SHORT QUESTIONS AND ANSWERS

UNIT – I

1. What are the main dimensions of a rotating machine?

Armature or rotor diameter

Stator core length

2. Define specific magnetic loading

It is defined as the ratio of total flux around the air gap and the area of flux path at the air gap.

3. Define specific electric loading.

It is defined as the ratio of total number of ampere conductors and the armature periphery at the air gap.

4. What is magnetic circuit?

It is the path of magnetic flux. The mmf of the circuit creates flux in the path by overcoming the reluctance of the path.

5. What is leakage flux?

It is the flux passing through unwanted path. The leakage flux will not help either for transfer or conversion of energy.

6. What is leakage coefficient?

It is defined as the ratio of total flux to useful flux.

7. What is fringing flux?

The bulging of magnetic path at the air gap is called fringing. The fluxes in the bulged portion are called fringing effect.

8. What are the factors that modify the reluctance of air gap.

It is modified by slots, radial ventilating ducts and non uniform air gaps.

9. Define gap contraction factor for slots.

It is defined as the ratio of reluctance of air gap of slotted armature to reluctance of air gap of smooth armature.

10. **Define gap contraction factor for ducts**.

It is defined as the ratio of reluctance of air gap with ducts to reluctance of air gap without ducts.

11. Define total gap contraction factor.

It is defined as the ratio of reluctance of slotted armature with ducts to reluctance of smooth armature without ducts.

12. Define field form factor.

It is the ratio of average gap density over the pole pitch to maximum flux density in the air gap.

13. List the methods used for estimating the mmf for teeth.

i) Graphical method
ii) Three ordinate method
iii) $B_{t/3}$ method

14. What is real and apparent flux density?

The real flux density is due to the actual flux through a tooth. The apparent flux density is due to total flux that has to be passing through the tooth. Since some of the fluxes pass through slot so that the real flux density is always less than the apparent flux density.

15. Define specific permeance.

It is defined as the permeance per unit length of field.

16. What factor decides the no. of turns in a winding?

The emf per turn and flux density and the emf per turn depend on the type of insulation employed.

17. How the area of cross section of a conductor is estimated?

The area of cross section of a conductor is estimated based on temperature rise, resistivity and cooling methods.

18. What are the factors to be considered for estimating the length of air gap in dc machines?

Armature reaction, cooling, iron losses, distortion of field form and noise.

19. What is the fundamental requirement of a good insulating material?

High dielectric strength, high insulating resistance with low dielectric loss, good mechanical strength, good thermal conductivity and high degree of thermal stability.

20. Why silicon content in electrical sheet steel is limited to four to five percent?

If silicon content in electrical sheet steel exceeds five percent then it acts brittle and creates difficulties in punching.

21. Why short time rating of an electrical machine is much higher than the continuous rating?

To reach the maximum permissible temperature rise in a short duration, the machine can be loaded to higher than the continuous ratings.

22. What are standard periods for short time rating of a machine?

10, 30,60 and 90 minutes.

23. Why large size machines have large rating time constant?

As the size of the machine increases, the volume and hence weight increases in proportion to third power of linear dimension and surface area in proportion to second power giving large heating time constant for large size machine.

24. State any two methods of cooling turbo alternators.

Methods of cooling turbo alternators:

a. Air Cooled Turbo - Alternators (Small units)

1. One sided axial ventilation
2. Two sided axial ventilation
3. Multiple inlet system

b. 1) Hydrogen cooled turbo-alternators

2) Direct cooled turbo-alternators

25. Distinguish between continuous rating and short time rating of an electrical machine.

Continuous Rating (Duty types S_1):

The continuous rating of a motor may be defined as the load that may be carried by the machine for an indefinite time without the temperature rise of any part exceeding the maximum permissible value.

E.g., Continuously running fans, pumps and other equipment which operate for several hours and even days at a time.

Short time rating (Duty type S_2):

The short time rating of a motor may be defined as its output at which it may be operated for a certain specified time without exceeding the maximum permissible value of temperature rise. Standard short time ratings are 10, 30, 60 and 90 minutes.

E.g., Pump sets and grinders, etc.

