1. Explain with a neat sketch, the construction of a d.c.. Machine.
2. Which part of a d.c. machine is laminated? Why?
3. What is the basic nature of the induced e.m.f. in a d.c. generator? What is the function of commutator.
4. What is the difference between lap type and wave type of armature winding?
5. Derive from first principles an expression for the e.m.f. of a d.c. generator.
6. State the different types of d.c. generators and state the applications of each type.
7. what is the difference between a generator and a motor?
8. Explain the principle of working of a d.c.motor.
9. State the voltage and power equation of a d.c. motor explaining the importance of each term.
10. What is back e.m.f? Explain the significance of a back e.m.f.
11. Derive the expression for the electromagnetic torque developed in a d.c. motor.
12. Why a d.c. series motor cannot be started on no load?
13. A 4 pole d.c. shunt motor takes 22 A from a 220 V supply. $R_a$=0.5 Ω and $R_{sh}$=100 Ω the armature is lap wound with 300 conductors. If the flux per pole is 20mWb, calculate Speed ii) Torque developed iii) Gross power developed.
14. A 4 pole 1500 rpm dc generator has a lap connected armature having 24 slots with 10 conductors per slot. If the flux per pole is 0.04wb, calculate the emf generated in the armature. What would be the emf generated if the winding is connected in wave?
15. A 200V, 4 pole lap wound dc motor has 800 conductors on its armature. The resistance of the armature winding is 0.5 ohms and that of the shunt field winding is 200 ohms. The motor takes 21A and the flux/pole is 30mwb. Find speed and gross torque developed in the motor.
16. A 8 pole lap connected armature has 40 slots with 12 conductors per slot , and generates a voltage of 500v .determine the speed at which it is running if the flux per pole is 50mWb.
17. A 4 pole lap wound dc generator has 40 slots. It runs at 1500 rpm. Flux per pole is about 30mwb. Find the conductors per slot, to give a generated emf of 180V.
18. A 4 pole 220V dc shunt generator supplies a load of 3KW at 220V. The resistance of the armature winding is 0.1 ohms and that of the field winding is 110 ohms. Calculate the total armature current, the current flowing through armature conductors, and the emf induced, assume that the armature winding is wave connected.

19. A 4 pole, 12 KW 240v dc generator has its armature coils wave connected . If the same machine is lap connected, all other things remaining constant calculate the voltage, current and power rating of the generator.
20. A 220v dc shunt motor takes 5A at no load. The armature resistance is 0.2 ohms and field resistance is 110 ohms. Calculate the efficiency of the motor when it takes 40A on full load.
21. A 100 KW, 460 V shunt generator was running as a motor on no load at its rated voltage and speed. The total current taken was 9.8 amps including a shunt current of 2.7 amps. The resistance of armature circuit at normal temperature was 0.11 Ohms. Calculate the efficiency of motor at
    1. Full load
    2. Half load
22. A shunt generator delivers 195 amps at a terminal voltage of 250 V. The armature resistance and shunt field resistance are 0.02 ohms and 50 ohms respectively. The iron and frictional losses equal to 950 Watts.
    1. Find emf generated.
    2. Copper losses.
    3. Efficiency of motor

**TRANSFORMERS**

1. Explain the principle of working a single phase transformer.
2. Explain the construction of a single phase transformer.
3. Discuss the difference between core type and shell type of construction.
4. Derive from the first principles, the e.m.f. equation for a transformer.
5. What is kVA rating of a transformer?
6. Explain the various features of an ideal transformer.
7. What is the difference between ideal transformer and practical transformer?

8. A 5 KVA 50 Hertz single phase transformer as primary and secondary turns of 120 and 80 at a certain flux density the induced EMF per turn in the primary is 2.5 V. Determine the primary and secondary voltages. Also calculate current in both windings.
9. A single phase 10 kVA transformer has 400 primary turns and 1000 secondary turns. The net cross sectional area of the core is 60 $cm^2$. When the primary winding is connected to 500V, 50 HZ supply calculate.
    a. The maximum value of flux density in the core
    b. The voltage induced in the secondary winding and the secondary full load current.
10. A 125 kVA transformer as a primary voltage of 2000 volts at 60 hertz primary turns are 182 and the secondary turns are 40. Neglecting losses calculate No load secondary EMF,Full load primary and secondary currents,Flux in the core.
11. The primary winding of a transformer is connected to a 240 volt 50 hertz supply. The secondary winding has 1500 turns. The maximum value of the core flux is point 0.00207 wb. Determine the secondary induced EMF, the number of turns in the primary, cross sectional area of core, if the flux density has maximum value of 0.465 T
12. A single phase transformer has 1000 turns on its primary and 400 turns on the secondary side. An AC voltage of 1250 V, 50 Hertz is applied to its primary side, with secondary open circuited. Calculate the secondary EMF, Maximum value of flux density, given that the effective cross sectional area of core is 60 CM square.
13. A single face 20 kVA transformer has 1000 primary turns and to 2500 secondary turns. The net cross sectional area of the core is 100 $cm^2$. When the primary winding is connected to 500 V, 50 Hz supply, calculate1)the maximum value of flux density in the core 2) the voltage induced in the secondary winding and 3) the primary and secondary full load currents.

## THREE PHASE INDUCTION MOTORS

1. What is rotating magnetic field? Explain in brief.
2. Explain the construction of a three phase induction motor.
3. List the differences between squirrel cage rotor and slip ring rotor.
4. Define the term slip of the induction motor.
5. Explain the operating principle of a three phase induction motor.
6. Explain the effect of slip on the rotor frequency.
7. List the various applications of three phase squirrel cage and slip ring induction motor.
8. A 50 Hz 4 pole induction motor has an induced e.m.f. in the rotor with a frequency of 2 Hz. Calculate i) Synchronous speed ii) Slip iii) speed of the motor.
9. If frequency of the supply voltage applied to the stator is 50 Hz, while the frequency of the induced e.m.f. in the rotor is observed to be 90 cycles per min. Calculate the slip and speed of the motor assuming that the stator is wound for 6 poles.
10. A 3 phase, 6 pole, 50 Hz induction motor has a slip of 1% at no load and 3% at full load. Find i) no load speed ii) full load speed iii) frequency of rotor current on full load.
11. A 3 phase induction is running at 1740 r.p.m on a 60 Hz supply. Calculate number of poles, the slip and the rotor frequency.
12. A 3 phase, 6 pole, 50 Hz induction motor has a speed of 950 r.p.m. on full load. Calculate the slip at full load.
13. An 8 pole alternator runs at 750 rpm. It supplies power to a 4 pole induction motor. The frequency of the rotor current is 1.5Hz. What is the speed of the motor? What is the slip?
14. A 3 phase 6 pole 60 Hz induction motor has a slip of 3% at full load. Find the synchronous speed, the full load speed and the frequency of rotor current at full load.