 10 yr ago, total age of P and Q = 20 × 2 = 40 yr Present total age of P and Q = 40 + 2 × 10 = 60 yr Present total age of P, Q and R = 30 × 3 = 90 yr

$\therefore$ R's present age = 90 – 60 = 30 yr

$\therefore$ After 10 yr R's age = (30 + 10) yr = 40 yr

8. A vessel has 60 litres of Sol. of acid and water having 80% acid. How much water be added to make it a

Sol. in which acid forms 60%?

A. 48 litres

B. 20 litres

C. 36 litres

D. None of these

Ans. B

Sol. In 60 litres of Solution,

Water = $\frac{60 \times 20}{100} = 12$ On adding x litres of water,

$\frac{12 + x}{60 + x} \times 100 = 40$

$60 + 5x = 120 + 2x$

$3x = 60$

$x = \frac{60}{3} = 20$ litres

9. In a basket, there are 125 flowers. A man goes to worship and offers as many flowers at each temple as there are temples in the city. Thus he needs 5 baskets of flowers, Find the number of temples in the city.

A. 25

B. 24

C. 27

D. 26

Ans. A

Sol. No. of flower in a basket = 125

Total flowers in 5 such baskets = 125 × 5 = 625

Since, a man offers as many flowers at each temple as there are temples in the city.

Let there are x temples in the city. Therefore,

$x \times x = 625$

$x^2 = 625$

$x = \sqrt{625} = 25$

Thus, there are 25 temples in the city.

Hence, option A is correct

10. A man said to a lady "Your mother's husband's sister is my aunt". How is the lady related to man?

A. Sister

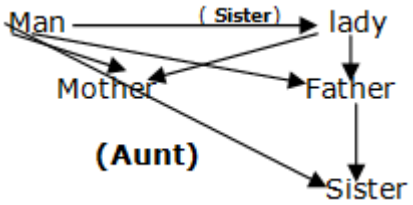
B. Mother

C. Daughter

D. Granddaughter

Ans. A

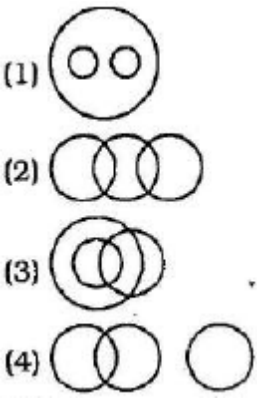
Sol.



Thus, the lady is the sister of that man.

Hence, option A is correct.

11. Which one of the following diagrams best depicts the relationship among Elephants Wolves and Animals?



A. Figure (1)

B. Figure (2)

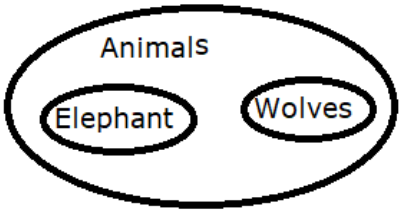
C. Figure (3)

D. Figure (4)

Ans. A

Sol. Elephants and wolves both are different types of animals.

So, possible ven diagram is –



Hence, option A is the correct answer.

12. In the following question, select the odd word from the given alternatives.

A. Square

B. Cone

C. Triangle

D. Rectangle

Ans. B

Sol. The square, triangle and rectangle are made up of straight lines only while cone is a three-dimensional shape that tapers smoothly from a flat base to a point called the apex or vertex.

Hence, option B is the correct answer.

13. Direction: Select the related word/letters/ number from the given alternatives.
EXCUSE : CXEESU : : ERODES : ?
A. OREESD
B. ORESED
C. REOSDE
D. ERODSE

Ans. B

Sol. First three letters of the word are placed in a reverse order and similarly last 3 letters are reversed
As in EXCUSE → EXC is placed as CXE and USE is placed as ESU
Similarly ERODES will be coded as ORESED

14. Directions: In the following questions, out of the four alternatives, choose the one which can be substituted for the given words / sentence. To die without having made a will
A. Intaglio
B. Inveterate
C. Intestate
D. Insolvent

Ans. C

Sol. Intestate means not disposed of by will.

15. Select the related / letters / word / number from the given alternatives.
XZG: CAT:: DOG:?
A. TTW
B. GAD
C. OWT
D. WLT

Ans. D

Sol. A Z
B Y
C X
D W
E V
F U
G T
H S
I R
J Q
K P
L O
M N Pairs of opposite letters
XYG ⇒ CAT

DOG ⇒ WLT

16. In the following question, select the related number from the given alternatives.
83 : 25 : : 92 : ?
A. 25
B. 16
C. 49
D. 36

Ans. C

Sol. As,
8 – 3 = 5; 5 × 5 = 25
Similarly,
9 – 2 = 7; 7 × 7 = 49
Hence, option C is the correct response.

17. In the following question, select the related word/letters/number from the given alternatives.
Yes: No:: Alive : ?
A. Life
B. Live
C. Dead
D. None of These

Ans. C

Sol. Opposite of word 'Yes' is 'No'.
Similarly, 'Dead' is opposite of word 'Alive'.
Hence, option C is correct.

18. The two windings of a transformer is
A. conductively linked.
B. inductively linked.
C. not linked at all.
D. electrically linked.

Ans B

Sol. In two winding transformers, the coils are mutually coupled which means that the secondary winding and primary winding are inductively linked with each other.

19. A salient pole synchronous motor is running at no load. Its field current is switched off. The motor will
A. come to stop.
B. continue to run at synchronous speed.
C. continue to run at a speed slightly more than the synchronous speed.
D. continue to run at a speed slightly less than the synchronous speed.

Ans: B

Sol. Total power in salient pole motor is

$$P = \frac{VE}{X_a}\sin\delta + V^2\left(\frac{X_d - X_q}{2X_dX_q}\right)\sin 2\delta$$ It field current $I_f = 0$

$E \rightarrow 0$

$E \propto I_f$

$$P = V^2\left(\frac{X_d - X_q}{2X_dX_q}\right)\sin 2\delta$$

Reluctance power

Due to this reluctance power motor will run at synchronous speed.

20. The d.c. series motor should always be started with load because

A. at no load, it will rotate at dangerously high speed.

B. it will fail to start.

C. it will not develop high starting torque.

D. all are true.

Ans. A

Sol. For DC series motor $\varphi \propto I_a$

At no-load $I_a = 0$

$\varphi = 0$

$$N = \frac{V - I_aR_a}{K\phi}$$

For $\varphi \rightarrow 0$

$N \rightarrow \infty$

So the no load speed of DC series motor is very high.

21. The frequency of the rotor current in a 3 phase 50 Hz, 4 pole induction motor at full load speed is about

A. 50 Hz.

B. 20 Hz.

C. 2 Hz.

D. Zero.

Ans. C

Sol. Generally the induction motor runs at a slia of 4%

S = 0.04

Freq. of rotor = Sfs.

= 0.04 × 50 = 2Hz

22. In a stepper motor the angular displacement

A. can be precisely controlled.

B. it cannot be interfaced with micro computer based controller.

C. the angular displacement cannot be precisely controlled.

D. it cannot be used for positioning of work tables and tools in NC machines.

Ans. A

Sol. In a stepper motor the angular displacement can be precisely controlled. Stepper motor is used for the position control system.

23. The power factor of a squirrel cage induction motor is

A. low at light load only.

B. low at heavy load only.

C. low at light and heavy load both.

D. low at rated load only.

Ans. A

Sol. The power factor of induction motor is low at no-load and light load. It is about 0.1 lagging at no-load. It is due to large magnetization current at no-load.

24. The generation voltage is usually

A. between 11 KV and 33 KV.

B. between 132 KV and 400 KV.

C. between 400 KV and 700 KV.

D. None of the above.

Ans. A

Sol. The generation voltage is usually between 11kv and 33 kv.

Transmission voltage is high 132kv and beyond.

25. When a synchronous motor is running at synchronous speed, the damper winding produces

A. damping torque.

B. eddy current torque.

C. torque aiding the developed torque.

D. no torque.

Ans. D

Sol. At synchronous speed due to damper winding No- torque is produced.