26. What is the difference between real and apparent magnetic flux densities in rotating machines?

Apparent flux density (B_{app})	Real flux density (B_{real})
The apparent flux density is defined as $B_{app} = \frac{\text{total flux in a slot}}{\text{tooth area}}$ $B_{app} = B_{real} + 4\pi \times 10^{-7}(K_s - 1)$ $K_s = \frac{L\, y_s}{l_i w_1}$ where L is length, y_s is slot pitch L_i is net iron length	The real flux density $B_{real} = \frac{\text{actual flux in a slot}}{\text{tooth area}}$ Since some of the flux passes at real(K_s -1) through slot, the real flux density is always less than the apparent flux density

W_t is width of the teeth	

27. List the advantages if direct cooling of rotating electrical machines.

1. Natural cooling 2. No investment

28. What are the assumptions made to calculate tire slot leakage?

- Current in the conductors of a slot is uniformly distributed over the cross section.
- Leakage path is straight across the slot and around the iron at the bottom
- Presence of air path is only considered reluctance iron path is assumed
- as zero.

29. How is leakage magnetic flux different from useful magnetic flux?

The leakage flux is not useful for energy transfer or conversion. But the fringing flux is useful flux.

The leakage flux is the unwanted path. But the fringing flux flows in the magnetic path.

The effect of leakage flux on machine performance is accounted by leakage reactance. The fringing flux increases the slot reactance.

30. How is heat produced in a rotating electrical machine?

i) Over loaded
ii)Poor ventilation
iii) Continuous duty

UNIT –II

PART A

1. What are the factors to be considered for the selection of no. of poles in a dc machine?

Frequency of flux reversal, current per brush arm and armature mmf per pole.

2. What are the parameters that are affected by no. of poles?

Weight of iron and cupper, length of commutator, dimension of brushes.

3. What is the range of specific magnetic loading in dc machine?

0.45 to o.75 wb/m^2 or tesla.

4. What is the range of specific electric loading in dc machine?

15000 to 50000 ac/m

5. **List the advantages of large no. of poles.**

Weight of armature core and yoke, cost of armature and field conductors, length of commutators.

6. **List the disadvantages of large no. of poles.**

Frequency of flux reversal, labour charges, possibility of flash over between brush arms.

7. **Why square pole is preferred?**

To reduce copper requirements.

8. **What factor decides the minimum no. of armature coils?**

The maximum voltage between the adjacent commutator segments.

9. **State the difference between armature winding of dc machine and stator winding of ac** machine.

The armature winding of dc machine has closed coils but the stator winding of ac machine has open coils.

10. **Define commutator pitch.**

It is defined as distance between two commutator segments to which the two ends of coils are connected.

11. **What is equalizer connection?**

They are low resistance copper conductors employed In lap winding to equalize the induced emf in parallel path.

12. **What are the effects of armature reaction?**

Reduction in induced emf, increase in iron losses, delayed commutation, sparking and ring firing.

13. **How the polarities of are inter pole decided?**

The polarity of interpole must be that of main pole just ahead for the generator and just behind for a motor.

14. **What is the effect of inter pole on main pole?**

In case of generator, the inter pole will magnetise the leading edge and demagnetize the trailing edge of main pole. In case of motor, the inter pole will demagnetize the leading edge and magnetize the trailing edge of main pole.

15. **Why equalizer connection is necessary for the armature winding of a dc machine with** lap winding?

The equalizer connections help in bypassing the circulating current through the winding and avoid over heating.

16. In a dc machine what are the limiting value of armature peripheral speed?

30 m/s.

17. In a dc machine what are the maximum voltage between commutator segments?

30 volts.

18. What is output equation?

The equation describing the relation between the output and main dimensions, specific loadings and speed of the machine is known as output equation.

19. State the relationship between number of armature coils and number of commutator segments in d.c. machine.

Relationship between number of armature coils and number of commutator segments in a d.c. machine $\beta_C = \frac{\pi D_C}{C}$

where β_C is commutator segment pitch

C is Number of coils

D_C is Diameter of commutator

20 State different losses in a d.c. generator.

Losses in a d.c. generator

1) Copper losses
   - i) Armature copper loss = $I_a^2 R_a$.
   - ii) Field copper loss = (I2shRsh, I2seRse)

2) Magnetic losses (iron (or) copper loss)
   - i) Hysteresis loss, $W_h B^{1.6}$ maxf
   - ii) Eddy current loss $W_e B^2$max f
   - iii) Mechanical loss

21. State different losses in a machine.

The losses in a d.c. machine can be classified into two general types. They are

1. Rotational losses
   - i. frictional and windage losses
   - ii. Iron losses
2. Copper loss

22. What are the main parts of a DC generator?

The DC generator essentially have three major parts

i. Field system
ii. Armature
iii. Commutator

The field system includes main poles, interpoles and frame.

