Energy conversion – I

1. What is the number of parallel paths in lap winding and wave winding in dc machines ?
2. What is the role of back emf in dc motor running ?
3. Why breather is used in transformer ?
4. What are the factors which affect the torque of dc motor ?
5. State the two methods of improving commutation in dc generator .
6. What do you mean by burden in instrument transformers ?
7. State any two cooling methods of transformer .
8. What is 'all day efficiency' in distribution transformers ?
9. Why the C.T. secondary should not be kept open ?
10. Write any two application of auto transformer.
11. What is the function of pole shoe in dc machine?
12. Why transformer rating is done in KVA ?
13. State the working principle of dc motor .
14. Define All Day Efficiency of transformer .
15. State two uses of auto –Tranformer .
16. What type of speed control is obtained by flux control method and armature voltage control method ?
17. State and condition for maximum efficiency in a transformer .
18. Difference between core –type and shell –type transformer .
19. State the name of vector groups for 180◦ phase displacement in three-phase transformers .
20. Define commutator pitch .
21. What are the advantages of auto transformer over 2-winding transformer ?
22. What purpose is served by the pole shoe in a dc m/c
23. Define what is voltage regulation of a transformer?
24. Show the phasor re presentation of a pure resistive lode .
25. What is the significance of back emf in d.c. motor?
26. What is function of nvc in the stater .
27. Define voltage regulation of a transformer.
28. What happens when a d.c suooly is given to the primary side of a single phase transformer?
29. Write down two advantages of parallel operation of 1^{ϕ} transformer.
30. State the different types of losses which occurs in transformer .
31. Write the application of d.c. compound motor .
32. Why stater is necessary for starting of d.c. motor ?
33. What is burden ?
34. Define 'Ration error' in current transformer .
35. What is critical resistance of a d.c. shunt generator ?
36. Show the phasor representation of a pure resistive lode .
37. What is the essential difference between lap and wave winding ?
38. What is back emf in a d.c. motor ?
39. What is commutation?

40. A 50 kw,440 v, shunt generator having an armature circuit resistance including inter-pole wdg. Of 0.15Ω at normar working temp n. was run as a shunt motor on no –lode at rated voltage and speed . the total current drawn by the the motor was 5 A including shunt field current of 1.5A. calculate the efficiency of the shunt generator at ¾ the f.i.
41. What is the difference between a power and distribution transformer ?
42. What purpose is served by the pole shoe in a dc m/c .
43. The greatest percentage of heat loss in a dc m/c is due to what?
44. Which of the dc shunt motor speed control method gives the new speed above rated speed.
45. What is resultant pitch?
46. What happens when a d.c. supply is given to the primary side of a single phase transformer?
47. Why d.c series motor is started with load ?
48. What is the function of breather in a transformer ?
49. What is the vconnection diagram of p.t.
50. What are the use of carbon brushes in a dc generator .
51. What is the fraction of f.l KVA at which maximum efficiency occurs in a transformer .
52. What is the value of commutator .
53. If wc is the constant loss and ra is the armature resistance of a dc gene rator , then load current IL corresponding to maximum efficiency will be how much ?
54. What are the names of various starters required for the d.c. motor ?
55. What arwe the advantages of separately excited d.c generator over over self excited generator.
56. What is the need of iron core in a transformer .
57. Upon what factor the armature resistance of a d.c. m/c depends ?
58. Why are iron losses constant at all loades in a transformer ?
59. Show the various of a 3-phase transformer.
60. What is the function of pole-shoe in a d.c. machine?

5 MARK QUESTIONS

1. Describe the armature control method in speed control of dc shunt motors.
2. Wrte the differences between core type transformer and shell type transformer.
3. A 4-pole, lap wound DC shunt generator has a useful flux per pole of 0.07 Wb. The armature winding consists of 220 turns each of 0.0040 resistance. Calculate the terminal voltage when running at 900 RPM if the armatuer current is 50 A.
4. Explain the operation of ON Load Tap changer in transformer using resistor transition.
5. Write a short note on potential transformer (PT).
6. A 25 kVA transformer has turns on the primary and 50 turns on the secondary winding. The primary is connected to 3000V, 50Hz supply. Find the full load primary and secondary currents, the secondary e.m.f. and the maximum flux in the core. Neglect leakage drops and no load primary current.

