

**PART-C**  
**(Numerical Questions)**  
**DC Machines**

1. A 220 volts separately excited DC machine has an armature resistance of  $0.4\ \Omega$ . If the load current is 20 ampere, find the induced emf when the machine operates i) as a motor ii) as a generator.  
**[ANS: 212 V, 228 V]**
2. The armature of a 6 pole DC machine has 125 turns and runs at 1000 rpm. The EMF generated on open circuit is 500 Volts. Find the useful flux per pole when the armature is (a) Lap connected and (b) wave connected.  
**[ANS: 0.12 Wb 0.04 Wb]**
3. The armature supply voltage of a DC motor is 230 V. The armature current is 12A, the armature resistance is  $0.8\ \Omega$  and the speed is 100rad/sec. calculate (a) the induced emf (b) the electromagnetic torque, (c) the electric power input to the armature, (d) the mechanical power developed by the armature, (e) the armature copper loss.  
**[ANS: 220.4V 26.448 Nm 2760W 2644.8W 115.2W]**
4. A 4-pole, 500 V shunt generator has 720 wave connected conductors on its armature. The full load armature current is 60A and the flux per pole is 0.3 wb. Armature resistance is 0.2 ohm. Calculate the full load speed of the generator so that it can maintain rated terminal voltage of 500 V at full load.  
**[ANS: 71.1 rpm]**
5. A 4 pole wave wound DC generator is rotated at a speed of 1000 rpm. The generator has 60 slots and each slot contains 10 conductors. Find the EMF generated by this machine when effective field flux per pole is 50mWb.  
**[ANS: 1000 V]**
6. A 6 pole lap connected DC generator with 125 coils generates a voltage of 400 V on open circuit when running at 1200 rpm. Find the useful flux per pole. For the same value of the flux per pole, find the voltage at open circuit when the machine runs at 1000 rpm.  
**[ANS: 333.3 V]**
7. A DC motor takes 100 A at 230 V. The armature resistance is  $0.05\ \Omega$ . The total number of lap connected armature conductors are 500 & the number of poles is 4. The flux per pole in 0.03 Wb. Find the speed and torque.  
**[ANS: 900 rpm 238.73 Nm]**