23. Write the guiding factors for choice of number of armature slots of D. C. Machine.

1.Slot width
2.Cooling of armature conductor
3.Flux pulsation
4.Commutation
5.Cost

24. Define brush contact loss.

The losses at the commutator are the brush contact losses and the brush friction losses. The brush contact loss depends on the material condition and quality of commutation obtained.

25. Give the main parts of a d. c. motor.

i. Field system (stator)
ii) Armature (Rotor)
iii) Commutator
iv) Main poles
v) Inter poles and
vi) Frame

26. State the relation between the number of commutator segments and number of armature coils in a d.c, generator.

The number of commutator segment is equal to the number of coils in a d.c. generator,

$$\beta_c = \frac{\pi D_c}{C}$$

β_c is Commutator segment pitch
C is No. of coils
D_c is Diameter of commutator

UNIT –III

PART A

1. Why the area of yoke of a transformer is usually kept 15 to 20 % more than that of core?

The flux density in the yoke is reduced resulting in to reduction in iron losses for yoke.

2. What is the cause of noise in transformer?

It is because of magnetostriction effect and also losing of stampings and mechanical forces produces during working.

3. **What are the important properties of transformer steel?**
   High permeability, high resistivity, low coercive force

4. **Why stepped core are generally used for transformer?**
   LV & HV coils are circular, for better utilization of space, for reducing the mean length of LV & HV turns, resulting in saving of copper material.

5. **What are the advantages of using higher flux density in the core?**
   Reduced overall size and weight of transformer

6. **List the disadvantages of using higher flux density in the core?**
   Increased magnetizing current and iron losses, saturation of magnetic material, lower efficiency.

7. **Why the cross section of yoke is taken greater than cross section?**
   In order to reduce flux density in the yoke, thereby reducing iron losses and no load current in yoke section.

8. **What are the types of windings commonly used for LV winding?**
   Cylindrical winding with rectangular conductors and helical winding.

9. **What are the drawbacks of sandwich winding?**
   Requires more labour in its maintenance, more difficult to insulate different coils from each other and from yoke.

10. **Name few insulating materials used in transformer.**

    Press board, cable paper, varnished silk, transformer oil, porcelain, insulating warmish.

11. **How iron losses occur in transformer minimized?**
    By laminating magnetic cores and yokes.

12. **Why the efficiency of transformer is so high?**
    Mechanical losses zero and iron losses are comparatively less.

13. **Mention clearly the condition for maximum efficiency?**
    Efficiency is maximum at a load at which copper losses are equal to iron losses.

14. **Mention the main function of cooling medium used in transformer.**
    i) To transfer heat from convection from the heated surface to tank surface.
    ii) To create good level of insulation between various conducting parts.

15. What is window space factor in design of transformer?

It is defined as the ratio of copper area in window to total area of window.

16. What are the different losses in a transformer?

Losses in a transformer:

a) Core (or) iron loss.

b) Copper loss

17. State merits of three phase transformer over single phase transformers.

Merits of three phase transformers:

a) A three phase transformer occupies less space for same rating compared to a bank of three single phase transformers.

b) It is less weight.

c) Cost is less.

d) The core will be smaller size and the material required for the loss is less.

18. Why is the core of the transformer laminated?

The cores of transformer are laminate in order to reduce the eddy current losses. The eddy current loss is proportional to the square of the thickness of laminations. This apparently implies that the thickness of the laminations should be extremely small in order to reduce the eddy current losses to a minimum.

19. What are the advantages of three phase transformers over single phase transformers?

i. A three phase transformers is lighter, occupies lesser space, cheaper and more efficient than a bank of single phase transformers.

ii. In case of three phase transformers than is only one unit to install and operate. Hence the installation and operational costs are smaller for three phase units.

20. Write the relation between core area and with of iron and copper for a single phase transformer..

$Ac=T_p\ \delta_p+ T_s\ \delta_s$

21. Differentiate core and shell type transformers.

Core type	**Shell type**
Easy in design and construction	Comparatively complex
Has low mechanical strength due to non-bracing of windings	High mechanical strength

22. State different losses in a transformer.

i) Iron losses (or) Core losses

ii) Copper losses

UNIT – 4

PART A

1. What is rotating transformer?

The principle of operation of induction motor is similar to that a transformer. The stator winding is equivalent to primary of a transformer and the rotor winding is equivalent to short circuited secondary of a transformer. In transformer the secondary is fixed but in induction motor it is allowed to rotate.

