1. A universal motor is one which

A. can run on any value of supply voltage

B. has infinitely varying speed

C. can operate on ac as well as dc voltage

D. can work as single-phase or three-phase motor

Ans. C

Sol.: Universal motor can operate both AC and DC supply Voltage.

2. The magnetising current of a transformer is usually small because it has _____

A. Small air gap

B. Large leakage flux

C. Laminated silicon steel core

D. Fewer rotating parts

Ans. A

Sol.: Air Gap increases the reluctance in the magnetic path of magnetic lines of force. When there is an air gap in the magnetic circuit the reluctance is high owing to the permeability of air which is much lower as compared to ferromagnetic materials. The mmf required to overcome that (maintaining flux density in the air gap) is more.

3. A reluctance motor

A. is self-starting

B. is constant speed motor

C. excitation

D. all options are correct

Ans. D

Sol.: From the principle of operation of reluctance motor, If is a self starting & maintains constant speed and it requires DC excitation for it's operations.

4. Transformer core is laminated,

A. because it is difficult to fabricate solid core.

B. because laminated core provides high flux density.

C. to avoid eddy current and hysteresis losses.

D. to increase the main flux.

Ans. C

Sol.: If the area is large current has got a different direction to flow and this will cause in loss of power. So, to reduce these eddy currents and hysteresis losses., transformer core is laminated and current is made to travel in a single direction.

5. Which one of the following statements is correct?

When a 1-φ induction motor is excited with single phase AC voltage, the magnetic field set up is equivalent to:

A. Two fields, rotating in opposite direction with different directions.

B. Two fields, rotating at synchronous speed in opposite directions.

C. Two fields, rotating at synchronous speed.

D. Two fields, rotating in same direction but at different speeds.

Ans. B

Sol.: Two fields, rotating in opposite direction with different speeds which is known as double-field revolution theory.

6. Under normal rated condition, the full load current of a DC shunt motor is 50A. If the field flux and the armature terminal voltage are reduced to half, then what should be the armature current for constant power output?

A. 25 A
B. 50 A
C. 75 A
D. 100 A

Ans. D

Sol.: For constant power output,

E_bI_a = constant

VI_a = constant (Neglecting losses)

$V_1I_{a1} = V_2I_{a2}$

Given $V_2 = \frac{V_1}{2}$

$\therefore Ia_2 = 2\ (Ia_1) = 2 \times 50 = 100$ A

7. The slip of an induction motor while conducting blocked rotor test will be:

A. s = 0
B. s = 1
C. s = 0.2
D. Cannot be determined

Ans. B

Sol.: At blocked rotor test, speed of motor; N = 0

$$S = \frac{N_s - N}{N_s} = \frac{N_s - 0}{N_s} = 1$$

8. No-load current in a transformer

A. lags behind the voltage by about 75°
B. leads behind the voltage by about 75°
C. lags behind the voltage by about 15°
D. leads the voltage by about 15°

Ans. A

Sol.: Magnetizing component of no load current is around 4-6% of full load current and lags applied voltage by 90°.

Core loss component is 1-2% of full load current and is in phase with the applied voltage. So, transformer has poor no load pf and hence no load current lags behind the voltage by about 70°-75°.

9. The hysteresis Motor:

A. Has a D.C. winding on the rotor

B. Rotor is made out of hard magnetic material

C. Has squirrel-cage winding on the rotor

D. Is not-self starting

Ans. B

Sol.: Rotor of hysteresis motor is made of hard magnetic material that has high hysteresis loss property. Example of this type of materials is chrome, cobalt steel or alnico or alloy.

10. The shunt resistance component in equivalent circuit obtained by no load test of an induction motor represents of?

A. Windage and frictional loss.

B. Core loss only

C. Core, windage and friction loss

D. Copper loss

Ans. B

Sol.: Losses in resistance of magnetizing branch represents core loss in induction machine.

11. Which of the following condition is not true about the self-excitation of DC generator?

A. Residual field must be present.

B. The polarity of excitation must aid the residual magnetism.

C. The field circuit resistance must be below the critical value.

D. The speed of operation of the machine must be below the critical speed.

Ans. D

Sol.: The conditions for self-excitation is as follows:

1) Residual field must be present.
2) The polarity of excitation must aid the residual magnetism.
3) The field circuit resistance must be below the critical value.
4) The speed of operation of the machine must be above the critical value.
5) The load resistance must be very large.

12. A squirrel-cage induction motor having a rated slip of 5% on full load has a starting torque twice as that of full-load torque. The starting current is:

A. 2 times of full load current

B. 40 times of full load current

C. 0.1 times of full-load current.

D. 6.32 times of full-load current

Ans. D

Sol.: As we known,

$$\frac{T_{st}}{T_{fl}} = \left(\frac{I_{st}}{I_{fl}}\right)^2 s_f$$

For $T_{st} = 2T_{fl}$

$s_f = 0.05$

$$\frac{2T_f}{T_f} = \left(\frac{I_{st}}{I_{fl}}\right)^2 \times 0.05$$

$$\left(\frac{I_{st}}{I_{fl}}\right)^2 = 40$$

$I_{st} = 6.32\ I_{fl}$

13. The efficiency of DC motor for maximum power transfer will be:

A. 50%
B. 80%
C. 70%
D. 100%

Ans. A

Sol.: In case of generator, for maximum output $\boxed{V_t = \frac{E_a}{2}}$

$$\eta = \left(\frac{P_{out}}{P_{in}} \times 100\right) = \frac{V_t I_L}{E_a I_a} \times 100 \left(I_L \simeq I_a\right)$$

$$\eta = \frac{V_t}{E_a} \times 100 = \frac{1}{2} \times 100 = 50\%$$

14. At high values of slip, the torque in a 3- φ IM is given by (where, V_1 = rotor phase voltage)

A. $T_e \propto \frac{SV_1^2}{R_2}$
B. $T_e \propto \frac{V_1^2 R_2}{s}$
C. $T_e \propto \frac{V_1^2 R_2}{sX_2^2}$
D. $T_e \propto \frac{sX_2^2 V_1^2}{R_2}$

Ans. C

Sol.: In general, electromagnetic torque is expressed as:

$$T_g = \frac{3 \times 60}{2\pi N_s} \times \frac{sV_1^2 R_2}{R_2^2 + \left(sX_2\right)^2}$$

$$T_g \propto \frac{sV_1^2 R_2}{R_2^2 + \left(sX_2\right)^2}$$

For higher slip, $(sX_2)^2 \gg R^2_2$

$$T_g \propto \frac{sV_1^2 R_2}{s^2 X_2^2}$$

$$T_g \propto \frac{V_1^2 R_2}{sX_2^2}$$

15. Consider the following statements regarding armature core:

1) Armature core accommodate the armature winding.

2) It offers high reluctance path for magnetic flux.

3) Armature core is laminated to reduce eddy current losses.

Which of the statements are correct?

A. 1 and 2 only

B. 1 and 3 only

C. 2 and 3 only

D. 1, 2 and 3

Ans. B

Sol.: It offers low reluctance path to the magnetic flux.

16. The main advantage of distributing the winding in slots is to

A. reduce the size of the machine

B. add mechanical strength to the winding

C. reduce the amount of copper required

D. reduce the harmonics in the generated emf

Ans. D

Sol.: The main advantage of distributing the winding in slots is to reduce the harmonics in the generated emf wave, thus making it approach a sine wave, the other two advantage are:

(i) Full utilization of the armature iron and copper and

(ii) adding rigidity and mechanical strength to the winding.