Because there are No-relative speed between rotor and rotating field when roter is rotating at synchronous speed, so no current induced in the damper winding, so no torque is produced.

26. If a transformer primary is energised from a square wave voltage source, its output voltage will be

A. A square wave.

B. A sine wave.

C. A triangular wave.

D. A pulse wave.

Ans. A

Sol. In the transformer

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

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

If we apply the square voltage at input. We will get the square wave at output.

Shape of voltage waveform not changes only the magnitude is changes.

27. In a d.c. series motor the electromagnetic torque developed is proportional to

A. I_a

B. I_a^2

C. $\frac{1}{I_a}$

D. $\frac{1}{I_a^2}$

Ans. B

Sol. In the DC series motor

$I_a \propto \varphi$

$\tau \propto \varphi I_a$

$\tau \propto (I_a)(I_a)$

$\tau \propto (I_a)^2$

28. In a 3 – phase induction motor running at slip 's' the mechanical power developed in terms of air gap power P_g is

A. $(s - 1) P_g$.

B. $P_g/(1-s)$

C. $(1 - s) P_g$.

D. $s.P_g$

Ans. C

Sol. The mechanical power developed in the 3-φ induction motor is

$P = (1 - S)P_g$

29. In a 3 – phase induction motor the maximum torque

A. is proportional to rotor resistance r_2.

B. does not depend on r_2.

C. is proportional to $\sqrt{r_2}$.

D. is proportional to r_2^2.

Ans. B

Sol. The maximum torque in a 3-φ induction motor

$$\Psi_{max} = \frac{3}{W_S}.\frac{V^2}{2X_2}$$

Does not depends upon the rotor resistance.

30. In a d.c. machine, the armature mmf is

A. stationary w.r.t. armature.

B. rotating w.r.t. field.

C. stationary w.r.t. field.

D. rotating w.r.t. brushes.

Ans. C

Sol. In a DC Machine the armature mmf is stationary w.r.t. to field.

31. In a transformer the voltage regulation will be zero when it operates at

A. unity p.f.

B. leading p.f.

C. lagging p.f.

D. zero p.f. leading.

Ans. B

Sol. For a zero voltage regulation in transformer it must be operate at leading P.F. and for maximum voltage regulation transformer must be operate at lagging P.F.

Also the condition for maximum voltage regulation

$$\varphi = \tan^{-1}\left(\frac{R}{X}\right)$$

32. The maximum power in cylindrical and salient pole machines is obtained respectively at load angles of

A. 90°, 90°.

B. <90°, 90°.

C. 90°, > 90°.

D. 90°, < 90°.

Ans. D

Sol. Power transter in cylindrical rotor is

$$P = \frac{EV}{X}\sin\delta$$

For max. power δ = 90°

Power transfer in salient pole machine is .

$$P = \frac{EV}{X_d}\sin\delta + V^2\left[\frac{X_d - X_q}{2X_dX_q}\right]\sin 2\delta$$

Maximum power occurs at $\delta \propto 90°$

33. The primary winding of a 220/6 V, 50 Hz transformer is energised from 110 V, 60 Hz supply. The secondary output voltage will be

A. 3.6 V.

B. 2.5 V.

C. 3.0 V.

D. 6.0 V.

Ans. C

Sol. In the transformer

$$\frac{V_1}{V_2} = \frac{N_1}{N_2}, \frac{220}{6} = \frac{N_1}{N_2}$$

When

$V_1 = 110V$

$$\frac{V_1}{V_2} = \frac{N_1}{N_2}, \frac{110}{V_2} = \frac{220}{6}$$

$V_2 = 3$ Volt

34. The emf induced in the primary of a transformer

A. is in phase with the flux.

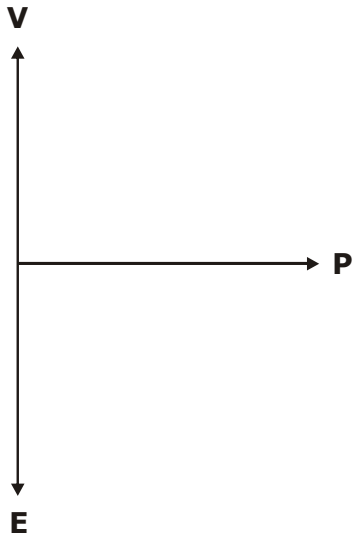
B. lags the flux by 90 degree.

C. leads the flux by 90 degree.

D. is in phase opposition to that of flux.

Ans. C

So. In the transformer the induced lags 90° by the flux.



35. The relative speed between the magnetic fields of stator and rotor under steady state operation is zero for a

A. 3 phase induction machine.

B. synchronous machine.

C. single phase induction machine.

D. all options are correct

Ans. D

Sol. The relative speed between the magnetic field of-stator and rotor is zero for induction motor and synchronous motor. So option (D) all of above is correct.

36. The current from the stator of an alternator is taken out to the external load circuit through

A. slip rings.

B. commutator segments.

C. solid connections.

D. carbon brushes.

Ans. C

Sol. The current from the stator of an alternator is taken out to the external load circuit through solid connection. The direct connection is provided at the stator of alternator where we collect the current.

37. A motor which can conveniently be operated at lagging as well as leading power factors is the

A. squirrel cage induction motor.

B. wound rotor induction motor.

C. synchronous motor.

D. DC shunt motor.

Ans. C

Sol. Induction motor always operates lagging power factor.

But synchronous motor can operates at both lagging and leading P.F.

For $E > V_t$ Cosf. → Over excitation → synchronous motor operates at leading P.F.

For $E = V_t$ Cosf → level excitation → synchronous motor operates at unity P.F.

For $E \propto V_t$Cosf under excitation → synchronous motor operates at lagging P.F.

38. A hysteresis motor

A. is not a self-starting motor.

B. is a constant speed motor.

C. needs dc excitation.

D. can not be run in reverse speed.

Ans. B

Sol. A hysteresis motor is constant speed motor due to constant torque.

39. The most suitable servomotor for low power applications is

A. a dc series motor.

B. a dc shunt motor.

C. an ac two-phase induction motor.

D. an ac series motor.

Ans. B

Sol. The most suitable servo-motor for low power application is DC shunt motor.

40. The size of a conductor used in power cables depends on the

A. operating voltage.

B. power factor.

C. current to be carried.

D. type of insulation used.

Ans. C

Sol. The size of conductor used in power cable depends on the current carried by the conductor

$I \propto A$

Where A = Area of cross section.

41. Out of the following methods of heating the one which is independent of supply frequency is

A. electric arc heating

B. induction heating

C. electric resistance heating

D. dielectric heating

Ans. C

Sol. The electric resistance heating is free from the supply frequency. In this method heat produced by passing an electric current through a material that preferably high resistance.

Heat generated $=I^2Rt$

Independent of the supply frequency.

42. A two-winding single phase transformer has a voltage regulation of 4.5% at full-load and unity power-factor. At full-load and 0.80 power-factor lagging load the voltage regulation will be

A. 4.5%.

B. less than 4.5%.

C. more than 4.5%.

D. 4.5% or more than 4.5%.

Ans. C

$\% R = V_r \cos \Phi + V_x \sin \Phi$

$= V_r$

p.f = $\cos \Phi = 1$

$\therefore \Phi = 0°$

$\therefore$ kVA = kW & kVAR = 0

No reactive power component

Percentage regulation (%R) = $V_r \cos \Phi \pm V_x \sin \Phi$

When $\cos \Phi = 0.8$ lagging

$\%R = V_r \cos \Phi + V_x \sin \Phi$

$= V_r (0.8) + V_x (0.6)$

$\%R = (0.8)V_r + (0.6) V_x$ at p.f 0.8 lagging

and %R = Vr at unity p.f

43. In a dc shunt motor the terminal voltage is halved while the torque is kept constant. The resulting approximate variation in speed ' 'ω and armature current 'I_a' will be

A. Both ω and a I_a are doubled.

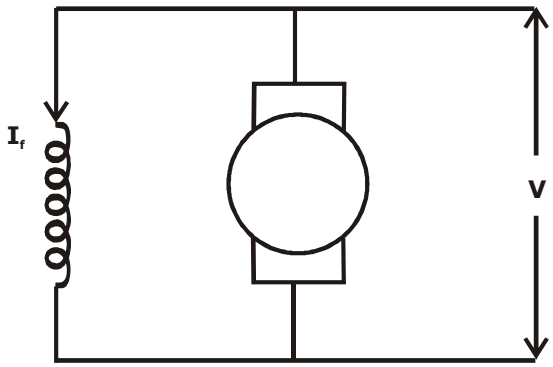
B. ω is constant and I_a is doubled.