2. Why wound rotor construction is adopted?

The wound rotor has the facility of increasing the rotor resistance through slip rings. Higher values of rotor resistance are needed during starting to get a high value of starting torque.

3. What are the main dimensions of induction motor?

The main dimensions of induction motor are stator core internal diameter and stator core length.

4. What are the different types of induction motor? How they differ from each other?

The two different types of induction motor are squirrel cage and slip ring type. The stator is identical for both types but they differ in the construction of rotor.

5. How the slip-ring motor is started?

The slip-ring motor is started by using rotor resistance starter. The starter consists of star connected variable resistances and protection circuits. The resistances are connected to slip-rings. While starting the full resistance is included in the rotor circuit to get high starting torque. Once the rotor starts rotating, the resistances are gradually reduced in steps. At running condition slip-rings are shorted and so it is equivalent to squirrel cage rotor.

6. What type of starter cannot be used for squirrel-cage motors?

The starter which cannot be used for squirrel cage motor is rotor resistance starter.

7. What type of connection is preferred for stator of induction motor?

Under running condition the stator of induction motor is normally connected in delta. (In delta connection the torque developed will be higher than the star connection). But for reducing the starting current, the stator can be connected in star while starting and then changed to delta.

8. Write the expression for output equation and output coefficient of induction motor.

The equation for input KVA is considered as output equation in induction motor.

The input KVA, $Q=C_oD^2Ln_s$ in KVA

Output coefficient, $C_o=11K_{ws}B_{av}ac \times 10^{-3}$ in KVA/m^3-rps

9. What are the materials used for slip-rings and brushes in induction motor?

The slip-rings are made of brass or phosphor bronze. The brushes are made of metal graphite which is an alloy of copper and carbon.

10. What are the ranges of specific magnetic loading in induction motor?

Specific magnetic loading = 0.3 to 0.6 Wb/m^2

Specific electric loading = 5000 to 45000 amp .cond /m.

11. What are the ranges of efficiency and power factor in induction motor?

Squirrel cage motors

Efficiency = 0.72 to 0.91

Power factor = 0.66 to 0.9

Slip ring motors

Efficiency = 0.84 to 0.91

Power factor = 0.7 to 0.92

The ISI specification says that the product of efficiency and power factor shall be in the range of 0.83 to 0.88.

12. What are the factors to be considered for' the choice of specific electric loading?

The choice of specific electric loading depends on copper loss, temperature rise, voltage rating and overload capacity.

13. How the induction motor can be designed for best power factor?

For best power factor the pole pitch, τ is chosen such that $\tau = \sqrt{0.101}$.

14. What are the factors to be considered for the choice of specific magnetic loading?

The choice of specific magnetic loading depends on power factor, iron loss and over load capacity.

15. What types of slots are preferred in induction motor?

Semi enclosed slots are preferred for induction motor. It results in less a gap contraction factor giving a small value of magnetizing currents, low tool pulsation loss and much quieter operation (less noise).

16. What is full pitch and short pitch or chording?

When the coil span is equal to pole pitch (180^oe). The winding is called full pitched winding.

When the coil span is less than the pole pitch (180^oe). The winding is called short pitched or Chorded.

17. Why short chorded windings are employed in induction motor?

For short chorded windings the length of mean turn will be lesser than the full pitch coils. Hence it results in reduction of copper. Also the short chorded winding eliminates certain harmonic magnetic fields.

18. What is integral slot winding and fractional slot winding?

In integral slot winding the total number of slots is chosen such that the slots per pole are an integer. The integer should also be a multiple of number of phases.

In fractional slot winding the total number of slots is chosen such that per pole is an integer.

19. What are the different types of stator windings in induction motor?

The different types of stator windings are mush winding, lap winding and wave winding.

20. List the undesirable effects produced by certain combination of rotor and stator slots.

The following problems may develop in induction motor with certain combination of rotor and stator slots.

1. The motor may refuse to start, (clogging)
2. The motor may run at sub synchronous speed (crawling)
3. Severe vibration may develop and the noise will be excessive.

21. What is slot space factor?

The slot space factor is the ratio of conductor (or copper) area per slot and slot area. It gives an indication of the space occupied by the conductors and the space available for insulation. The slot space factor for induction motor varies from 0.25 to 0.4.

22. What are the factors to be considered for estimating the length of air-gap in induction motor?

The following factors are to be considered for estimating the length of air-gap.