17. The correct expression of synchronizing torque expression is-

A. $T_{sy} = \frac{EV}{X_s\omega}\cos\delta$

B. $T_{sy} = \frac{EV}{X_s\omega}\sin\delta$

C. $T_{sy} = \frac{EV}{X_s\omega}\cos\delta\Delta\delta$

D. $T_{sy} = \frac{EV}{X_s\omega}\sin\delta\Delta\delta$

Ans. C

Sol.: Synchronizing power = $P_{sy}\cdot \Delta\delta$

Where P_{sy} = synchronizing power coefficient

$$P_{sy} = \frac{EV}{X_s}\cos\delta$$

$$\text{Synchronizing Torque} = \frac{P_{sy}\cdot\Delta\delta}{\omega}$$

$$T_{sy} = \frac{EV}{X_s\omega}\cos\delta\cdot\Delta\delta$$

18. Which of the following is/are correct about voltage build-up of a self-excited generator?

1) The resistance of the field circuit should be less than the critical resistance.

2) The speed of the generator should be lower than the critical speed.

A. 1 only

B. 2 only

C. 1 and 2 both

D. Neither 1 nor 2

Ans. A

Sol.: The speed of the generator should be higher than the critical speed.

19. If there is a break in 220/100 V auto transformer in the windings which is common to both HV as well as LV sides, then the output voltage on LV side will be:

A. 110 V

B. 220V

C. zero

D. $110\sqrt{2}$V

Ans. B

Sol.: When there is an open circuit in common winding then supply will directly connect to output. So, supply voltage is the LV voltage.

20. If the excitation of a 3-phase alternator operating on infinite bus bars is changed, which one of the following shall alter?

A. Active power of machine

B. Reactive power of machine

C. Terminal voltage of machine

D. Frequency of machine

Ans. B

Sol.: Active power depend on prime mover *I/P*. V_f, frequency is fixed for infinite bus.

Whereas, reactive power depends on the excitation of the system.

21. The main purpose of using core in a transformer is to

A. decrease iron losses

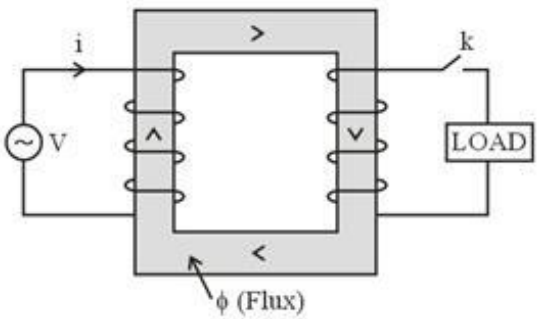
B. eliminate magnetic hysteresis

C. reduce reluctance of the common magnetic circuit

D. prevent eddy current loss

Ans. C

Sol.:



By the use of magnetic core, flux linking in between primary and secondary case to flow. Core at the transformer help to provide magnetic path by reducing the reluctance of the common magnetic circuit.

22. The operation of an induction motor is based on

A. Lenz's law

B. Ampere's law

C. mutual induction

D. Self induction

Ans. C

Sol.: In an induction motor, only stator winding is fed from a.c. supply. The rotor winding derives voltage and power from the externally energized stator winding through the principle of mutual induction.

23. Assertion (A): In DC machine speed control, the constant torque drive is obtained below base speed.

Reason(R): The speed below base speed is obtained by changing the flux.

A. Both A & R is correct, R is the correct explanation of A

B. Both A & R is correct, R is not the correct explanation of A

C. A is correct and R is false.

D. A is false and R is correct.

Ans. C

Sol.: By varying or decreasing the flux from the rated value by increasing extra resistance in the field leads to increase the speed above rated value.

$$\therefore \downarrow \phi \propto \downarrow I_f = \frac{V}{(R_f + R_{ext}) \uparrow}$$

$N \propto \frac{1}{\phi}$ (speed increases above rated speed)

So, Reason is false and Assertion is correct.

24. In a DC series generator, the terminal voltage with increase in load will

A. Decrease

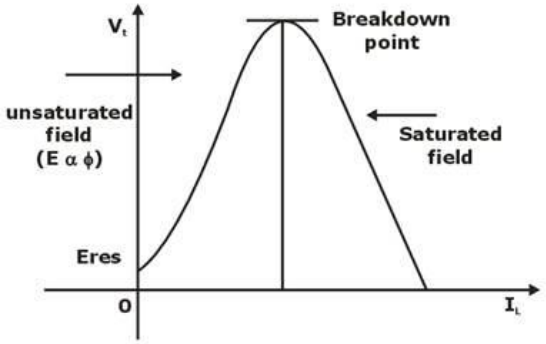
B. Increase gradually

C. Remains constant almost

D. Increase to rated voltage and then may decrease.

Ans. D

Sol.: Series generator characteristics,

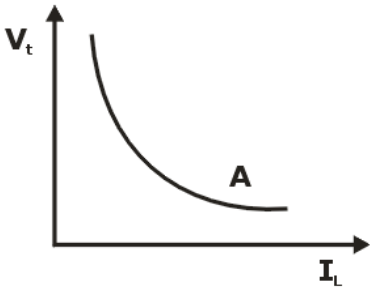


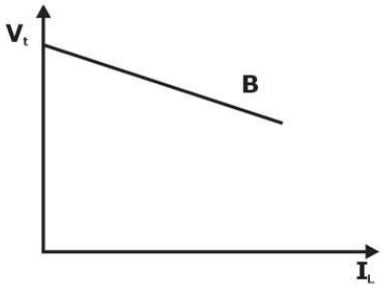
In Starting, φ ≠ constant

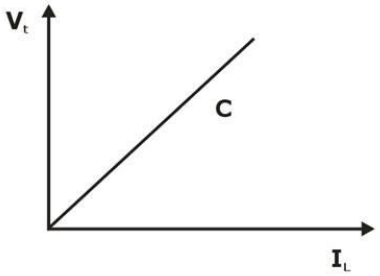
So, ↑ E ∝ V ↑∝ ϕ ↑

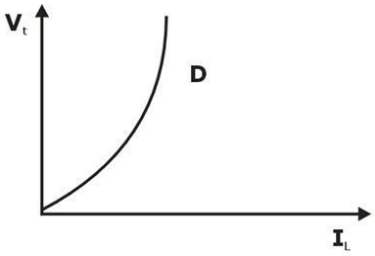
After Saturation, Voltage decreases due to increase in armature current.

25. Which of the following represents the load characteristics of DC shunt generator.

A. 

B. 

C. 

D. 

Ans. B

Sol.: DC shunt generator

$$\boxed{V_t = E_a - I_a R_a}$$

This represents slight drooping characteristics.

For all practical applications. DC shunt motor is considered as 'Constant speed motor.

26. Two 40 kVA single phase transformer are connected in open delta to supply a 230 V balanced 3-phase load. What is the total load that can be supplied without overloading either transformer?