C. ω is doubled while I_a is halved.

D. ω is constant but I_a is halved.

Ans. B

Sol. In DC motor



ψ = const.

When V = half

$I_f = \frac{V}{R_f}$ = also half

$\varphi \propto I_f$

φ is half.

Since it is given ψ = cost.

$\psi \propto \varphi I_a$

$\varphi_1 Ia_1 = \varphi_2 Ia_2$

$Ia_2 = \left(\frac{\phi_1}{\phi_2}\right) \times Ia_1$

$Ia_2 = 2\ Ia_1$

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

$N \propto \frac{V}{\phi}$ V and $\propto$ both are half. So

N = Cost.

44. A balanced three-phase, 50 Hz voltage is applied to a 3 phase, 4 pole, induction motor. When the motor is delivering rated output, the slip is found to be 0.05. The speed of the rotor m.m.f. relative to the rotor structure is

A. 1500 r.p.m.

B. 1425 r.p.m.

C. 25 r.p.m.

D. 75 r.p.m.

Ans. D

Sol. N_S = 120f /P = 120 x 50 /4 =1500rpm

N = N_S (1— s) = 1500 (1-0.05) = 1425

∴ relative speed = 1500 – 1425 = 75 rpm

45. An alternator is delivering rated current at rated voltage and 0.8 power-factor lagging case. If it is required to deliver rated current at rated voltage and 0.8 power-factor leading, the required excitation will be

A. less.

B. more.

C. more or less.

D. the same.

Ans. B

Sol. For the alternator

If E > Vcos δ → over excitation condition synchronous machine operator at leading P.F.

IF E < VCos δ → under excitation condition synchronous machines operates at lagging P.F.

46. A ceiling fan uses

A. split-phase motor.

B. capacitor start and capacitor run motor.

C. universal motor.

D. capacitor start motor.

Ans. D

Sol. A ceiling fan motor is a capacitor start motor.

47. A stepper motor is

A. a dc motor.

B. a single-phase ac motor.

C. a multi-phase motor.

D. a two phase motor.

Ans. D

Sol. A stepper motor is a two phase motor. It is a brushers DC electric motor that divides a full rotation into a number of equal steps.

Stepper motor works on 1-phase-ON or 2-phase –ON modes of operation

48. The 'sheath' is used in cable to

A. provide strength to the cable.

B. provide proper insulation.

C. prevent the moisture from entering the cable.

D. avoid chances of rust on strands.

Ans. A

Sol. The sheath in underground cable is provided to give mechanical strength.

49. The drive motor used in a mixer-grinder is a

A. dc motor.

B. induction motor.

C. synchronous motor.

D. universal motor.

Ans. D

Sol. The universal motor is suitable for AC & DC both supply systems.

50. A 1:5 step-up transformer has 120V across the primary and 600 ohms resistance across the secondary. Assuming 100% efficiency, the primary current equals

A. 0.2 Amp.

B. 5 Amps.

C. 10 Amps.

D. 20 Amps.

Ans. A

Sol. $I_1 = V_1 / R_1 = 120/600 = 0.2$

(η = 100%, losses are zero $\therefore V_1 = V_R = I_1R_1$)

51. A dc shunt generator has a speed of 800 rpm when delivering 20 A to the load at the terminal voltage of 220V. If the same machine is run as a motor it takes a line current of 20A from 220V supply. The speed of the machine as a motor will be

A. 800 rpm.

B. more than 800 rpm.

C. less than 800 rpm.

D. both higher or lower than 800 rpm.

Ans. C

Sol. $N_g = E_g$ (60A / Φpz)

$E_g = V + I_a R_a$; in generator

$N_m = E_b$ (60A / Φpz)

$E_b = V - I_a R_a$; in motor

$E_g > E_b$ for same terminal voltage

Therefore, $N_g > N_m$

52. A 50 Hz, 3-phase induction motor has a full load speed of 1440 r.p.m. The number of poles of the motor are

A. 4.

B. 6.

C. 12.

D. 8.

Ans. A

Sol. $N = N_s (1-S) = N_S - N_S \times S$

$1440 = N_S (1 - S)$

$N_S = 1440 / (1-S)$

$N_S = (120 f/ p) = 120 \times 50/p = 6000 p$

N_S will be closer to N i.e 1440

When P=2 ; N_S = 3000 rpm , not close to N

When P=4 ; N_s = 1500 rpm , it is closer to N

Therefore P = 4 for N=1440

53. In a 3-phase synchronous motor

A. the speed of stator MMF is always more than that of rotor MMF.

B. the speed of stator MMF is always less than that of rotor MMF.

C. the speed of stator MMF is synchronous speed while that of rotor MMF is zero.

D. rotor and stator MMF are stationary with respect to each other.

Ans. D

Sol. Because, Motor is magnetically locked into position with stator, the rotor poles are engaged with stator poles and both run synchronously in same direction Therefore, rotor & stator mmf are stationary w.r.t each other.

54. In a capacitor start single-phase induction motor, the capacitor is connected

A. in series with main winding.

B. in series with auxiliary winding.

C. in series with both the windings.

D. in parallel with auxiliary winding.

Ans. B

Sol. To make single phase motor self start. We split the phases at 90 degree. Hence, motor behaves like a two phase motor.

55. A synchro has

A. a 3-phase winding on rotor and a single-phase winding on stator.

B. a 3-phase winding on stator and a commutator winding on rotor.

C. a 3-phase winding on stator and a single-phase winding on rotor.

D. a single-phase winding on stator and a commutator winding on rotor.

Ans. C

Sol. Synchros : The basic synchro unit called a synchro transmitter. It's construction similar to that of a Three phase alternator.

56. As the voltage of transmission increases, the volume of conductor

A. increases.

B. does not change.

C. decreases.

D. increases proportionately.

Ans. C

Sol. Volume of conductor $\propto \frac{1}{V^2}$

So as transmission voltage ↑

Volume of conductor ↓

57. The size of the feeder is determined primarily by

A. the current it is required to carry.

B. the percent variation of voltage in the feeder.

C. the voltage across the feeder.

D. the distance of transmission.

Ans. A

Sol. Size of conductor depends upon amount of current flow.

58. The boundary of the protective zone is determined by the

A. Location of CT

B. sensitivity of relay used

C. Location of PT

D. None of these

Ans. B

Sol. The boundary of the protective zone is determined by the sensitivity of relay used. If the relay is more sensitive, the protective zone will be increased.

59. In a three phase transformer, if the primary side is connected in star and secondary side is connected in delta, what is the angle difference between phase voltage in the two cases.

A. delta side lags by -30°.

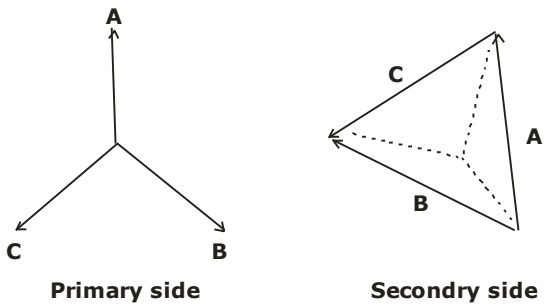
B. delta side lags by -30°.

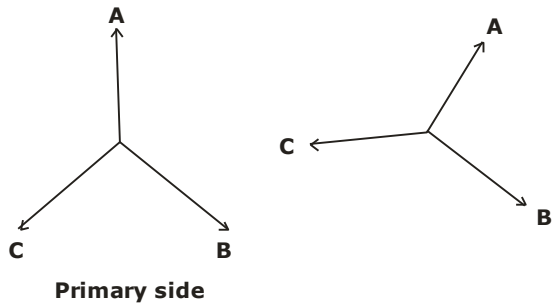
C. delta side lags by 30°.

