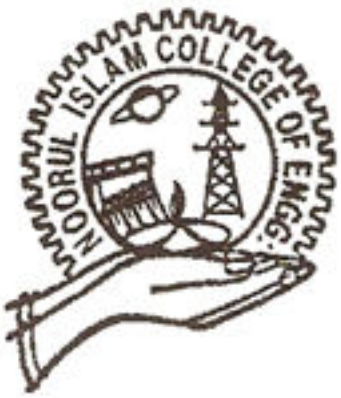
ELECTRICAL MACHINES

TWO MARKS



NOORUL ISLAM COLLEEGE OF ENGINEERING

KUMARACOIL

1. Mention the difference between core and shell type transformers?

In core type, the windings surrounded the core considerably and in shell type the core surround the windings i.e winding is placed inside the core.

2. **What is the purpose of laminating the core in a transformer?**

To reduce the eddy current loss in the core of the transformer.

3. **Give the emf equation of a transformer and define each term?**

Emf induced in primary coil E1= 4.44fΦmN1 volt emf induced in secondary coil E2 =4.44 fΦmN_2.

f--->freq of AC input

Φm---->maximum value of flux in the core

N1,N2--->Number of primary & secondary turns.

4. **Does transformer draw any current when secondary is open? Why?**

yes, it(primary) will draw the current from the main supply in order to magnetize the core and to supply for iron and copper losses on no load. There will not be any current in the secondary since secondary is open.

5. **Define voltage regulation of a transformer?**

When a transformer is loaded with a constant primary voltage, the secondary voltage decreases for lagging PF load, and increases for leading PF load because of its internal resistance and leakage reactance. The change in secondary terminal voltage from no load to full load expressed as a percentage of no load or full load voltage is termed as regulation.

%regulation down=($V_{2noload}$-V_2F.L)*100/$V_{2noload}$

%regulationup=($V_{2noload}$-$V_{2F.L}$)*100/$V_{2F.L}$

6. **Full load copper loss in a transformer is 1600W. what will be the loss at half load?**

If x is the ratio of actual load to full load then copper loss = x2(F.L copper loss) here Wc = (0.5)2 – 1600=400W.

7. **Define all day efficiency of a transformer?**

It is computed on the basis of energy consumed during a certain period, usually a day of 24 hrs. all day efficiency=output in kWh/input in kWh tor 24 hrs.

8. **Why transformers are rated in kVA?**

Copper loss of a transformer depends on current & iron loss on voltage. Hence total losses depends on Volt-Ampere and not on PF. That is why the rating of transformers are in kVA and not in kW.

9. **What are the typical uses of auto transformer?**

1. To give small boost to a distribution cable to correct for the voltage drop.
2. As induction motor starter.

10. **What are the application of step-up & step-down transformer?**

Step-up transformers are used in generating stations. Normally the generated voltage will be either 11kV. This voltage(11kV) is stepped up to 110kV or 220kV or 400kV snd transmitted through transmission lines(simply called as sending end voltage). Step-down transformers are used in receiving stations. The voltage are stepped down to 11kV or 22kV are stepped down to 3phase 400V by means of a distribution transformer and made available

at consumer premises. The transformers used at generating stations are called Power transformers.

11. **How transformers are classified according to their construction?**

1. core type

2.shell type. In core type, the winding (primary and secondary) surround the core and in shell type, the core surround the winding.

12. **Explain on the material used for core construction?**

The core is constructed by sheet steel laminations assembled to provide a continuous magnetic path with minimum of air gap included. The steel used is of high silicon content sometimes heat treated to produce a high permeability and a low hysteresis loss at the usual operating flux densities. The eddy current loss is minimized by laminating the core, the laminations being used from each other by light coat of core-plate vanish or by oxide layer on the surface. The thickness of lamination varies from 0.35mm for a frequency of 50Hz and 0.5mm for a frequency of 25Hz. When will a Bucholtz relay operates and give an alarm.

13.**How does change in frequency affect the operation of a given transformer?**

With a change in frequency, iron and copper loss, regulation, efficiency & heating varies so the operation of transformer is highly affected.

14. **What is the angle by which no-load current will lag the ideal applied voltage?**

In an ideal transformer, there are no copper & core loss i.e loss free core. The no load current is only magnetizing current therefore the no load current lags behind by angle 90^0. However the winding possess resistance and leakage reactance and therefore the no load current lags the applied voltage slightly less than 90^0.

15. **List the arrangement of stepped core arrangement in a transformer?**

1. To reduce the space effectively

2. To obtain reduce length of mean turn of the winding

3. To reduce I^2R loss. Why are breathers used in transformers? Breathers are used to entrap the atmospheric moisture and thereby not allowing it to pass on to the transformer oil. Also to permit the oil inside the tank to expand and contract as its temperature increases and decreases.

16. **What is the function of transformer oil in a transformer?**

1. It provides good insulation

2. Cooling.

17. **Can the voltage regulation go –ive? If so under what condition?**

Yes, if the load has leading PF.