A. 121 kVA
B. 69.28 kVA
C. 57 kVA
D. None

Ans. B

Sol.: The rated secondary transformer current $I_2 = \frac{40 \times 10^3}{230} = 173.9A$

This is also the load current. Therefore the load KVA is,

$= \sqrt{3}V_2I_2 \times 10^{-3}$

$= \sqrt{3} \times 230 \times 173.9 \times 10^{-3}$

$= 69.28$ KVA

27. High speed alternators usually have

A. Cylindrical rotor

B. Salient pole rotor

C. Both salient and cylindrical rotor

D. None of these

Ans. A

Sol.: High speed alternators should not have salient rotor because an outward force acting on rotor conductors during running operation at high speeds.

28. Two 3-phase alternator operates in parallel. The rating of one machine is 100 MW and that of other is 150 MW. Both alternator are fitted with governors having drooping characteristics of 5% and 6%. How will alternator share a common load of 180 MW.

A. Machine-I share 80 MW and machine-2 share 100 MW

B. Machine-1 share 60 MW and machine-2 share 120 MW

C. Machine-1 share 120 MW and machine-2 share 60 MW

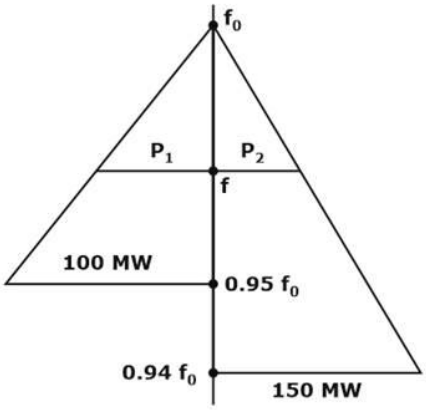
D. Machine-1 share 100 MW and machine-2 share 60 MW

Ans. A

Sol.: Let assume the original frequency is f_o

Ist machine having droop = 5%

IInd machine having droop = 6%



According to similar triangle property,

$$\frac{P_1}{f_0 - f} = \frac{100}{f_0 - 0.95f_0}$$

Let $f_0 - f = x$

$$\frac{P_1}{x} = \frac{100}{0.05f_0}$$

$$P_1 = \frac{2000x}{f_0} \quad \ldots (1)$$

Similarly,

$$\frac{P_2}{f_0 - f} = \frac{150}{(f_0 - 0.94f_0)}$$

$$\frac{P_2}{x} = \frac{150}{0.06f_0}$$

$$P_2 = \frac{2500x}{f_0} \quad \ldots (2)$$

$P_1 + P_2 = 180$

$$\frac{2000x}{f_0} + \frac{2500x}{f_0} = 180$$

$4500x = 180f_0$

$x = 0.04f_0$

$P_1 = 2000 \times 0.04 = 80$ MW

$P_2 = 2500 \times 0.04 = 100$ MW

29. The iron loss in a 100 kVA transformer is 1 kW and full load copper losses are 4 kW. The maximum efficiency occurs at a load of-

A. 100 KVa
B. 50 kVA
C. 200 kVA
D. 75 kVA

Ans. B

Sol.: For maximum efficiency:

$$\text{Loading factor} = \sqrt{\frac{P_i}{P_{Cu}}}$$

$$x = \sqrt{\frac{1}{4}} = 0.5$$

So, load for maximum efficiency,

$(S)_{\max \eta} = x \times S_{Total} = 0.5 \times 100$ KVA $= 50$ KVA

Load will be 50 kVA.

30. Alternator used in hydro power station has more number of poles in it than that used in thermal power station, because

A. Speed of the prime mover may be changed whenever required.
B. Power generated by the alternator may be changed according to demand.
C. Speed of its prime mover is less.
D. Power generated by this alternator is less.

Ans. C

Sol.: Alternator used in hydel power station has more number of poles in it than that used in thermal power station because speed of its prime mover is less.

31. A 1 KVP, 400 Hz transformer is desired to be used at a frequency of 60Hz. The KVA rating of the transformer at this reduced frequency is

A. 52.5 VA B. 550 VA

C. 150 VA D. 500 VA

Ans. C

Sol.: Since in transformer KVA rating × frequency

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

Given,

S_1 = 1000 VA

f_1 = 400 Hz

F_2 = 60 Hz

$$\frac{S_2}{1000} = \frac{60}{400}$$ 9873318676

S_2 = 150 VA

32. A 6 poles, 50Hz, 3- φ IM has negligible stator impedance. The rotor resistance and reactance are 0.2 and 3.0 respectively. The speed of the motor is 950 RPM.

The running power factor motor is:

A. 0.006 B. 0.8

C. 0.75 D. 0.9

Ans. B

Sol.: Running p.f can be expressed as:

$$\cos\phi = \frac{R_2}{\sqrt{R_2^2 + (sX_2)^2}}$$

where, $s = \frac{N_s - N}{N_s}$

$$N_s = \frac{120 \times 50}{6} = 1000 \text{ RPM}$$

$$s = \frac{1000 - 950}{1000} = 0.05$$

$$\cos\phi \frac{0.2}{\sqrt{(0.2)^2 + (0.05 \times 3)^2}}$$

cos φ = 0.8

33. Which of the following have highest power factor at full load:

A. Shaded pole type B. Split phase type

C. Capacitor-start type D. Capacitor-run type

Ans. D

Sol.: In capacitor run-type induction motor, the capacitor will be present in series with auxiliary winding even in running condition. Hence running power factor will be good.

34. A 3- φ slip ring induction motor (SRIM) has 6-pole stator and 2-pole rotor energised from 50Hz source, the rotor will run at a speed:

A. Less than 1500 RPM
B. Less than 3000 RPM
C. Less than 2000 RPM
D. Zero RPM

Ans. D

Sol.: For 3- φ induction motor to run, the poles of rotor and stator must be equal.

In the question:

No. of poles of rotor ≠ No. of poles of stator

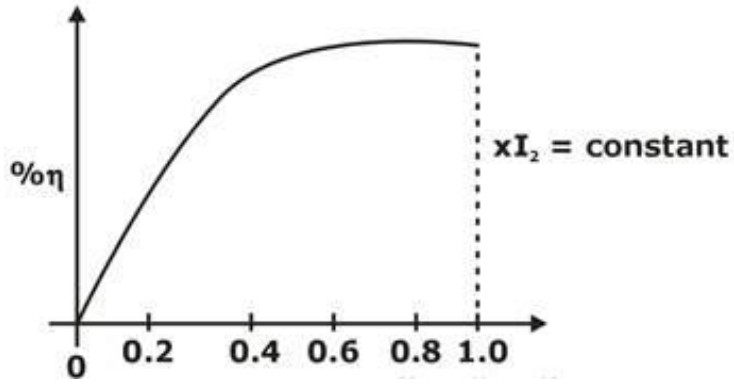
Hence, motor will not run.

35. The load on a transformer is $2\angle 0°\ \Omega$ or $2\angle 20°\ \Omega$. The efficiency of the transformer will be

A. greater for a load of $2\angle 0°\ \Omega$.
B. greater for a load of $2\angle 20°\ \Omega$
C. the same for two loads
D. insufficient data

Ans. A

Sol.: Percentage of efficiency increases as power factor increases as shown in figure below



Efficiency Vs Power factor curve

for $Z = 2\angle 0°\ \Omega$, pf = 1

$Z = 2\angle 20°\ \Omega$, pf = cos 20° = 0.939 lag

From above curve, we can conclude that efficiency for $2\angle 0°\ \Omega$ impedance will be more.