D. star side leads by -30°.

Ans. C

Sol. delta side lags by 30°





60. To achieve low PT error, the burden value should be _____.

A. low

B. high

C. medium

D. none of the above

Ans. A

Sol. In a Potential transformer, burden should be in permissible range to maintain errorless measurement.

61. Slip of the induction machine is 0.02 and the stator supply frequency is 50 Hz. What will be the frequency of the rotor induced emf?

A. 10 Hz.

B. 50 Hz.

C. 1 Hz.

D. 2500 Hz.

Ans. C

Sol. Given : s = 0.02 ; f = 50 Hz

Therefore, frequency of rotor induced emf = s f

= 0.02 x 50 = 1.0 Hz

62. A 4 pole lap wound dc shunt motor rotates at the speed of 1500 rpm, has a flux of 0.4 mWb and the total number of conductors are 1000. What is the value of emf?

A. 100 Volts.

B. 0.1 Volts.

C. 1 Volts.

D. 10 Volts.

Ans. D

Sol. Given N = 1500 rpm, Φ = 0.4 mWb,

Z = 1000, P = 4, & A= 4

Therefore, $E_b = N\Phi PZ / 60 A$

$= 1500 \times 0.4 \times 4 \times 1000 \times 10^{-3} / 60 \times 4$

= 60/6 = 10 volts

63. The synchronous reactance of the synchronous machine is _____.

A. Ratio between open circuit voltage and short circuit current at constant field current

B. Ratio between short circuit voltage and open circuit current at constant field current

C. Ratio between open circuit voltage and short circuit current at different field current

D. Ratio between short circuit voltage and open circuit current at different field current

Ans. A

Sol. The Synchronous reactance of a synchronous machine is a total steady state reactance, presented to applied voltage, when rotor is running synchronously without excitation.

Therefore, $X_S = E_f / I_S$

= Emf of OC for same I_f / short circuit current

64. A 3 stack stepper motor with 12 numbers of rotor teeth has a step angle of _____.

A. 12°

B. 8°

C. 24°

D. 10°

Ans. D

Sol. Given m = 3,

N_r = 12

Step angle = 360 / m x N_r = 360 /3 x 12 = 10°

65. In case of a universal motor, torque pulsation is minimized by _____. A. load inertia

B. rotor inertia

C. both rotor and load inertia

D. none of the above

Ans. C

Sol. In a universal motor, torque pulsation is minimized by rotor and load inertia.

66. Oil-filled cable has a working stress of _____ kV/mm

A. 10

B. 12

C. 13

D. 15

Ans. D

Sol. This is defined by dielectric strength of mineral oil i.e. 15 kV/mm.

67. Inverse definite minimum time lag relay is also called _____

A. pilot relay.

B. differential relay.

C. over current relay.

D. directional overcurrent relay.

Ans. B

Sol. Inverse definite minimum time lag relay characteristic is inverse but minimum time is fixed. The operating time is inversely proportional to the magnitude of actuating quantity.

68. Specific heat of nickel–chrome is _____

A. 0.112

B. 0.106.

C. 0.108.

D. None of these

Ans. D

None of these Specific heat of Nickel-Chrome is 440 J/kg°C to 450 J/kg°C

69. The polarity test is not necessary for the single-phase transformer shown in Fig. 1 so as to correctly determine _____of the transformer.

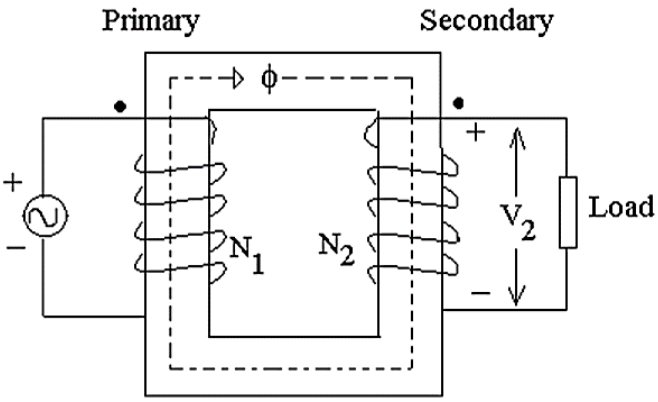


Fig. 1

A. shunt branch parameters.

B. transformation ratio.

C. series parameters.

D. None of the above

Ans. D

Sol. Polarity test is required for parallel operation of transformers to know the direction of current flow in secondary circuit w.r.t primary circuit.

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

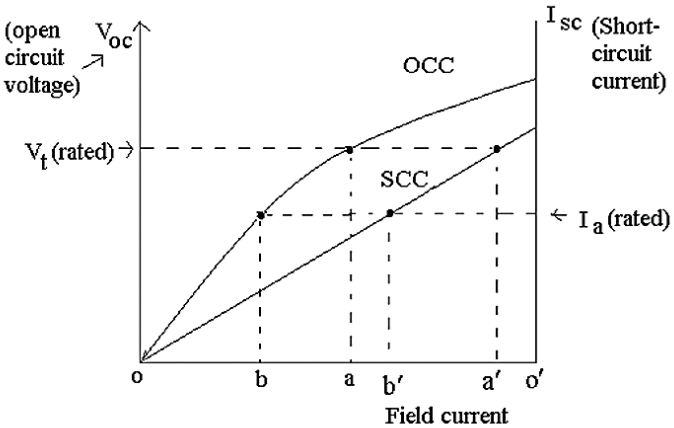


Fig.2

A. $\frac{oa}{ob}$

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

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

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

Ans. B

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

71. The speed-torque characteristics of a DC series motor are approximately similar to those of the _____motor.

A. universal

B. synchronous

C. DC shunt

D. two-phase

Ans. A

Sol. Universal motor has same characteristics as DC series motor and also known as an a.c series motor.

72. The rotor frequency for a 3 phase 1000 RPM 6 pole induction motor with a slip of 0.04 is_____Hz

A. 8

B. 4

C. 6

D. 2

Ans. D

Sol. Given: N=1000 rpm ; P= 6; s = 0.04;

and f = N×P/ 120

= 1000 × 6/120

= 50 Hz

Rotor frequency

$f_r = s \times f = 0.04 \times 50$

= 2.0 Hz

73. The torque-speed characteristics of an a.c. operated universal motor has a _____characteristic and it_____ be started under no-load condition.

A. inverse, can

B. nearly inverse, can

C. inverse, cannot

D. nearly inverse, cannot

Ans. C

Sol. If torque is zero then speed may exceed up to infinite, that is dangerous for machine and machine can be damaged. N α 1/ T

74. In the heating process of the _____type a simple method of temperature control is possible by means of a special alloy which loses its magnetic properties at a particular high temperature and regains them when cooled to a temperature below this value.

A. Indirect induction over

B. core type induction furnace

C. coreless induction furnace

D. high frequency eddy current

Ans. D

Sol. Magnetic property of alloy changes with change of the temperature and Heat is produced due to eddy current = i^2R and i α f^2

75. In order to reduce the harmful effects of harmonics on the A.C. side of a high voltage D.C. transmission system _____are provided.

A. synchronous condensers

B. shunt capacitors

C. shunt filters

D. static compensators

Ans. C

Sol. $X_c = 1/\omega c$

76. An a.c. tachometer is just a _____with one phase excited from the carrier frequency.

A. two-phase A.C. servomotor

B. two-phase induction motor

C. A.C. operated universal motor

D. hybrid stepper motor.

Ans. D

Sol. This is a special purpose machine whose stator coil can be energized by electronically switched current.

77. The torque, in a _____is proportional to the square of the armature current

A. DC shunt motor

B. stepper motor

C. 2-phase servomotor

D. DC series motor

Ans. D

Sol. T_a α Φ. Ia and Φ α Ia; therefore T_a α Ia^2

78. The synchronous speed for a 3 phase 6-pole induction motor is 1200 rpm. If the number of poles is now reduced to 4 with the frequency remaining constant, the rotor speed with a slip of 5% will be _____.