7. Derive the condition for maximum power developed in a dc motor.
8. Derive the condition for maximum efficiency in a dc generator.
9. An 8-pole dc shunt generator with 778 wave connected armature conductors and running at 500 rpm supplies a load of 12.502 resistance at terminal voltage of 250 V. The armature resistance is 0.24 and field resistance is 2502. Find the armature current induced emf and flux per pole.
10. Derive the emf equation of DC Generator.
11. A 20kVA, 440/220V, 1-6, 50 Hz transformer has iron loss of 324 W. The copper loss is found to be 100 W when delivering half full-load current. Determine:
    (i) Efficiency when delivering full-load current at 0.8 pf lagging.
    (ii) Percent of full-load KVA when the efficiency will be maximum.
12. Compare the amount of copper used in between auto-transformer and two-winding transformer of same rating.
13. Develop the phasor diagram of a single-phase transformer under load condition. Assume lagging power factor load.
14. State the conditions for parallel operation of 1-0 transformers.
15. State different methods of speed control of a d.c. motor. Explain the field flux control method of speed control.
16. Explain the process of building up of voltage in a d.c. shunt generator.
17. A shunt generator gives full-load output of 30 kW at a terminal voltage of 200 volt. The armature and shunt field resistance are 0.05Ω and 50Ω respectively. The iron and friction losses are 1000 watt. Calculate, i) generated emf, (ii) copper losses,iii)efficiency.
18. What are the drawbacks of three point starter? Describe a four point starter with a neat sketch.
19. Derive the torque equation of D.C. motor.
20. Explain the commutation process in D.C. Generator.
21. Derive the condition for maximum efficiency of a transformer.
22. A 4 pole, 220 V shunt motor has 540 lap-wound conductor .it takes 32 A form the supply mains and develops output power of 5.595 kW. The field winding takes 1 A. The armature resistance is 0.09 and the flux per pole is 30 mWb. Calculate:
    (i) the speed and
    (ii) the torque developed in N-M.
23. Derive the e.m.f. equation of DC Generator.
24. A 30 kVA, 2400/120 V, 50 Hz transformer has a high voltage winding resistance of 0.1 and a leakage reactance of 0.22 2. The low voltage winding resistance is 0.035 and the leakage reactance is 0.012 2. Find the equivalent winding resistance, reactance and impedance referred to the (i) High voltage side (ii) Low voltage side
25. State use of C.T. and P.T.
26. A 120 volt, d.c. shunt motor has an armature resistance of 0.2 Q and a field resistance of 60 2. The full-load line current is 60 A and full-load speed is 1500 r.p.m. If the brush contact drop is 3 V, find the speed of the motor at half- load.
27. A 50 kVA, 6360/240 V, 50 Hz two winding transformer gave the following test results for measurements on h.v. side. O.C. Test: 6360 V, 1 A, 2000 W S.C. Test: 180 V, 6.6 A, 1000 W(i)

Parameters as referred to high voltage side, (ii) Regulation and efficiency at full-load 0.8 p.f. lagging.

28. Derive the emf equation of a transformer.
29. What is critical speed of a d.c. shunt generator? Also explain the condition for voltage development.
30. Why cooling of transformer is necessary and how it can be cooled ?
31. Make a comparison between auto transformer and a 2-winding transformer.
32. What are the principle of operations of a transformer ?
33. A 4-pole DC series motor has 944 wave connected armature conductors. At a certain load, the flux per pole is 34.6 mwb and the mechanical torque developed is 200 N.m. Calculate the line current taken by the motor and the speed at which it will run. The applied voltage is 500 V and total motor resistance is 30Ω.
34. Why C.T. secondary should never be open circuited. Draw the ckt. diagram of a C.T.
35. a 16 transformer has 500 primary and 1000 secondary turns. The net C.S. area of the core 80 cm^2. If the pri. wdg be connected to 50 Hz supply at 400 volt. Calculate:
36. (i) the maximum value of flux density in the core ii) the voltage in the secondary wdg.
37. A 220 volt dc shunt motor has a shunt field resistance of 110 and has a armature resistance of 0.52. when running in no-load it takes 5 Amp; fromt he lines and its speed is 1500 rpm. Calculate its speed, when taking 40 A from the lines.
38. Why cooling of transformer is necessary and how it can be cooled ?
39. What is critical speed of a d.c. shunt generator? Also explain the condition for voltage development.
40. A 220 volt de shunt motor has a shunt field resistance of 110 2 and has a armature resistance of 0.50. when running in no-load it takes 5 Amp; fromt he lines and its speed is 1500 rpm. Calculate its speed, when taking 40 A from the lines.
41. Two 2200/ 110 V10 transformer are connected in parallel to supply a common load of 125 kVA at 0.8 PF lagging transformers are rated as follows: Transformer A: 100 kVA, 0.9 % resistance and 10% reactance . Transformer-B: 50 kVA, 1% resistance and 5% reaction. How will the two transformers share the commonload?
42. What is the chief advantage of a dc series motor?
43. Estimate the reduction in speed of a generator with constant excitation on bus bars to decrease its load from 500 kW to 250 kw. The resistance between terminals is 0.015 2. The bus bar voltage is 500 V.

10 MARK QUESTIONS

1. Explain the saving of copper in auto-transformer as compared to ordinary two winding transformer.
2. The armature winding of a 4-pole, 250V DC shunt motor is lap connected. There are 120 slots in each slot containing 8 conductors. The flux per pole is 20 mWb and current taken by the motor is 25A The resistances of armature and field circuit are 0.1Ω and 125Ω respectively if

the rotational losses amount to be 810W. Find (i) Gross torque(ii) Useful torque and (iii) Efficiency.