36. The power angle characteristic of machine infinite bus system is

$P_{in} = \sqrt{2} \sin \delta$ pu

It is operating at δ = 30°, which one of the following is the synchronizing power coefficient at the operating point?

A. $\sqrt{6}$
B. $\sqrt{3}$
C. $\sqrt{\frac{1}{2}}$
D. $\sqrt{\frac{3}{2}}$

Ans. D

Sol.: Synchronizing power coefficient, S_p:

$S_p = P_{max} \cos \delta$

where,

$P_{max} = \sqrt{2}$

$\delta = 30^o$

$$S_p = \sqrt{2}\cos 30^\circ = \sqrt{2} \times \frac{\sqrt{3}}{2}$$

$$S_p = \sqrt{\frac{3}{2}}$$

37. A DC machine has maximum efficiency when:

A. Variable loss = constant loss
B. Variable loss = $\sqrt{\text{constant loss}}$
C. Variable loss = (constant loss)^2
D. None of the above.

Ans. A

Sol.: Condition for maximum efficiency is [Variable loss (I^2R) = Constant loss]

38. A induction motor has double-cage rotor with equivalent impedance at stand-still of (1+j1) and (0.2+j 4) ohms. Find the relative values of torque produced by each cage at 5% slip. ie Find ratio of T1:T2

A. 1 : 1
B. 0.8 : 1
C. 0.4 : 1
D. 0.6 : 1

Ans. C

Sol.: $z_1 = 1 + j1\Omega, Z_2 = 0.2 + j4\Omega$

at starting s = 1

$$T_s = \frac{sRE^2}{R^2 + X^2 s}$$

$$T_1 = \frac{0.05 \times 1 \times E^2}{1^2 + (0.05)^2 \times 1}$$

$$T_1 = \frac{0.05}{1.0025}E^2 \approx 0.05E^2$$

Similarly,

$$T_2 = \frac{0.05 \times 0.2E^2}{(0.2)^2 + (0.05 \times 4)^2} = \frac{0.05 \times 0.2E^2}{0.08} = 0.05 \times 2.5E^2$$

$T_1 : T_2 = 1 : 25 = 0.4 : 1$

39. The rotating part of a DC motor is known as _____.

A. pole
B. stator
C. armature
D. carbon brush

Ans. C

Sol.: In electrical engineering, an armature is the power-producing component of an electric machine. The armature is rotating part in dc machine. In case of ac machine The armature can be on either the rotor (rotating part) or the stator (stationary part) of the electric machine.

40. A single-phase transformer has a no-load loss of 64 W as obtained from the open circuit test. When a short circuit test is performed with 90% of the rated current flowing in its both LV and HV windings, the measured loss is 81 W. The transformer should exhibit maximum efficiency at

A. 50.0% of the rated current
B. 64.0% of the rated current

C. 80.0% of the rated current D. 88.8% of the rated current

Ans. C

Sol.: $P_w = (0.9)2\ P_{flcw}$

$$Pf/w = \frac{81}{0.81} = 100$$

[P_{flw} = Ful load copper loss]

$$x = \sqrt{\frac{P_{core}}{P_{flw}}} = \sqrt{\frac{64}{100}} = 0.8$$

x = 80%

41. 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.

42. A 3-phase, 4-pole, 50 Hz induction motor, during short circuit test took 100 A and 40 kW. In case stator resistance is equal to equivalent standstill rotor resistance, compute the starting torque.

A. 189.097 N-m B. 117.103 N-m

C. 96.816 N-m D. 127.324 N-m

Ans. D

Sol.: Power at short circuit = stator Cu loss + Rotor Cu loss

As stator resistance = rotor resistance.

Stator Cu loss = Rotor Cu loss.

$$\text{Rotor CU loss} = \frac{40 \times 10^2}{2} = 20\text{kW}$$

$$\text{Torque} = \frac{60}{2\pi \times sN_s} \times \text{Rotor Cu loss}$$

At starting, slip s = 1

$$\text{Torque} = \frac{60 \times 20000}{2\pi \times 1500} = 127.32$$

T_g = 127.324 N-m

43. If a transformer core has air gaps, then

A. reluctance of magnetic path is decreased

B. Hysteresis loss is decreased

C. magnetizing current is greatly increased

D. eddy current is increased

Ans. C

Sol.: If core has airgap then the reactance of the core increases, after this "I_u" (magnetic current) required for maintaining constant flux also increases.

44. In a transformer the resistivity of core material is $0.1 \times 10^{-6}\Omega$ m which causes eddy current loss of 100W. What is the eddy current the core material resistivity is $0.2 \times 10^{-6}\ \Omega$ m.

A. 20W B. 30W

C. 40W D. 50W

Ans. D

Sol.: $P_e \times \frac{1}{\rho}$

$$\frac{P_{e_1}}{P_{e_2}} = \frac{\rho_2}{\rho_1} = \frac{0.2 \times 10^{-6}}{0.1 \times 10^{-6}}$$

$Pe_2 = 50$ W

45. In a transformer the resistance between its primary and secondary is

A. zero B. 1 ohm

C. 1000 ohms D. infinite

Ans. D

Sol.: In a transformer the coils are not electrically connected therefore the resistance is ideally infinite.

46. In a transformer, the leakage flux and the voltage induced by it depends upon the value of:

A. main flux B. Applied voltage

C. load voltage D. winding current

Ans. D

Sol.: Leakage flux depends on load current and current flows through the winding. It depends on load of the transformer.

47. For a 3-phase synchronous motor, if air gap is increased, then what will be its effect on voltage regulation?

A. Increases B. Decreases

C. Remains constant D. Cannot determined

Ans. B

Sol.: If air gap is increased, then field current required to maintain rated voltage will be higher.

The SCR will increase, as

$$SCR = \frac{\text{Field current for rated voltage}}{\text{Field current for rated armature current}}$$

$$\text{As, } SCR = \frac{1}{X_s(pu)}$$

when SCR increases, then synchronous reactance decreases. If the reactance is less, the voltage drop in it is also less and hence voltage regulation decreases.

48. A 4 pole, 50 Hz 3- φ IM has a starting toque of 100 N-m. The slip at which maximum torque occur is 0.5 . The value of maximum torque produced by the motor is:

A. 80 N-m B. 100 N-m

C. 125 N-m D. 200 N-m

Ans. C

Sol.: Starting torque and maximum torque can be expressed as:

$$\frac{T_{st}}{T_{max}} = \frac{2s_m}{1+s_m^2}$$

where, T_{st} = 100 N-m

s_m = 0.5

$$\frac{100}{T_{max}} = \frac{2\times 0.5}{1+0.5^2}$$

T_{max} = 1.25 × 100

T_{max} = 125 N-m

49. In a 3-phase induction motor, the regenerative braking occurs when:

A. The load is lowered by a hoisting machine.

B. The load is raised by hoisting machine.

C. Number of poles is reduced is reduced in pole changing motor.

D. The motor speed falls due to due to over load.

Ans. A

Sol.: Regenerative braking is done when speed of rotor becomes larger than synchronous speed. This can be achieved by lowering the load.

50. Consider the following statements concerning the utility of mesh-connected tertiary windings in star-star transformers.

1) It is used to supress harmonic voltages.

2) It is used to allow flow of earth fault currents for operation of protective devices.

3) It facilitates supply of single phase loads.

4) It provides low-reactance path for zero sequence currents.

Which of the following statements are correct?