A. 1690 rpm

B. 1750 rpm

C. 1500 rpm

D. 1710 rpm

Ans. D

Sol. Given : N_{s1} =1200, P_1 = 6,

P_2 = 4, s = 0.05,

Frequency f = $N_s \times P/120$

= 120 × 6/120 = 60 Hz

rotor frequency f = s.f = 0.05 × 60 = 3.0 H_z

Now, N_{s2} = 120 × 60 /4 = 1800

and Ns – N = 120 f / P_2

Therefore, $N=N_s - 120 f / P_2 = 1800 - 120 \times 0.05 \times 60/4 = 1800 - 90 = 1710$

79. The eddy current loss in an a-c electric motor is 100 watts at 50 Hz. Its loss at 100 Hz will be

A. 25 watts

B. 59 watts

C. 100 watts

D. 400 watts

Ans. D

Sol. Eddy current losses α f^2

New loss α $(2f)^2$

New loss α $4f^2$

$\therefore$ 4 times

80. The maximum power for a given excitation in a synchronous motor is developed when the power angle is equal to

A. 0°

B. 45°

C. 60°

D. 90°

Ans. A

Sol. In the synchronous motor

$$P = \frac{EV}{X}\sin\delta$$

Maximum power is developed who when $\sin\delta = 1$ i.e. $\delta = 90°$

81. A commutator in a d.c. machine

A. Reduces power loss in armature.

B. Reduces power loss in field circuit.

C. Converts the induced a.c armature voltage into direct voltage.

D. Is not necessary.

Ans. C

Sol. As name suggests, it commutes ac into dc.

82. The speed of a d.c. shunt motor at no-load is

A. 5 to 10%

B. 15 to 20%

C. 25 to 30%

D. 35 to 40%

Ans. A

Sol. $$N = \frac{V - I_aR_a}{K\phi}$$

For DC shunt motor φ = const.

So at No. load I_a90°

So $N = V - I_aR_a = 0$

N at no-load 5 to 10% higher than its rated speed.

83. The efficiency of a transformer is mainly dependent on

A. core losses.

B. copper losses.

C. stray losses.

D. dielectric losses.

Ans. B

Sol. The efficiency of transformer is mainly dependent on the copper loss. Since core loss is constant for all value of load. Only copper loss vary with the load.

84. When two transformers are operating in parallel, they will share the load as under:

A. proportional to their impedances.

B. inversely proportional to their impedances.

C. 50% — 50%

D. 25% — 75%

Ans. B

Sol. When transformer are operating in parallel they will share the load as inversely proportional to their impedance.

$$S_r \propto \frac{1}{Z_{pv}}$$

85. If the voltage is reduced to half, the torque developed by an induction motor will be reduced to

A. $\frac{1}{4}$ of original torque.

B. $\frac{1}{2}$ of original torque.

C. $\frac{1}{8}$ of original torque.

D. $\frac{1}{16}$ of original torque.

Ans. A

Sol. $\tau \propto V^2$ in the induction motor. If voltage is half than torque must be ¼ times of original torque.

86. A 3-phase, 400 volts, 50 Hz, 100 KW, 4 pole squirrel cage induction motor with a rated slip of 2% will have a rotor speed of

A. 1500 rpm

B. 1470 rpm

C. 1530 rpm

D. 1570 rpm

Ans. B

Sol. $N = N_S (1 - S)$ and $N_S = 120 f / p$

$= 120 \times 50 / 4 = 1500$ rpm

$\therefore N = 1500 (1-0.02) = 1470$ rpm

87. If the phase angle of the voltage coil of a directional relay is o 50 , the maximum torque angle of the relay is

A. 130°

B. 100°

C. 50°

D. 25°

Ans. C

Sol. Torque α Power

Power α Voltage

Therefore, It has same angle as 'V' has.

88. The voltage at the two ends of a transmission line are 132 KV and its reactance is 40 ohm. The Capacity of the line is

A. 435.6 MW

B. 217.8 MW

C. 251.5 MW

D. 500 MW

Ans. A

Sol. Power transfer capacity is

$$P = \frac{V^2}{Z}$$

$$P = \frac{(132)^2}{40} = 435.6 \text{ Mw}$$

89. A 220/440 V, 50 Hz, 5 KVA, single phase transformer operates on 220V, 40Hz supply with secondary winding open circuited. Then

A. Both eddy current and hysteresis losses decreases.

B. Both eddy current and hysteresis losses increases.

C. Eddy current loss remains the same but hysteresis loss increases.

D. Eddy current loss increases but hysteresis loss remains the same.

Ans. A

Sol. $W_h = k_h f B_m^{1.6}$ and $W_e = k_e f^2 B_m^2 . k$

Therefore, hysteresis and eddy current losses will be decreased when frequency decreases.

90. A synchronous motor is operating on no-load at unity power factor. If the field current is increased, power factor will become

A. Leading & current will decrease

B. Lagging & current will increase.

C. Lagging & current will decrease.

D. Leading & current will increase.

Ans. A

Sol. Initially synchronous motor is operating at no load and unity power factor. When field current increases, the excitation will increase. Therefore, p.f will be leading and current will be I CosΦ < I

91. A d.c. shunt motor runs at no load speed of 1140 r.p.m. At full load, armature reaction weakens the main flux by 5% whereas the armature circuit voltage drops by 10%. The motor full load speed in r.p.m. is

A. 1080

B. 1203

C. 1000

D. 1200

Ans. A

Sol. $N_2 / N_1 = E_{b2} / E_{b1} \times \Phi_1 / \Phi_2$; $\Phi_2 = 0.95\Phi_1$; $E_{b2} = 0.9E_{b1}$

$\therefore N_2 / 1140 = 0.9 \times 1/0.95$

$N_2 = 1080$

92. The introduction of interpoles in between the main pole improves the performance of d.c. machines, because

A. The interpole produces additional flux to augment the developed torque.

B. The flux waveform is improved with reduction in harmonics.

C. The inequality of air flux on the top and bottom halves of armature is removed.

D. A counter e.m.f is induced in the coil undergoing commutation.

Ans. D

Sol. Counter e.m.f is produced, it neutralizes the reactive emf.

93. The rotor power output of a 3-phase induction motor is 15 KW and corresponding slip is 4%. The rotor copper loss will be

A. 600 W

B. 625 W

C. 650 W

D. 700 W

Ans. B

Sol. Rotor copper losses = rotor input- rotor output

and output = (1— s) input

∴ Input = output/(1— s) = 15000 /1— 0.04 = 15625

∴ loss = 15625 — 1500 = 625 watt

94. The direction of rotation of hysteresis motor is reversed by

A. Shift shaded pole with respect to main pole

B. Reversing supply lead

C. Either A or B

D. Neither A nor B

Ans. A

Sol. In the hysterisis motor, the direction of rotation can be reversed by shifting the shaded pole region with respect to main pole. But not by changing supply lead because it has ac supply.

95. A 1.8° step, 4-phase stepper motor has a total of 40 teeth on 8 pole of stator. The number of rotor teeth for their rotor will be

A. 40

B. 50

C. 100

D. 80

Ans. B

Sol. Step angle 'β' = $N_S - N_r$ / $N_S N_r$ x 360°

∴ 1 — 8 = —40 + N_r/40 N_r x 360°

N_r = 50

96. Low head plants generally use

A. Pelton Turbines

B. Francis Turbine

C. Pelton or Francis Turbine

D. Kaplan Turbines

Ans. A

Sol. Pelton turbine are used for low head and Kaplan turbine are used for high head.

97. The charging reactance of 50 Km length of line is 1500Ω. The charging reactance for 100Km length of line will be

A. 1500 Ω

B. 3000 Ω

C. 750 Ω

D. 600 Ω

Ans. B

Sol. Characteristic reactance per km = 1500/50 = 30 ohms ∴ Characteristic reactance per 100km = 30 x 100 = 3000 ohms

98. Electric ovens using heating elements of _____ can produce temperature up to 3000°C.

A. Nickel

B. Graphite

C. Chromium

D. Iron

Ans. C

Sol. Chromium has high melting point.