1.Power factor
2.Overload capacity
3.Pulsation loss
4.Unbalanced magnetic pull
5.Cooling
6.Noise

23. Write the expression for length of mean turn of stator winding.

Length of mean turn of stator, $L_{mts} = 2L + 2.3\tau + 0.24$

24. Which part of induction motor has maximum flux density? What is the maximum value of flux density in that part?

The teeth of the stator and rotor core will have maximum flux density. The maximum value of flux density in the teeth is 1.7 Wb/m^2.

25. What are the advantages and disadvantages of large air-gap length, in induction motor?

Advantages

A large air-gap length results in higher overload capacity, better cooling, reduction in noise and reduction in unbalanced magnetic pull.

Disadvantages

The disadvantage of large air-gap length is that it results in high value of magnetizing current.

26. What is skewing?

Skewing is twisting either the stator or rotor core. The motor noise, vibrations, clogging and synchronous cusps can be reduced or even entirely eliminated by skewing.

In order to eliminate the effect of any harmonic, the rotor bars should be skewed through an angle so that the bars lie under alternate harmonic poles of the same polarity or in other words the bars must be skewed through two pitches.

27. Explain the phenomena of clogging.

When the number of stator and rotor slots are equal, the speeds of all the harmonics produced by stator slotting coincide with the speed of corresponding, rotor harmonics. Thus harmonics of every order would try to exert synchronous torques at their corresponding synchronous speeds and the machine would refuse to start. This is known as clogging.

28. What are the methods to reduce harmonic torques?

The methods used for reduction or elimination of harmonic torques are chording, integral slot winding, skewing and increasing the length of air-gap.

29. What is crawling and clogging?

Crawling is a phenomenon in which the induction motor runs at a speed lesser than sub synchronous speed.

Clogging is a phenomenon in which the induction motor refuses to start.

30. What is harmonic induction torque and harmonic synchronous torque?

Harmonic induction torque is the torque produced by harmonic fields due to stator winding and slots.

Harmonic synchronous torques are torques produced by the combined effect of same order of stator and rotor harmonic fields.

Due to both the harmonic torques the machine may crawl, but there will be difference in the crawling speeds. In case of harmonic induction torque crawling speed is slightly lesser than the sub synchronous speed. But in case of harmonic synchronous torque the crawling speed is same as that of sub synchronous speed and this is also called synchronous cusps.

31. State the main constructional differences between cage induction motor and slip ring induction motor.

The squirrel cage motor has the following advantages a s compared with wound rotor machine. They are

a. No slip rings, brush gear, short circuiting devices, rotor terminals for starting rheostats are required. The star delta starter is sufficient for starting.
b. It has slightly higher efficiency.
c. It is cheaper and rugged in construction.
d. It has better spce factor for rotor slots, a short overhang and consequently a smaller copper loss.
e. It has bare and rings, a larger space for fans and thus the cooling conditions are better.
f. It has a smaller rotor overhang leakage which gives a better power factor and a greater pull out torque and overload capacity.

Disadvantages:

The greatest disadvantage of squirrel cage rotor is that it is not possible to insert resistances in the rotor circuit for the purpose of increasing the starting torque. The cage motor has a smaller starting torque and larger starting current as compared with wound rotor motor.

32. What are the different losses in an induction motor?

The various power losses in an induction motor can be classified as

b. Constant loss: These can be further classified as core losses and mechanical losses.
c. Variable loss: This includes the copper losses in stator and rotor winding due to current flowing in the winding.

33. What are the merits of slip-ring induction motor over cage-induction motor?

1. It is possible to insert resistances in the rotor circuit for the purpose of increasing the starting torque.
2. The starting current is low when compared to the cage induction motor.

34. How does the external resistance of slip-ring induction motor influence the motor performance?

The starting torque of a slip ring motor is increased by improving its power factor by adding external resistance in the rotor circuit from the star connected rheostat resistance being progressively cut out as the motor gathers speed.

Addition of external resistance, however increases the rotor impedances and so reduces the rotor current.

35. State the effect of change of air gap length in a 3 phase Induction motor -.

i. The length of the air gap determines the magnetizing current.
ii. Greater the length 'Of the air gap, greater will be the over load capacity.

36. Define unbalanced magnetic pull:

Unbalanced magnetic pull is the radial force acting on the rotor due to non uniform air gap around armature periphery.

37. List the main parts of a slip-ring Induction motor

i) Rotor core
ii) Rotor winding
iii) Slip rings
iv) Frame
v) Stator core
vi) Stator winding

38. What is the function of end rings ill the rotor of a cage induction motor?

End rings are provided to short circuit the rotor bars at both the ends.