A. 1, 2, 3 & 4 B. 1, 2 & 3 only

C. 1, 2 & 4 only D. 3 & 4 only

Ans. A

Sol.: All are the advantages of mesh connected tertiary windings in star-star transformer.

51. PMDC motor offers _____

A. Cumulative compound type characteristic

B. Differential compound type characteristic

C. Series characteristic

D. Shunt characteristic

Ans. D

Sol.: The stator is made of permanent magnet in the PMDC motor hence, there is no need for separate field excitation for stator. So, PMDC acts as a shunt motor with fixed field. This can be seen from the construction also.

52. The speed of universal motor is generally reduced by

A. gear trains B. V belts

C. brakes D. chains

Ans. A

Sol.: Universal motors often run at dangerously high speed when operated at no load. This means that motor speed will be low at full load, but the speed of the motor will start increasing as the load on the motor decreases. Various methods are evolved to set the RPM of the motor. One is through the use of a gear train to reduce the actual load speed.

53. In 3-phase squirrel-cage induction motor

A. rotor conductor ends are short-circuited through slip rings

B. rotor conductor are short circuited through end rings

C. rotor conductor are kept open

D. rotor conductor are connected to insulation

Ans. B

Sol.: The rotor conductor are permanently shorted by the copper or aluminium rings called end rings to provide mechanical strength and close path for current.

54. A stepper motor with stator and rotor teeth of 12 and 10 respectively. The value of single step of stepper motor will be:

A. 3° B. 6°

C. 12° D. 24°

Ans. B

Sol.: Single step of stepper motor can be expressed as:

$$\alpha = \frac{N_s - N_r}{N_s N_r} \times 360°$$

where,

N_s = Number of stator teeth

N_r = Number of rotor teeth

$$\alpha = \frac{12 - 10}{12 \times 10} \times 360°$$

$\propto = 6°$

55. A 8-pole, DC generator has a wave wound armature containing 32 coils of 6 turns each. Its flux per pole is 0.06 Wb. The machine is running at 250rpm. The induced armature voltage is.

A. 192 V. B. 384 V

C. 96 V. D. 768 V

Ans. B

Sol.: P = 8, A = 2 (wave) φ = 0.06 Wb, N = 250 rpm

$Z = 2 \times 32 \times 6 = 384$

$$\boxed{E = \frac{P\phi NZ}{60A}}$$

$$E = \frac{8 \times 0.06 \times 250 \times 384}{60 \times 2}$$

$$\boxed{E = 384V}$$

56. For a 3-phase synchronous motor, if air gap is increased, then what will be its effect on voltage regulation?

A. Increases
B. Decreases
C. Remains constant
D. Cannot determined

Ans. B

Sol.: If air gap is increased, then field current required to maintain rated voltage will be higher.

The SCR will increase, as

$$SCR = \frac{\text{Field current for rated voltage}}{\text{Field current for rated armature current}}$$

$$\text{As, } SCR = \frac{1}{X_s(pu)}$$

when SCR increases, then synchronous reactance decreases. If the reactance is less, the voltage drop in it is also less and hence voltage regulation decreases.

57. A 3 phase transformer which are connected in Δ/Δ connection of rating 50 kVA, 1000/500 V. Calculate the current in primary winding of the transformer when supplying a balanced 3-ϕ load of 20 kW at 500 V and 0.8 p.f lagging?

A. 8.33 A
B. 28.86 A
C. 23.2 A
D. 16.66 A

Ans. A

Sol.: $\sqrt{3}V_L I_L \cos\phi = 20 \times 10^3$

$$\sqrt{3} \times 500 \times I_L \times 0.8 = 20000$$

$$I_L = \frac{20000}{\sqrt{3} \times 500 \times 0.8} = 28.86A$$

The current in the winding of the transformer secondary,

$$I_{Ph_2} = \frac{28.86}{\sqrt{3}} = 16.66A$$

Current in the primary winding of the transformer

$$I_{Ph_1} = 16.66 \times \frac{500}{1000} = 8.33A$$

58. A transformer has hysteresis loss of 30 Watts at 240 V 60 Hz supply. The hysteresis loss at 200V, 50 Hz supply is

A. 30W
B. 25 W
C. 60 W
D. 100 W

Ans. B

Sol.: V_1 = 240 V, f_1 = 60 Hz, V_2 = 200V, f_2 = 50 Hz

$$\frac{V_1}{f_1} = \frac{V_2}{f_2} = 4$$

So, V/f & constant

$$W_n \propto f \frac{W_{h_2}}{W_{h_1}} = \frac{f_2}{f_1}$$

$$\frac{W_{h_2}}{W_{h_1}} = \frac{50}{60}, \; W_{h2} = \frac{50}{60} \times 30 = 25 \text{ W}$$

$$\boxed{W_{h2} = 25W}$$

59. An 8-pole single induction motor is running at 690 rpm. What is its slip with respect to forward and backward field's respectively?

A. 0.08, 2

B. 0.08, 1.92

C. 1.92, 0.08

D. 2, 0.08

Ans. B

Sol.: Slip for forward $s = \frac{N_s - N_r}{N_s}$

$$N_s = \frac{120f}{P} = \frac{120 \times 50}{8} = 750 \text{ rpm}$$

$$N_r = 690 \text{ rpm}, \; s = \frac{750 - 690}{750} \Rightarrow \frac{60}{750} = 0.08$$

So, Forward slip = 0.08

Backward slip = 2 – s = 2 – 0.08 = 1.92

60. Number of brushes in a 4 pole LAP wound DC machines will be.

A. 4

B. 2

C. 8

D. None of these

Ans. A

Sol.: Number of brushes = Number of poles in LAP winding = 4

61. In a transformer, if primary leakage impedance is neglected, then

1) magnetizing current lags the applied voltage V1 by 90°

2) Core-loss current lags V1 by 90°

3) exciting current lags V1 by 90°

4) core loss current is in phase with V1

5) exciting current lags V1 by about 80°

6) magnetizing current leads the exciting current by 90°

From above, the correct statements are:

A. 1, 4, 5 B. 3, 4, 6

C. 1, 4 D. 1, 2, 6

Ans. A

Sol.: The magnetizing current is in phase with flux which lags the applied voltage V_1 by 90°.

The core loss component is resistive so it's current is in phase with applied voltage V_1.

The exciting current is resultant of magnetizing and core loss current which lags V1 by about 80°.

So, option with statement 1, 4 and 5 are correct.

62. The voltage regulation of a large transformer is mainly influenced by

A. No load current and load power factor

B. Winding resistances and load power factor

C. Leakage fluxes and load power factor

D. Winding resistance and core loss

Ans. C

Sol.: As per voltage regulation formula, we calculate the regulation Which depends on leakage reactance and load power factor of the transformer.

63. A 3-phase induction motor has a full-load slip of 3 percent at normal voltage. What will be the value of slip if it develops the same torque theoretically while operating at 110 percent of normal voltage?