99. In DC generators, armature reaction is produced actually by

A. Its field current.

B. Armature conductors.

C. Field pole winding.

D. Load current in armature.

Ans. D

Sol. Because load current in armature gives rise to armature mmf which react with main field mmf.

100. Two transformers operating in parallel will share the load depending upon them

A. Rating.

B. Voltage regulation

C. Efficiency.

D. Per-unit impedance.

Ans. A

Sol. When the transformer operating in parallel will share the load depending upon-

1. Rating

2. Impedance of transformer

101. As compared to shunt and compound DC motors, the series DC motor will have the highest torque because of its comparatively _____ at the start.

A. Lower armature resistance.

B. Stronger series field.

C. Fewer series turns.

D. Larger armature current.

Ans. D

Sol. $T \propto \Phi I_a$ (before saturation)

$\Phi \propto I_a$

$T \propto I_a^2$

102. A 400kW, 3-phase, 440V, 50Hz induction motor has a speed of 950 r.p.m. on full load. The machine has 6 poles. The slip of the machine will be _____.

A. 0.06

B. 0.10

C. 0.04

D. 0.05

Ans. D

Sol. $N = N_s (1 - S)$

$950 = 120 \times 50 (1-S)/6$

$S = 0.05$

103. Reduction in the capacitance of a capacitor-start motor, results in reduced

A. Noise.

B. Speed.

C. Starting torque.

D. Armature reaction.

Ans. C

Sol. Reduction in the capacitance reduces starting voltage, which results in reduced starting torque.

104. Regenerative braking

A. Can be used for stopping a motor.

B. Cannot be easily applied to DC series motors.

C. Can be easily applied to DC shunt motors

D. Cannot be used when motor load has overhauling characteristics.

Ans. B

Sol. Because reversal of I_a would also mean reversal of field and hence of E_b

Regenerative breaking:

In this Ia must be reversed.

In the DC series motor

$\varphi \propto I_a$

If I_a is $-V_e$ of Ia than

$\varphi \propto -V_e$

$\psi \propto \varphi I_a$

$\psi \propto (-V_e)(-V_e)$

$\psi \propto + V_e$

Torque remains in the same direction. So it is difficult to break the DC series motor by this method.

105. At present level of technology, which of the following method of generating electric power from sea is most advantageous?

A. Tidal power.

B. Ocean thermal energy conversion

C. Ocean currents.

D. Wave power.

Ans.

Sol. A At present level of technology, tidal power for generating electric power from sea is most advantageous because of constant availability of tidal power.

106. If the field circuits of an unloaded salient pole synchronous motor gets suddenly open circuited, then

A. The motor stops.

B. It continues to run at the same speed.

C. Its runs at the slower speed.

D. It runs at a very high speed.

Ans. B

Sol. The motor continues to run at the same speed because synchronous motor speed does not depend upon load,

$$N = \frac{120 \times f}{p}.$$

107. Electric resistance seam welding uses _____ electrodes.

A. Pointed

B. Disc.

C. Flat

D. Domed

Ans. B

Sol. Disc type electrodes are used for electric resistance seam welding.

108. For LV applications (below 1 kV),_____ cables are used.

A. Paper insulated.

B. Plastic.

C. Single core cables.

D. Oil filled.

Ans. C

Sol. For low voltage applications single core cables are suitable.

109. No load current in a transformer:

A. lags the applied voltage by 90°

B. lags the applied voltage by somewhat less than 90°

C. leads the applied voltage by 90°

D. leads the applied voltage by somewhat less than 90°

Ans. B

Sol. The primary input current under no load conditions has to supply (i) iron losses in the core i.e hysteresis loss and eddy current loss (ii) a very small amount of Cu loss in the primary (there being no Cu loss in secondary as it is open)

110. A transformer operates most efficiently at 3/4th full load. Its iron (PI) and copper loss (PCu) are related as:

A. P_I/P_{Cu} = 16/9

B. P_I/P_{Cu} = 4/3

C. P_I/P_{Cu} = 3/4

D. P_I/P_{Cu} = 9/16

Ans. D

Sol. If P_{Cu} is the Cu loss at full load, its value at 75% of full load is

$P_{Cu} \times (0.75)^2 = 9/16\ P^{Cu}$

At maximum efficiency, it equals the iron loss P_I which remains constant through out. Hence max. efficiency at

$P_I = 9/16\ P_{Cu}$

Or $P_I / P_{Cu} = 9/16$

111. In a salient pole synchronous machine (usual symbols are used):

A. $x_q > x_d$

B. $x_q = x_d$

C. $x_q > x_d$

D. $x_q = 0$

Ans. C

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

112. The armature of a dc machine is laminated to reduce:

A. Eddy current loss

B. Hysteresis loss

C. copper losses

D. friction and windage losses

Ans. A

Sol. Thinner the laminations, greater is the resistance offered to the induced e.m.f., smaller the current and hence lesser the I^2R loss in the core.

113. The resistance representing mechanical output in the equivalent circuit of an induction motor as seen from the stator is:

A. $r_2'\left(\frac{1}{s}-1\right)$

B. $\frac{r_2'}{s}$

C. $r_2^2\left(\frac{1}{s}-1\right)$

D. $\frac{r_2}{s}$

Ans. ?

Sol. A Mechanical Power developed by the rotor (P_m) or gross power developed by rotor (P_g)

= rotor input – rotor Cu losses

= $(3^{I/2} R_2' / S) — (3I^{/2} R_2')$

= $3I^{/2} R_2' (1/ S — 1)$

114. A single phase Hysteresis motor

A. can run at synchronous speed only

B. can run at sub synchronous speed only

C. can run at synchronous and super synchronous speed

D. can run at synchronous and sub synchronous speed

Ans. A

Sol. The rotor revolves synchronously because the rotor poles magnetically lock up with the revolving stator poles of opposite polarity

115. The temperature of resistance furnaces can be controlled by changing the:

A. applied voltage

B. number of heating elements

C. circuit configuration

D. All of the above

Ans. D

Sol. Temperature of resistance furnaces can be controlled by changing either applied voltage or by number of heating elements or by circuit configuration.

116. The line trap unit employed in carrier current relaying:

A. offers high impedance to 50 Hz power frequency signal

B. offers high impedance to carrier frequency signal

C. offers low impedance to carrier frequency signal

D. Both (A) & (C)

Ans. B

Sol. The line trap unit employed in carrier current relaying offers high impedance to carrier frequency signal.

Because carrier frequency range is 35 km – 500 kHz

$X_L = 2\Pi f_1$

Where f increases X_L will also increases

117. For a line voltage V and regulation of a transmission line R

A. $R \propto V$

B. $R \propto 1/V$

C. $R \propto V^2$

D. $R \propto 1/V^2$

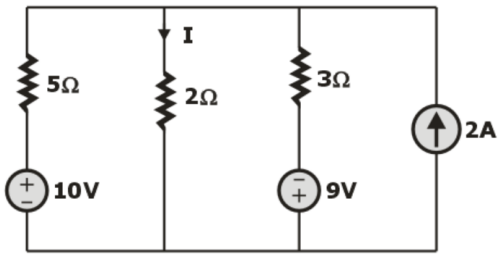
Ans. B

Sol. R ɑ 1/V

Regulation = $(V_0 - V_L) / V_0$, if V_L is high the $(V_0 - V_L)$ will be low.