3. Describe the process of commutation in DC Generator along with sketch diagram in details.
4. Explain about the care and the maintenance of transformer on daily, monthly and yearly basis.
5. A25 kW, 250V, DC shunt generator has armature and field resistances of 0.06 ohm and 100 ohm respectively. Determine the total armature power developed when working (i) as a generator delivering 25 kW output and (ii) as a motor taking 25 kW.
6. The total iron loss in a 460V, 50Hz single-phase transformer is 2400W. When a 230V, 25Hz supply is applied, the total iron loss is 800W. Calculate the hysteresis loss and eddy current loss at normal voltage and frequency of 460 V
7. A230 V dc shunt motor runs at 800 rpm and takes armature current of 50A. Find the resistance to be added to the field circuit to increase the speed to 1000 rpm at armature current of 80A. Assume flux proportional to field current. Ra = 0.15Ω and Rf =250Ω.
8. A 20 kVA, 1-0, 50Hz, 2200/200V transformer gave the following results: OC Test: 2200V applied to primary, Power = 220W. SC Test: Power required to circulate full-load current in SC secondary 240W. Calculate the efficiency at full-load and half-load at pf 0.8 lagging.
9. Explain short-circuit test of 1-ϕ transformer.
10. Explain about the process of communication in DC machines.
11. An 8-pole dc shunt generator with 778 wave connected armature conductors and running at 500 rpm supplies a load of 12.5Ω resistance at terminal voltage of 250 V. The armature resistance is 0.24Ω and field resistance is 250Ω. Find the armature current induced emf and flux per pole.
12. A 20 kVA, 1-ϕ, 50Hz, 2200/200V transformer gave the following results: OC Test: 2200V applied to primary, Power = 220W. SC Test: Power required to circulate full-load current in SC secondary 240W. Calculate the efficiency at full-load and half-load at pf 0.8 lagging.
13. Explain short-circuit test of 1-0 transformer.
14. The total iron loss in a 460V, 50Hz single-phase transformer is 2400W. When a 230V, 25Hz supply is applied, the total iron loss is 800W. Calculate the hysteresis loss and eddy current loss at normal voltage and frequency of 460 V.
15. A shunt generator has FL. current of 196 A at 220 V. The stray losses are 720 W and the shunt field coil resistance is 55 Ω. If it has a F.L. efficiency of 88%. Find the armature resistance. Also find the load current corresponding to maximum efficiency.
16. Explain the working principle of current transformer.
17. An autotransformer supplies a load of 5 kW at 110 volt at unity power factor. If the applied primary voltage is 220 volt, calculate the power transferred to the load (1) inductively (ii) conductively.
18. Two 1100/400 V, single-phase transformers have total equivalent impedances of (0.2+j0.5) Ωand (0.3+j0.6) referred to the secondary side. They are connected in parallel and supply a load of 50 kW at a power factor of 0.85 lagging. Find (1) the magnitudes of their secondary currents (ii) the power delivered by each transformer.

19. A dc shunt generator delivers full load current of 200 A at 240 V. The shunt field resistance is 60 and full load 'n' is 90%. the rotational losses are 800 w. Find.(1) Armature resistance(ii) Current at which max" efficiency occurs ?
20. A 400 KVA transformer has an iron loss of 2kw and the maximum efficiency at 0.8 pf occurs when the load is 240 kw Calculate (1) The maximum efficiency at unity PF(ii) The efficiency on £.L. at 0.71 PF lagging
21. Design the resistance sections of a seven-stud starter for 36.775 kW, 400 V d.c. shunt motor Full-load efficiency is 92% and total cu-losses are 5% of the input. Shunt field resistance is 200Ω The lower limit of the current through the armature is to be the full-load value.
22. Open circuit and short-circuit tests on a 5 kVA 220/440 volt, 50 Hz, 1- transformer gave the following results: O.C. test: 220 volt, 2 amp, 100 watt (1.v side) S.C. test: 40 volt, 11.4 amp, 200 watt (h.v side) Determine the efficiency and approximate regulation of the transformer at full load, 0.9 power factor lagging.
23. A 120 volt d.c. shunt motor having an armature circuit resistance of 0.2 Ω and field circuit resistance of 60 Ω, draws a line current of 40 amp at full load. The brush voltage drop is 3 volt and rated full load speed is 1800 r.p.m. Calculate, the speed at half load.
24. Discuss in detail the armature reaction in d.c machine and the methods to reduce its effects.
25. A shunt generator has a full-load current of 196 A at 220 V. The stray losses are 720 W and the shunt field resistance is 55 Ω. If it has full-load efficiency of 88%, find armature resistance. Also find load current corresponding to maximum efficiency.
26. A 50 kw, 440 V. Shunt generator having an armature circuit resistance including inter-pole wdg. of 0.15Ω at normal working temp was run as a shunt motor on no-load at rated voltag and speed. The total current drawn by the moter was 5A including shunt field current of 1.5A Calculate the efficiency of the shunt generator at 3/4 the f.l.
27. Construction and working of Potential Transformer.
28. A10KVA 200/400V, 50Hz single phase transformer gave the following test results: O.C. test-2000V, 1.3 Amp, 120 watt-on L.V. side S.C. test-22V, 30 Amp, 200 watt-on H.V. side Calculate: (1) The different parameters from O.C. and S.C. test (B) Draw the equivalent circuit referring to H.V side.
29. Write short notes on All day efficiency?