A. 2.48% B. 3%

C. 2.72% D. 4.83%

Ans. A

Sol.: As we known,

$T \propto sV^2$

$T_1 \propto s_1V_1^2$

$T_2 \propto S_2V_2^2$

where $T_1 = T_2$

$s_1 = 3\% = 0.03$

$V_2 = 110\%$ of $V_1 = 1.1V_1$

$$\frac{T_2}{T_1} = \frac{s_2V_2^2}{s_1V_1^2}$$

$$1 = \frac{S_2 \times (1.1)^2V_1^2}{0.03 \times V_1^2}$$

$s_2 = 2.48\%$

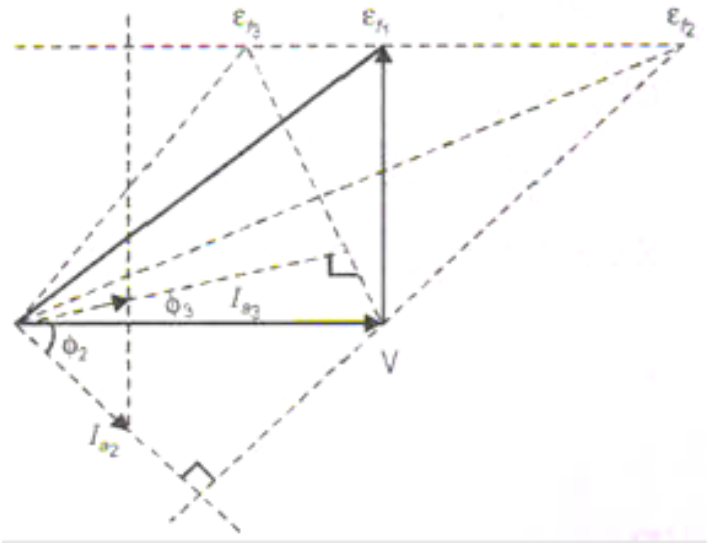
64. Power factor of an alternator driven by constant prime mover input can be changed by changing its

A. Speed B. Load

C. Field excitation D. Phase sequence

Ans. C

Sol.:



So due to change of field excitation power factor will be change.

65. Synchronizing power of a synchronous machine is

A. directly proportional to the synchronous reactance

B. equal to the synchronous reactance

C. inversely proportional to the synchronous reactance

D. None of these

Ans. C

Sol.: Synchronizing power = $\frac{E_f V_t}{X_s}\sin\delta$

From the given formula of synchronizing power, we can say that

Synchronizing power $\times \frac{1}{x_s}$

66. Shaded pole induction motor are used in

A. fan

B. compressor

C. blower

D. electric clocks

Ans. D

Sol.: The simplest and least expensive type of AC single phase induction motor is the shaded pole type motor. It has low starting torque and also quite compact in size.

It is used in electric clocks, toys, etc.

67. The wave winding in DC machine is designed for-

A. Low voltage and High current

B. Low current and high Voltage

C. High voltage and high current

D. Low voltage and low current

Ans. B

Sol.: Wave winding has less no of parallel path (A = 2). So, it is used for high voltage and low current operation.

68. What is the frequency of an alternator which makes 3000 revolutions per minute and has 2 poles?

A. 100 Hz
B. 50 Hz
C. 750 Hz
D. None of these

Ans. B

Sol.: We know, $N = \frac{120f}{p}$

N = speed of alternator = 3000 rpm

P = number of pole = 2

f = frequency

$3000 = \frac{120f}{2}$

f = 50 Hz

69. Under commutation in a DC machine gives rise to-

A. Sparking at the leading edge of the Brush
B. Sparking at the trailing edge of the Brush
C. Sparking at the middle of the Brush.
D. No sparking at all

Ans. B

Sol.: Under commutation delays the current to reverse while commutation. It results in sparking at the trailing edge of the Brush.

70. A 50 kVA, 2200/110V transformer when tested gave S.C. test 90V, 20.5A, 808W (H.V. Side). Calculate the % Voltage regulation at $\frac{1}{4}^{th}$ full load with 0.8 p.f. lagging?

A. 4%
B. 1.5%
C. 1%
D. 3%

Ans. C

Sol.: S.C. test data is given

So, $I^2R = P_{cu}$.

$(20.5)^2R = 808$

$R = 1.922\ \Omega$

$Z = \frac{V}{1} = \frac{90}{20.5} = 4.39\Omega$

$X = \sqrt{Z^2 - R^2} = 3.94\Omega$

$R_{PU} = \frac{R_\Omega \times S_b}{V_b^2} = \frac{1.922 \times 50 \times 10^3}{(2200)^2} = 0.0198 P.U$

$$X_{PU} = \frac{X_\Omega \times S_b}{V_b^2} = \frac{3.94 \times 50 \times 10^3}{(2200)^2} = 0.0407 \text{P.U.}$$

We know that the % V.R^n is given by VR^n % = I_{PU} (R_{PV} cos Φ + X_{PU} sin Φ) × 100 for $\frac{1}{4}^{th}$ load,

I_{PV} = 0.25

V.R% = 0.25 (0.0198 × 0.8 + 0.0407 + 0.6) × 100

% V.R = 1%

71. Which of the following statement is true for DC machines?

A. Interpole winding is used for producing residual flux while compensating winding is used for improving commutation.

B. Interpole winding is used for improving commutation while compensating winding is used for reducing armature reaction.

C. Interpole winding is used for reducing armature reaction while compensating winding is used for improving commutation.

D. Interpole winding is used for reducing armature reaction while compensating winding is used for producing residual flux.

Ans. B

Sol.: Interpoles have a polarity opposite of the main pole that is in the direction of rotor. Hence, Interpoles generates necessary voltage to neutralize EMF that are produced from Self Induction of the armature coils which were under commutation process. That is why Interpoles are used for improving commutation process while compensating winding is used for reducing armature reaction.

72. Enclosure of motor is made from

A. copper B. aluminium

C. cast iron D. laminated sheath

Ans. C

Sol.: Yoke and enclose of the motor is generally made up of cast iron.

73. Which of the following is motors develops minimum torque and used in lower power applications?

A. DC series motor B. Shaded pole induction motor

C. Capacitor start induction motor D. Split phase induction motor

Ans. B

Sol.: Shaded pole induction motors are used for low watt applications (up to 50W). They are very cheap motors and low maintenance having rotor same as squirrel cage induction motor.

74. A synchronous capacitor is

A. an unloaded and under excited 3-phase synchronous motor

B. a loaded and over excited 3-phase synchronous generator

C. an unloaded and over excited 3-phase synchronous motor

D. a 3-phase synchronous generator loaded with a capacitor bank

Ans. C

Sol.: An unloaded over excited synchronous motor performs only one function i.e. delivers reactive power to the 3-phase line, like a capacitor. Hence the name synchronous capacitor. So option C. is correct.

75. A 450V, 50 KVA 1-φ alternator has an effective armature resistance of 0.62 Ω. An excitation current of 10A produces 200A armature current on short circuit and an emf 400V on open-circuit. Calculate synchronous reactance

A. 1.4 Ω
B. 2.4 Ω
C. 1.9 Ω
D. 3 Ω

Ans. C

Sol.: $Z_s = \frac{\text{open circuit emf}}{\text{short ckt cumer}} = \frac{400}{200} = 2\Omega$

$X_S = \sqrt{Z_j^2 - R_a^2} = \sqrt{4 - (0.62)^2} = \sqrt{4 - 0.38} \approx 1.9\Omega$

76. Which of the following is not the method of reducing harmonics?

A. Adding filters
B. Adding capacitors
C. Adding inductors
D. Adding resistors

Ans. D

Sol.: Reduce the harmonic currents produced by the load. Add filters to siphon the harmonic currents off the system, or block the currents from entering the system, or supply the harmonic currents locally. Modify the frequency response of the system by filters, inductors, or capacitor.