Therefore R ɑ 1/V

118. Find the value of current I in the 2 Ω resistor?



A. 0.525 A

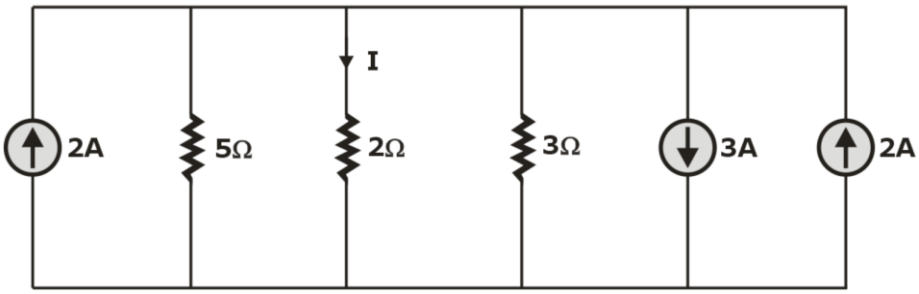
B. 0.434 A

C. 0.625 A

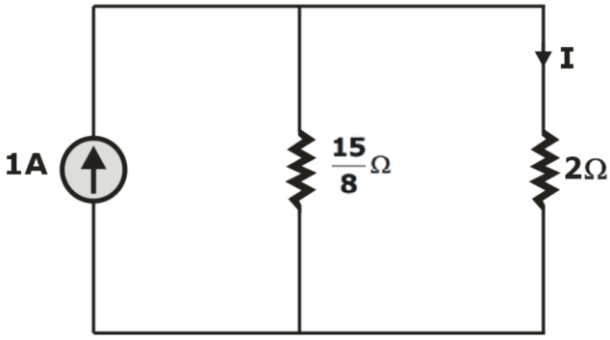
D. 1 A

Ans. B

Sol. Applying source transformation, the circuit reduces to

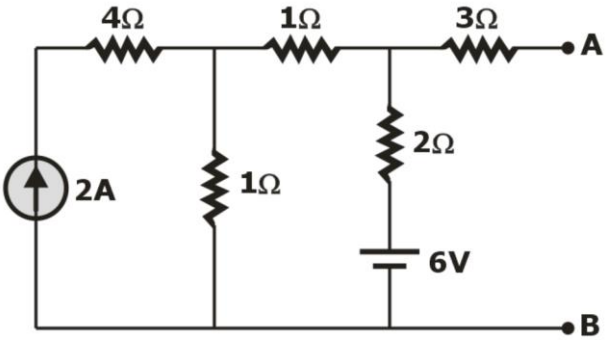


Now 5 Ω and 3Ω are in parallel, and apply current division rule



$$I = \frac{1\times\frac{15}{8}}{2+\frac{15}{8}} = \frac{\frac{15}{8}}{\frac{16+15}{8}} = \frac{15}{31} = 0.434\,\text{A}$$

119. Find the Norton equivalent resistance across the terminals A and B?



A. 2 Ω

B. 3 Ω

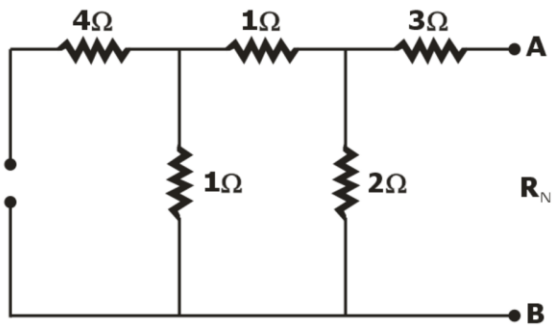
C. 4 Ω

D. 5 Ω

Ans. C

Sol. To calculate the Norton's equivalent resistance, voltage and current sources are replaced by their internal resistances. Therefore, current source is replaced by open circuit and voltage source is replaced by short circuit.

The circuit reduces to



$$R_N = ((1+1) \| 2) + 3 = (2 \| 2) + 3 = 1 + 3 = 4\Omega$$

120. The internal resistance of ideal voltage source and ideal current source are

A. 0 and ∞

B. 0 and 0

C. ∞ and ∞

D. ∞ and 0

Ans. A

Sol. In an ideal voltage source, the source resistance or internal resistance must be zero because no internal voltage drop must be present ideally and in an ideal current source, the source resistance or internal resistance must be infinity.

121. Which of the following mode of operation of NPN transistor occurs when emitter is negative with respect the base?

A. Saturation region

B. Forward active region

C. Cut-off region

D. Reverse active region

Ans. B

Sol. For the active operation of NPN transistor, Base emitter must be forward biased i.e. base must be positive with respect to emitter or emitter is negative with respect to base.

122. Resistivity of a semiconductor depends on

A. The atomic value of the semiconductor

B. Cross-sectional area of the semiconductor

C. Volume of the semiconductor

D. Length of the semiconductor

Ans. A

Sol. The resistivity of the semiconductor depends on the chemical properties or the structure of the semiconductor crystal which signifies its atomic value.

123. The fermi level for the n-type extrinsic semiconductor lies

A. Close to the valence band

B. At the middle of the band gap

C. Close to the conduction band

D. One-fourth above the valence band

Ans. C

Sol. In n-type extrinsic semiconductor, the fermi level lies nearly close to the conduction band.

124. What is the ratio of peak inverse voltage for mid-point and full wave bridge rectifier respectively?

A. 2:1

B. 1:2

C. 1:1

D. None of these

Ans. A

Sol. The peak inverse voltage for mid-point (two diode rectifier) is $2V_m$ and the peak inverse voltage for full wave bridge rectifier is V_m.

125. A Zener diode operates as voltage regulator in which of the following biasing?

A. Only forward biasing

B. Only reverse biasing

C. Either forward or reverse biasing

D. Zero biasing

Ans. B

Sol. Zener diode is a highly doped p-n junction diode and as of normal diode, it works like a p-n junction diode in case of forward biasing but due to the heavily doped nature, in reverse biasing, the diode break downs and operates as a constant voltage source regulator.

126. Which of the following has the least number of free electrons in it?

A. Superconductors

B. Semiconductors

C. Conductors

D. Insulators

Ans. D

Sol. Conductivity of any material depends on the number of free electrons present in it. Higher the number of free electrons, higher the conductivity of the material and vice-versa. Therefore, insulator shows the least conductivity, hence it has least number of free electrons among all other materials.

127. The current gain of common base and common emitter amplifier is respectively

A. Both are less than 1

B. Both are greater than 1

C. Less than 1 and greater than 1

D. Greater than 1 and less than 1

Ans. C

Sol. The current gain of the common base amplifier is always less than 1 and current gain of common emitter is always greater than unity.

128. What is the maximum load that is permitted in a power circuit?

A. 2 KW

B. 3 KW

C. 5 KW

D. 10 KW

Ans. B

Sol. The maximum load that is permitted in a power circuit is 3 KW.

129. What should be the value of earth resistance for small sub-stations?

A. 1 Ω

B. 5 Ω

C. 2 Ω

D. 0.5 Ω

Ans. C

Sol. The value of earth resistance depends on the power station which is categorized as follows:

For small sub-station: 2 Ω

For large substations: 0.5 Ω

For domestic: 5 Ω

130. Which of the following wiring have a very long life span?

A. Cleat wiring

B. Batten wiring

C. Conduit wiring

D. Casing capping wiring

Ans. C

Sol. An electrical conduit is a tube like structure which is used to protect and route electrical wiring in a building or an organization. It can be made up of metal, plastic, fiber or fired clay. These are very rigid but flexible in nature.

131. What is the purpose of using choke in a fluorescent tube?

A. Decrease current

B. Increase current

C. Decrease voltage

D. Increase voltage

Ans. D

Sol. The purpose of choke coil is to provide a very high voltage initially between the filaments, due to which gas is ionized and will help in normal operation of the tube.

132. The most important factor with respect to the lighting quality is

A. Uniform lighting

B. Illumination

C. Glare

D. Color

Ans. C

Sol. Glare is defined as sensation caused by luminance's which has a major role in lighting quality.

133. Arc lamps operates at

A. Zero power factor

B. Unity power factor

C. Low Lagging power factor

D. High Leading power factor

Ans. C

Sol. Arc lamps are very high lagging loads, therefore their power factor is very low.

134. The most common type of unsymmetrical faults in three phase system is

A. Double line to ground fault

B. Single line to ground fault

C. Line to line fault

D. Three phase fault

Ans. B

Sol. Single line to ground fault is the most common unsymmetrical fault.

135. What is the ratio of line-to-line capacitance and line-to-neutral capacitance is

A. 2:1

B. 1:2

C. 1:4

D. 4:1

Ans. B

Sol. The capacitance of the two line system is given as

$$C = \frac{\pi \in}{\ln\left(\frac{d}{r}\right)} \text{F/m}$$

$$\frac{C_{l-l}}{C_{l-n}} = \frac{C}{2C} = \frac{1}{2} = 1:2$$

In other words, line to neutral capacitance is twice the line to line capacitance.