18. **Distinguish power transformers & distribution transformers?**

Power transformers have very high rating in the order of MVA. They are used in generating and receiving stations. Sophisticated controls are required. Voltage ranges will be very high. Distribution transformers are used in receiving side. Voltage levels will be medium. Power ranging will be small in order of kVA. Complicated controls are not needed.

19. **What is the purpose of providing Taps in transformer and where these are provided?**

In order to attain the required voltage, taps are provided, normally at high voltages side(low current).

20. **What is prime mover?**

The basic source of mechanical power which drives the armature of the generator is called prime mover.

21. **Give the materials used in machine manufacturing?**

There are three main materials used in m/c manufacturing they are steel-----to conduct magnetic flux copper----to conduct electric current insulation.

22. **What are factors on which hysteresis loss?**

It depend on magnetic flux density, frequency & volume of the material.

23. **What is core loss? What is its significance in electric machines?**

When a magnetic material undergoes cyclic magnetization, two kinds of power losses occur on it. Hysteresis and eddy current losses are called as core loss. It is important in determining heating, temperature rise, rating & efficiency of transformers, machines & other A.C run magnetic devices.

24. **What is eddy current loss?**

When a magnetic core carries a time varying flux, voltages are induced in all possible path enclosing flux. Resulting is the production of circulating flux in core. These circulating current do no useful work are known as eddy current and have power loss known as eddy current loss.

25. **How hysteresis and eddy current losses are are minimized?**

Hysteresis loss can be minimized by selecting materials for core such as silicon steel & steel alloys with low hysteresis co-efficient and electrical resistivity. Eddy current losses are minimized by laminating the core.

26. **How will you find the direction of emf using Fleming's right hand rule?**

The thumb, forefinger & middle finger of right hand are held so that these fingers are mutually perpendicular to each other, then forefinger-field thumb-motion middle-current. 27. **How will you find the direction of force produced using Fleming's left hand rule?** The thumb, forefinger & middle finger of left hand are held so that these fingers are mutually perpendicular to each other, then forefinger-field thumb-motion middle-current. How are armature windings are classified based on placement of coil inside the armature slots? Single and double layer winding.

28. **Write down the emf equation for d.c.generator**?

$E=(\Phi NZ/60)(P/A)V$.

p--->noof poles

Z--->Total noof conductor

Φ--->flux per pole ,N--->speed in rpm.

29. **Why the armature core in d.c machines is constructed with laminated steel sheets instead of solid steel sheets?**

Lamination highly reduces the eddy current loss and steel sheets provide low reluctance path to magnetic field.

30. **Why commutator is employed in d.c.machines?**

Conduct electricity between rotating armature and fixed brushes, convert alternating emf into unidirectional emf(mechanical rectifier).

31. **Distinguish between shunt and series field coil construction?**

Shunt field coils are wound with wires of small section and have more noof turns. Series field coils are wound with wires of larger cross section and have less noof turns.

32. **How does d.c. motor differ from d.c. generator in construction?**

Generators are normally placed in closed room and accessed by skilled operators only. Therefore on ventilation point of view they may be constructed with large opening in the frame. Motors have to be installed right in the place of use which may have dust, dampness, inflammable gases, chemicals….etc. to protect the motors against these elements, the motor frames are made either partially closed or totally closed or flame proof.

33.**How will you change the direction of rotation of d.c.motor?**

Either the field direction or direction of current through armature conductor is reversed.

34. **What is back emf in d.c. motor?**

As the motor armature rotates, the system of conductor come across alternate north and south pole magnetic fields causing an emf induced in the conductors. The direction of the emf induced in the conductor is in opposite to current. As this emf always opposes the flow of current in motor operation it is called as back emf.

35. **What is the function of no-voltage release coil in d.c. motor starter?**

As long as the supply voltage is on healthy condition the current through the NVR coil produce enough magnetic force of attraction and retain the starter handle in ON position against spring force. When the supply voltage fails or becomes lower than a prescribed value then electromagnet may not have enough force to retain so handle will come back to OFF position due to spring force automatically.

36. **Enumerate the factors on which speed of a d.c.motor depends**?

$N= (V-I_aR_a)/\Phi$ so speed depends on air gap flux, resistance of armature, voltage applied to armature.

37. Under What circumstances does a dc shunt generator fails to generate?

Absence of residual flux, initial flux setup by field may be opposite in direction to residual flux, shunt field circuit resistance may be higher than its critical field resistance, load circuit resistance may be less than its critical load resistance.

38. **Define critical field resistance of dc shunt generator?**

Critical field resistance is defined as the resistance of the field circuit

which will cause the shunt generator just to build up its emf at a specified field.

39. **Why is the emf not zero when the field current is reduced to zero in dc generator?**

Even after the field current is reduced to zero, the machine is left out with some flux as residue so emf is available due to residual flux.

40. **On what occasion dc generator may not have residual flux?**

The generator may be put for its operation after its construction, in previous operation, the generator would have been fully demagnetized.