77. The voltage at induction motor rotor oscillates 180 times per minute. The stator frequency is 60 Hz. The slip of the motor is

A. 4%
B. 5%
C. 3%
D. 2%

Ans. B

Sol.: Rotar frequency $= \frac{\text{Rotation}}{\text{sec}} = \frac{\text{RPM}}{60}$

Frequency $= \frac{180}{60} = 3\text{Hz}$

As we known:

$f_r = s\, f_s$

$3 = s \times 60$

$s = 0.05 = 5\%$

78. How will you change the rotation of dc shunt motor

A. change the field terminal
B. change the supply terminal
C. change the armature terminal
D. and 1 or 3

Ans. D

Sol.: As we know that in case of dc shunt motor torque is give by such that

Torque T αΦ.I

Now if we alter the field flux or we change the armature terminal then either flux or current reverses by which we can change the direction of applied torque and hence the rotor rotation can be reversed.

79. A single–phase transformer has no–load loss of 64 W, as obtained from an open–circuit test. When a short–circuit test is performed on it with 90% of the rated currents flowing in its both LV and HV windings, the measured loss is 81 W. The transformer has maximum efficiency when operated at

A. 50.0% of the rated current. B. 64.0% of the rated current.

C. 80.0% of the rated current. D. 88.8% of the rated current.

Ans. C

Sol.: For 90% current

$P_{Cu} = (0.9)^2 P_{flCu}$

$P_{flCu} = \frac{81}{0.81} = 100W$

$x = \sqrt{\frac{P_{core}}{P_{fCC}}} = \sqrt{\frac{64}{100}} = 0.8 = 80\%$

80. A 10 KVA, 400V/200V, 1-phase transformer with a percentage resistance of 3% and percentage reactance of 6% is supplying a current of 50A to the resistive load of 10 KW. Find the % voltage regulation at 0.8 power factor lag.

A. 6% B. 8%

C. 10% D. 9%

Ans. A

Sol.: % Resistance = 3% ® = 0.03 p.u.

% Reactance (x) = 6% = 0.06 p.u.

Since voltage regulation = Rp.u cos Φ + xp.u. sin Φ

Since cos Φ = 0.8

Φ = 36.87°

So sin Φ = 0.60

Regulation = $0.03 \times 0.8 + 0.06 \times 0.06 = 24 \times 10^{-3} + 36 \times 10^{-3}$

$= 60 \times 10^{-3} = 6 \times 10^{-2}$

% Regulation = 6%

81. A commutator in DC machine can

1) Provide half wave rectification

2) Provide full wave rectification

3) Convert dc to ac

4) Convert ac to dc

Which of the above statements are correct?

A. 2, 3 and 4 B. 1, 2 and 3

C. 1, 3 and 4 D. All of the above

Ans. A

Sol.: Commutator provide full wave rectification not half wave rectification.

82. Consider the following statements.

1) The no of parallel paths in lap winding is equal to the no of poles.

2) LAP winding is used for low voltage and high current operation.

Which of the above is/ are correct.

A. 1 only B. 2 only

C. Both 1 and 2 D. Neither 1 nor 2

Ans. C

Sol.: Both the given statements are true about LAP winding.

83. An ideal induction motor will:

A. run at synchronous speed

B. run at speed below synchronous speed

C. not run

D. run at speed higher than synchronous speed

Ans. C

Sol.: For an ideal induction machine, there will be no losses in machine.

When emf will induce in rotor winding, then the current will not flow on closing rotor terminal as there will be no rotor resistance to produces any loss.

Hence, there will no torque in the machine which can run the motor.

Hence, the motor will not more at all

84. A 8 pole generator with 64 coil has a two layer LAP winding. The pole pitch is-

A. 4 B. 8

C. 12 D. 1

Ans. B

Sol.: $\boxed{\text{Pole pitch} = \frac{\text{Slots}}{\text{Pole}}}$

In double layer winding.

No. of slots = No. of coil = 64

$\therefore$ Pole pitch = $\frac{64}{8} = 8$

85. In a synchronous machine if the field MMF is decreased by any mean then what will the effect on reactive power?

A. Reactive Power Increases B. Reactive Decreases

C. Remain Constant D. First increase then decrease

Ans. A

Sol.: In synchronous machines active power,

$$V_t I_a \cos\theta = \frac{V_t E_f}{C} \sin(\delta_{rf}) \quad \ldots(i)$$

In synchronous machines reactive power,

$$V_t I_a \sin\theta = \frac{V_t E_f}{C} - \frac{V_t E_f}{C}\cos(\delta_{rf}) \ldots(ii)$$

If field mmf F_f is decreased, to keep the active power would remain constant δ_{rf} must be increases as seen from equation (1), as the terminal voltage V_t is constant.

Now from equation (2), as δ_{rf} increased, cos δ_{rf} decreased in turn the second term $\frac{V_t F_f}{c}\cos(\delta_{rf})$ also decreases, Therefore if the field MMF is decreased by any mean then the Reactive power will increases.

86. A synchronous generator is supplying power to an infinite bus at voltage of 1.0pu and supplying current of 1.0pu at zero power factor lagging. its synchronous reactance is 0.5 pu. the excitation emf of the motor will be:

A. 1.0 pu
B. 0.5 pu
C. 2 pu
D. 1.5 pu

Ans. D

Sol.: Induced emf, E_f can be calculate as:

$$\vec{E}_f = \vec{V}_t + jI_aX_s = 1.0\angle 0^\circ + (1\angle -90^\circ)(0.5/90^\circ) = 1.0\angle 0^\circ + 0.5\angle 0^\circ$$

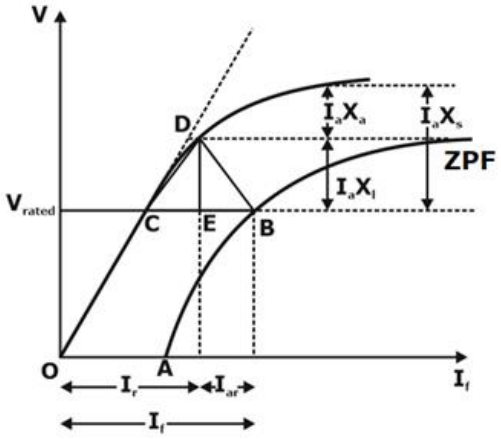
$$\vec{E}_i = 1.5 \text{ pu}$$

87. Potier triangle method is helpful in obtaining the voltage regulation of synchronous machines by determining the armature

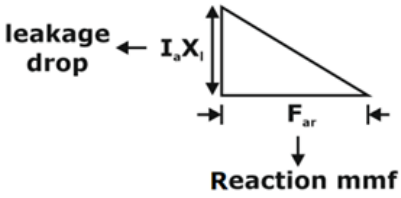
A. Leakage reactance and its reaction mmf
B. Leakage reactance and air-gap flux
C. Resistance and its reaction mmf
D. Resistance and air-gap flux

Ans. A

Sol.: Potier triangle or zero power factor characteristic



ΔBDE is called Potier triangle.



88. A single phase transformer having 10KVA with turning ratio of 5:1 is fed from 1KV supply. Find the full-load secondary current that should be connected across secondary winding in order to supply full load current?