UNIT – V

PART A

1. Name the two types of synchronous machines.

Based on construction the synchronous machines may be classified as,

1. Salient pole machines.
2. Cylindrical rotor machines.

2. What are the factors to be considered for the choice of specific magnetic loading?

The factors to be considered for the choice of specific magnetic loading are

1. Iron loss
2. Voltage rating
3. Transient short circuit current
4. Stability
5. Parallel operation

3. What is runaway speed?

The runaway speed is defined as the speed which the prime mover should have, if it is suddenly unloaded, when working at its rated load.

4. What are the two types of poles used in salient pole machines?

The two types of poles used in salient pole machines are Round poles and Rectangular poles.

5. What are the factors to be considered for the choice of specific electric loading?

The factors to be considered for the choice of specific electric loading are

- Copper loss

- Temperature rise
- Voltage rating
- Synchronous reactance
- Stray load losses

6. What is short circuit Ratio (SCR)?

The Short Circuit Ratio (SCR) is defined as the ratio of field current required to produce rated voltage on open circuit to field current required to circulate rated current at short circuit.

It is also given by the reciprocal of synchronous reactance, X_d in p.u (per unit). For turbo - alternators *SCR* is normally between 0.5 to 0.7. For salient pole alternator SCR varies from 1.0 to 1.5.

7. Write the expressions for length of air-gap in salient pole synchronous machine?

Length of air-gap,

$$l_g = \frac{AT_{for}}{B_g K_g 10^{-6}}$$

(Or)

$$l_g = \frac{AT_a SCR K_f}{B_{av} K_g 10^6}$$

8.What is salient pole rotor? What is Alternator? What are the advantages of large air-gap in synchronous machine?

The advantages of large air-gap are

- Reduction in armature reaction
- Small value of regulation
- Higher value of stability
- A higher synchronizing power which makes the machine less sensitive to load variation.
- Better cooling
- Lower tooth pulsation loss
- Loss noise
- Smaller unbalanced magnetic pull.

9. What is the limiting factor for the diameter of synchronous machine?

The limiting factor for the diameter of synchronous machine is the peripheral speed. The limiting value of peripheral speed is 175 m/sec for cylindrical rotor machines and 80 m/sec for salient pole machines.

10. Write the expression for air-gap length in cylindrical rotor machine.

$$l_g = \frac{0.5(SCR)(ac)K_f \tau \, x10^{-6}}{B_{av}K_g}$$

1. State merits of computer aided design of an electrical machine.

Merits of Computer Aided design:

b. It makes it possible to select an optimized design with a reduction in cost and improvement in performance.

c. It has capabilities to store amount of data, count integers, round off results down to integer and refer to tables, graphs and other data in advance.

d. A large number of loops can be incorporated in the design programme and therefore it makes it easier to compare different designs out of which the best suited can be selected.

11. **What are the constructional differences between salient pole type alternator and cylindrical rotor type alternator?**

Salient pole Alternator:

The term salient pole means projected pole. This type of rotor is used for low and medium speed machines. The prime mover used is water turbine which gives low speed 50 to 500 rpm.

In order to get standard frequency 50 Hz, the number of poles lies in the range 12 to 120. Because of low speed such machines are characterized by large diameter and small length.

Since water turbine is used' as a prime mover type of alternator is also called hydro electric generator.

12. Define short circuit ratio of a synchronous gemerator.

The short circuit ratio (SCR) of a synchromous machine is define as the ratio of field current required to produce rated voltage or open circuit to field current required to circulate rated current at short circuit.

13. State merits of Computer Aided Design of electrical machines.

- It is possible to select an optimized design with a reduction in cost and improvement in performance.
- Reduces the probability of error with the result likely accurate and reliable.
- All simple arithmetic operations are performed at a high speed and makes possible to provide design in a short time.

14. State the merits of computer aided design of electrical machines.

(i) Easy to access

(ii) Time consumption

(iii) Accuracy

15. What is the use of-damper winding?

To prevent hunting.

16. How is cylindrical pole different from salient pole in a synchronous machine?

i) Cylindrical pole are non, projecting pole whereas the salient pole machines are projecting pole.

ii) Cylindrical rotor construction is used for turbo alternators which are driven by high speed steam or gas turbines where as salient pole construction is used for generators driven by hydraulic turbine since these turbines 'operate at relatively low speeds.

17. How is computer aided design different from conventional design in the case of electrical apparatus?

i) Easy to access

ii) Time consumption

iii) Accuracy