41. **What are the conditions to be fulfilled by for a dc shunt generator to build back emf?** The generator should have residual flux, the field winding should be connected in such a manner that the flux setup by field in same direction as residual flux, the field resistance should be less than critical field resistance, load circuit resistance should be above critical resistance.

42. **Define armature reaction in dc machines?**

The interaction between the main flux and armature flux cause disturbance called as armature reaction.

43. **What are two unwanted effects of armature reactions?**

Cross magnetizing effect & demagnetizing effect.

44. **What is the function of carbon brush used in dc generators?**

The function of the carbon brush is to collect current from commutator and supply to external load circuit and to load.

45. **What are the 2 types of 3phase induction motor?**

Squirrel cage and slip ring induction motor.

46. **Write two extra features of slip ring induction motor?**

Rotor has 3phase winding. extra resistance can be added in rotor circuit for improving PF with the help of three slip rings.

47. **Why an induction motor is called as rotating transformer?**

The rotor receives same electrical power in exactly the same way as the secondary of a two winding transformer receiving its power from primary. That is why induction motor is called as rotating transformer.

48. **Why an induction motor never runs at its synchronous speed?**

If it runs at sy.speed then there would be no relative speed between the two, hence no rotor emf, so no rotor current, then no rotor torque to maintain rotation.

49. **What are slip rings?** The slip rings are made of copper alloys and are fixed aroud the shaft insulating it. Through these slip rings and brushes rotor winding can be connected to external circuit.

50. **What are the advantage of cage motor?**

Since the rotor have low resistance, the copper loss is low and efficiency is very high. On account of simple construction of rotor it is mechanically robust, initial cost is less, maintenance cost is less, simple starting arrangement.

51. **Give the condition for maximum torque for 3phase induction motor, when it is running?**

The rotor resistance and reactance should be same for max.torque i.e. $R2=Sx_2$.

52. **List out the method for speed control of 3phase cage type induction motor?**

By changing supply frequency

By changing noof poles

By operating the two motors in cascade.

53. **Name the two winding of single phase induction motor?**

Running and starting winding.

54. **What are methods available for making single phase induction motor a self starting?**

By slitting the single phase, by providing shading coil in the poles.

55. **What is the function of capacitor in single phase induction motor?**

To make phase difference between starting and running winding, to improve PF and to get more torque.

56. **State any 4 use of single phase induction motor?**

Fans, wet grinders, vacuum cleaner, small pumps, compressors, drills. Explain why single phase induction motor is not a self starting one? When motor fed supply from single phase, its stator winding produces an alternating flux, which doesn't develops any torque.

57. **What kind of motors used in ceiling fan and wet grinders?**

Ceiling fan - Capacitor start and capacitor run single phase induction motor,

wet grinders- Capacitor start capacitor run single phase induction motor.

58. **What is the application of shaded pole induction motor?**

Because of its small starting torque, it is generally used for small toys, instruments, hair driers, ventilators..etc.

59. **In which direction a shaded pole motor runs?**

The rotor starts rotation in the direction from unshaded part to the shaded part.

60. **Why single phase induction motor have low PF?**

The current through the running winding lags behind the supply voltage by large angle so only single phase induction motor have low PF.

61. **Differentiate between "capacitor start" & "Capacitor start capacitor run" single phase induction motor?**

Capacitor start – capacitor is connected series with starting winding, but it will be disconnected from supply when motor pick up its speed. Capacitor start capacitor run- starting winding and capacitor will not be disconnected from supply even though motor pickup its speed.

62. **What are the principal advantages of rotating field type construction?**

Relatively small amount of power required for field system can easily supplied to rotating system using slip rings and brushes, more space is available in the stator part of the

machine to provide more insulation, it is easy to provide cooling system, stationary system of conductors can easily be braced to prevent deformation.

63. **What are the advantages of salient type pole construction used in sy.machines?**

They allow better ventilation, the pole faces are so shaped radial air gap length increases from pole center to pole tips so flux distortion in air gap is sinusoidal so emf is also sinusoidal.

64. **Which type of sy.generators are used in hydroelectric plants and why?**

As the speed of operation is low, for hydro turbines used in hydroelectric plants, salient pole type sy.generator is used because it allows better ventilation also better than smooth cylindrical type rotor.

65. **Why are alternators rated in KVA and not in KW?**

As load increases I^2R loss also increases, as the current is directly related to apparent power delivered by generator, the alternator has only their apparent power in VA/KVA/MVA as their power rating.

66. **Why the sy.impedance method of estimating voltage regulation is is considered as pessimistic method?**

Compared to other method, the value of voltage regulation obtained by this method is always higher than the actual value so it is called as pessimistic method.

67. **Why MMF method of estimating voltage regulation is considered as optiimistic method?**

Compared to EMF method, MMF method involves more noof complex calculation steps. Further the OCC is referred twice and SCC is referred once while predetermining the voltage regulation for each load condition. Reference of OCC takes core saturation effect. As this method require more effort, final result is very close to actual value, hence this method is called as optiimistic method.