136. The reverse recovery voltage will be maximum for power factor of

A. 0.707

B. 0.866

C. 0.5

D. 0

Ans. D

Sol. The reverse recovery voltage will be maximum at zero power factor.

137. Which of the following is/are the advantages of transmitting power at high voltages?

A. It will reduce the voltage drop in the line impedance

B. Power loss will be less

C. Magnitude of the current will be less

D. All of these

Ans. D

Sol. The following are the advantages of transmitting power at high voltage as follows:

1. It will reduce the voltage drop in the line impedance.
2. Power loss will be less.
3. Magnitude of current will be less.

138. How many units are supplied by a motor developing 2 HP (British) for 6 hours (Take 1 unit = 1 KWhr)?

A. 8.952 units

B. 7.45 units

C. 8.88 units

D. None of these

Ans. A

Sol. 1 HP = 746 Watts

Total power = 2 x 746 x 6 = 8952 Watts

1 unit = 1 KWhr

Number of units = 8.952 units

139. If voltage is increased by "n" times, then the size of the conductor would be

A. Increased by "n" times

B. Increased by "n^2" times

C. Reduced by "1/n" times

D. Reduced by "$1/n^2$" times

Ans. D

Sol.

$$P = VI\cos\theta$$

$$I = \frac{P}{V\cos\theta}$$

Power loss in conductor,

$$P_L = I^2 R = \left(\frac{P}{V\cos\theta}\right)^2 R$$

$$P_L = \frac{P^2 R}{V^2 \cos^2\theta}$$

$$\frac{1}{R} = \frac{P^2}{P_L V^2 \cos^2\theta}$$

$$Now, R = \frac{\rho l}{A}$$

$$\frac{1}{R} = \frac{A}{\rho l}$$

$$\frac{A}{\rho l} = \frac{P^2}{P_L V^2 \cos^2\theta}$$

$$A \propto \frac{1}{V^2}$$

Therefore, by increasing the voltage, the area of cross section of the conductor reduces. When voltage is increased by "n" times, hence the size of the conductor reduces by $1/n^2$ times.

140. Power distribution by cable is generally adopted for line length

A. Less than 50 km

B. Above 50 km

C. Less than 10 km

D. Above 10 km

Ans. C

Sol. The length of cable for power distribution is generally less than 10 km.

141. The rated voltage of a 3 phase power system is given as

A. Rms line to line voltage

B. Peak phase voltage

C. Rms phase voltage

D. Peak line to line voltage

Ans. A

Sol. The rated voltage of 3 phase power system is rms line to line voltage.

142. The rotor input when, rotor copper loss in an induction motor is 600 W and slip is 3% is

A. 18 kW

B. 200 kW

C. 20 kW

D. 25 kW

Ans. C

Sol. Rotor input = Air gap power P_q

$$= \frac{\text{Rotor Copper loss}}{s}$$

$$\text{slip}(s) = 3\% = 0.03$$

$$= \frac{600}{0.03} = 20 \text{ KW}$$

So the input power of a motor is 20 KW.

143. If copper loss of transformer at $\frac{7}{8}$ th full load is 4900 W, then its full load copper loss would be

A. 5600 W

B. 6400 W

C. 373 W

D. 429 W

Ans. B

Sol. Let the full load copper loss of transformer is x watt.

According to question

Then $x \times \left(\frac{7}{8}\right)^2 = 4900$

As Cu loss ∞ I^2

$$x = 4900 \times \frac{64}{49} = 6400 \text{ watt}$$

So the full load copper loss is 6400 W.

144. If a 500 KVA, 200 Hz transformer is operated at 50 Hz, its KVA rating will be

A. 2000 KVA

B. 125 KVA

C. 250 KVA

D. 1000 KVA

Ans. B

Sol. For the same load (constant load)

$$S \infty E_{ind} \qquad (E_{ind} = \text{Induced emf})$$

$$S \infty f \text{ as } E_{ind} = 4.44 \text{ fN}\phi$$

$$\frac{S_1}{S_2} = \frac{f_1}{f_2}$$

$$S_2 = S_1 \frac{f_2}{f_1} = 500 \times \frac{50}{200} = 125 \text{ KVA}$$

So, the rating current will be 125 KVA.

145. The angle between induced emf and terminal voltage on no-load for a single phase alternator is

A. 180°

B. 90°

C. 0°

D. 270°

Ans. C

Sol. At no load

$I_a = 0$

$V = E_f - I_a(R_a + jX_a)$

$\vec{V} = \vec{E}_f \quad \delta = 0^\circ$

So, at no load for a single phase alternator.

146. A salient pole synchronous generator connected to an infinite bus power will deliver maximum power at a power angle of

A. δ = 0

B. δ = 90°

C. δ = 45°

D. δ = 30°

Ans. C

Sol. $P = \frac{VE_f}{X}\sin\delta$

For P_{max}, $\sin\delta = 1$

$= \sin 90^\circ$

$\therefore \quad \delta = 90^\circ$

$\therefore \quad P_{max} = \frac{VE_f}{X}$

So, the power angle will be 90°.

147. The efficiency of a loo KVA transformer is 0.98 at full as well as half load. For this transformer at full load the copper loss

A. is less than core loss

B. is equal to core loss

C. is more than core loss

D. All the above

Ans. C

Sol. η at full load = η at half load = 0.98

η at full load = 0.98

$$= \frac{P_{out}}{P_{out} + P_{co} + P_{cu\ at\ fL}}$$

$$= \frac{100}{100 + P_{co} + P_{cu\ at\ fL}}$$

Left Pf load be unity

$P_{co} + P_{cu\ fL} = 2.0408 \quad . \quad ..(i)$

η at half load = 0.98

$$= \frac{100 \times 1/2}{100 \times 1/2 \times P_{co} + \left(\frac{1}{4}\right) P_{cu\ at\ fL}}$$

$$P_{co} + \frac{1}{4} Pcu_{at\ fL} = 1.020408 \qquad ...(ii)$$

Solving (i) and (ii) we get

$P_{co} = 0.6802$ KW,

$P_{cu\ at\ fL} = 1.3605$ KW

$P_{cu\ at\ fL} > P_{co}$

148. Variation in dc excitation of a synchronous motor causes variation in

A. speed of motor

B. power factor

C. armature current

D. both (b) and (c)

Ans. D

Sol. Variation is dc excitation of a synchronous motor causes variation in power factor verses field excitation and armature current verses field excitation respectively.

149. For a 3-phase, 4-pole, 50 Hz synchronous motor the frequency, no. of poles, and the load torque are all halved. The motor speed will be

A. 375 rpm

B. 75 rpm

C. 1500 rpm

D. 3000 rpm

Ans. C

Sol. $\because \quad N_1 = \frac{120f}{P_1}$

$\because \quad f_1 = 50$ Hz, $P_1 = 4$

$$As, N_1 = \frac{120 f_1}{P_1}$$

Here f1 = Initial frequency = 50 Hz

P1 = No. of poles (initial) = 4

And $f_2 = \frac{f_1}{2}, P_2 = \frac{P_1}{2}$ (from question)

$$N_2 = \frac{120 f_2}{P_2} = \frac{120.f_1}{2.\frac{P_1}{2}} = \frac{120\ f_1}{P_L}\ f$$

$$= \frac{120 \times 50}{4} = 1500 \text{ rpm.}$$

150. A 4-pole, 3-phase induction motor is running at 4% slip at full load. If the speed of the motor is 750 rpm, the supply frequency is

A. $17\frac{2}{3}$ Hz

B. 25 Hz

C. 50 Hz

D. 60 Hz

Ans. B

Sol. No. of revolutions (N_r) = 750 rpm

Slip at full load (s) = 0.04

No. of poles (P) = 4

$$N_s = \frac{120f}{P} \quad \text{...(i)}$$

$$\because \quad N_r = N_s(1-s)$$

$$\therefore \quad N_s = \frac{N_r}{1-s}$$

$$= \frac{750}{1-0.04}$$

$$= \frac{750}{0.96} = 781.25 \text{ rpm}$$

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