TWO MARKS

1. List out the main parts of DC machine.
   a. Magnetic frame or yoke
   b. Poles
   c. Interpoles
   d. Armature
   e. Commutator
   f. Brushes
   g. Bearings
   h. Shaft

2. What is the purpose of yoke in a DC machine?
   1. It acts as a protecting cover for the whole machine
   2. It provides a mechanical support for the poles.
   3. It carries the magnetic flux produced by the poles.

3. What is self-excited DC machine?
   If in a DC motor field winding is supplied from the armature of the motor itself, then it is called a self excited DC machine.

4. What is the purpose of commutator in a DC generator?
   The commutator converts the alternating emf into unidirectional or direct emf.
5. Write down the emf equation of DC generator?

$$E_g = \frac{p\phi N}{60}.\frac{Z}{A} = \frac{p\phi ZN}{60A} \quad \text{volts}$$

6. Define back emf.
   When a motor rotates, the conductors housed in the armature also rotate and cut the magnetic lines of force. So an emf is induced in the armature conductors and this induced emf opposes the supply voltage as per Lenz's law. This induced emf is called back emf or counter emf.

$$E_b = \frac{p\phi ZN}{60A} \quad \text{volts}$$

7. What are the applications of DC motors?

DC shunt motor

- Lathe machines
- Fans
- Machine tools
- Drilling machines

DC series motor

- Electric locomotives
- Cranes
- Hoists
- Elevators
- Trolleys

Cumulative compound motor

- Elevators
- Rolling mills
- Printing presses
- Air compressors

Differential compound motor

Not suitable for any practical applications

8. What is DC compound generator?
   The compound generator consists of both shunt field and series field windings. One winding is connected in series and the other winding is in parallel with the armature.
9. Write the conditions for the maximum efficiency of DC motor.
   Iron loss = Copper loss
10. List the methods of speed control of a DC shunt motor.
    Three methods of speed control are

1. By varying the resistance in the armature circuit(Rheostatic control)

2. By varying the flux (Flux control)

3. By varying the applied voltage (Voltage control)

REVIEW QUESTIONS

PART A

1. List the conditions for self excitation of DC generator.
2. Write the conditions for the maximum efficiency of DC motor.
3. Mention the significance of back emf.
4. Define back emf.
5. Draw the mechanical characteristics of DC shunt and series motors.
6. What is self-excited DC machine?
7. What is the purpose of yoke in a DC machine?
8. What is the purpose of commutator in a DC generator?
9. List the methods of speed control of a DC shunt motor.
10. Write down the emf equation of DC generator?
11. List out the main parts of DC machine.
12. What are the applications of DC motors?
13. What is DC compound generator?
14. A DC motor connected to a 460V supply has an armature resistance of 0.15Ω. Calculate a) the value of back emf when the armature current is 120A, b) the value of armature current when the back emf is 447V.
15. A DC series generator delivers a load of 20KW at 400V. Its armature and series field resistances are 0.3Ω and 0.2Ω respectively. Calculate the generated emf and the armature current. Allow 1.1V per brush for contact drop.
16. A 4 pole, 500V DC shunt motor has 700 wave connected conductors on its armature. The full load armature current is 60A and flux per pole is 30mwb. Calculate the full load speed if the motor armature resistance is 0.2Ω and the brush drop is 1V per brush.
17. A 4 pole generator with wave wound armature has 51 slots each having 24 conductors. The flux per pole is 0.01wb. At what speed must the armature rotate to give an induced emf of 250V. What will be voltage developed, if the winding is lap connected and the armature rotates at the same speed?
18. What for field coils are provided in a DC machine?

PART B

1. With a neat sketch, explain the construction and working of DC Motor and explain each parts.

2. What is meant by DC Generator ? Explain the theory and principle of operation and working of DC Generator.

3. Obtain the mathematical expression for the Generated EMF or EMF Equation of a Generator.