A. 50A

B. 40A

C. 10A

D. 30A

Ans. A

Sol.: Given: Turning ratio of transformer $N_1/N_2 = 5/1$

$V_1 = 1KV = 1000\ V$

For secondary voltage:

$N_1/N_2 = V_1/V_2$

$V_2 = [N_2/N_1] \times V_1$

$V_2 = [1/5] \times 1000$

$V_2 = 200$ volts

The transformer rating in volt-amperes = V_2I_2 (at full load)

i.e. $10,000 = 200I_2$

Hence full load secondary current

$I_2 = 10,000/200$

$I_2 = 50\ A$

89. Consider the following statements regarding transformer test.

A) Sumpner's test is done to detect the temperature rise in a transformer.

B) In Sumpner's test primaries and secondaries of two identical transformers is connected in series.

C) In No load test, the current is drawn at high power factor.

D) In impedance test the transformer is subjected to only copper loss.

Which of the following statement is/are correct?

A. A, B and C

B. A, B and D

C. A and D

D. C and D

Ans. C

Sol.: A is correct but B is not correct because primaries are connected in parallel and secondaries are connected in series.

C The current is drawn at low power factor not at high power factor.So, it is incorrect.

D is correct, the impedance test the transformer is subjected to only copper loss.

90. Which of the following match is correct?

List I (Generator)	**LIST II (Voltage regulation)**
A. Series generator	1. Positive
B. Flat compound	2. Negative
C. Separately excited	3. Zero

A. (a – 2), (b – 3), (c – 1)

B. (a – 1), (b – 2), (c – 3)

C. (a – 1), (b – 3), (c – 2)

D. None of the above.

Ans. A

Sol.: Series generator exhibits negative VR as at No-load the speed is very less than full load. Flat compound shows zero VR while Separately Excited Generator shows positive VR.

91. The pitch factor for a full pitched winding of a synchronous machine is

A. 0.5

B. 0.9

C. 0.0

D. 1.0

Ans. D

Sol.: Pitch factor for a full pitched winding of a synchronous machine is 1.

92. In case of 3- φ IM, shaft power is 2700 W and mechanical losses are 180 W. At a slip of 4%, The rotor ohmic losses will be:

A. 120 W

B. 115.2 W

C. 108 W

D. 105 W

Ans. A

Sol.: P_{out} = shaft power + Mechanical losse = 2700 + 180

P_{out} = 2880 W

$$\text{Air gap power} = \frac{P_{out}}{1-s} = \frac{2880}{1-0.04} = \frac{2880}{0.96}$$

$$\text{Rotor copper loss} = s \times \text{Air gap power} = 0.04 \times \frac{2880}{0.96}$$

P_{cu} = 120 W

93. An autotransformer has V_1, I_1 as input quantities and V_2, I_2 as output quantities With $V_2 < V_1$. The V_A transformed from primary to secondary is

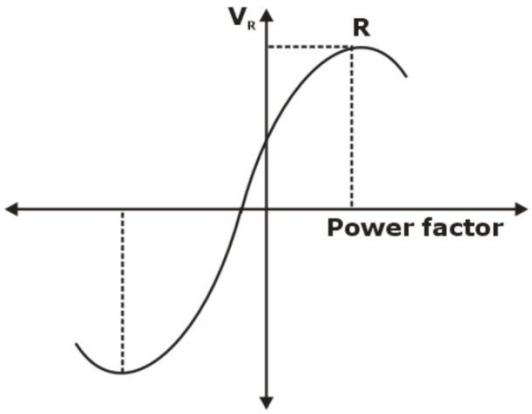
A. V_1I_2 B. V_2I_1

C. $V_1I_1 - V_2I_2$ D. $(V_1 - V_2)I_1$

Ans. D

Sol.: V_A conducted from input to output is V_2I_1. The V_A transformed from input to output Will be $V_1I_1 - V_2I_2$ i.e. $(V_1 - V_2)I_1$

94. A 2300/230 V single phase transformer has resistance and reactance 0.05 p.u. and 0.5 p.u. respectively. Voltage regulation versus load power factor plot is shown in figure below:



At point R, power factor of load is

A. 0.995 lagging

B. 0.0995 lagging

C. 0.995 leading

D. 0.0995 leading

Ans. B

Sol.: Point R corresponds to the maximum voltage regulation.

For maximum voltage regulation load power factor is equal to

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

$$Z = \sqrt{R^2 + X^2} = \sqrt{0.05^2 + 0.5^2} = 0.5024\Omega$$

$$\cos\phi = \frac{R}{Z} = \frac{0.05}{0.5024} = 0.0995(\text{lagging})$$

95. A DC shunt motor having unsaturated magnetic circuit runs at 1000 rpm with rated voltage. If the applied voltage is half of the rated voltage the motor will run at:

A. 2000 rpm B. 1000 rpm

C. 750 rpm D. 500 rpm

Ans. B

Sol.: $N \propto \frac{E_b}{\phi}, (E_b \propto V) \& (\phi \propto V)$

Field is unsaturated means

[$\varphi \neq$ Constant]

∴ As applied voltage becomes half both E_b and ϕ becomes half.

Hence, speed will remain constant.

96. Which of the following statements are correct?

1) Compensating winding is placed under the main field pole shoe.

2) This winding is connected in parallel with armature winding.

A. Only 1 B. only 2

C. Both 1 & 2 D. Neither 1 nor 2

Ans. A

Sol.: Compensating winding is connected in series of armature in such a way that it can neutralize the AR effect under the main pole.

97. A 3-phase IM takes 60 A as starting current (short circuit current). When started with star-delta starter, the motor will take from supply mains a current of

A. $60/\sqrt{3}$ A B. 20 A

C. $60\sqrt{3}$ A D. 180 A

Ans. B

Sol.: As we known,

Current from main supply at the time of star-delta starter is

$$= \frac{\text{Short circuit current}}{3} = \frac{60}{3} = 20 \text{ A}$$

98. An ideal transformer has $N_1 = 100$ turns $N_2 = 200$ turns with a mutual flux of $\varphi_m(t) = -0.05(t^2 - 2t)$. The induced emf of secondary in volts is

A. $-5(t - 1)$ B. $-10(t - 1)$

C. $-5(t^2 - 1)$ D. $-20(t - 1)$

Ans. D

Sol.: $\phi(t) = -0.02\left(t^2 - 2t\right)$

$$\because E_2 = N_2 \frac{d\phi}{dt} = 200 \times (-0.05) \frac{d}{dt}\left(t^2 - 2t\right)$$

$$E_2 = -20(t - 1)$$

99. The motor best suited for hoist, crane and traction type load is:

A. DC series motor B. Synchronous motor

C. Induction motor D. DC shunt motor

Ans. A

Sol.: Hoist, crane, Traction type load, requires great starting torque which can be provided by DC series motor.

100. A three phase, 4-pole and 50 Hz induction motor have rotor copper loss equal to 400 W. The torque developed by the motor at 5% slip will be.

A. 45 N-m B. 60 N-m

C. 50.93 N-m D. 1273.23 N-m

Ans. C

Sol.: Air gap power = $\frac{P_w}{s} = \frac{400}{0.05}$

P_g = 8000 W

$$\text{Torque} = \frac{P_s}{\omega_s}$$

$$T_g = \frac{8000 \times 60}{2\pi \times 1500}$$

T_g = 50.93 N-m

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