

EE2111A Week 9 Studio 1: Quiz

1. The torque constant and the armature resistance of a PMDC motor are 30 mNm/A and $10 \text{ }\Omega$, respectively. The motor is powered by a 12 V DC source to drive a load, and spins at 1910 RPM . What is the power developed by the motor at this operating speed?
2. The back emf constant and the armature resistance of a PMDC motor are 40 mVs/rad and $10 \text{ }\Omega$, respectively. The motor is powered by a 12 V DC source to drive a load, and produces 30 mNm electromagnetic torque. What is the speed of the motor?
3. A PMDC motor driven by 10 V DC source draws 1 A current for a given load and spins at 4000 RPM . The motor was slowed down by using a friction pad. When the motor was completely stopped, the current rises to 2 A . What was the electromagnetic torque produced when the motor was spinning at 4000 RPM ?
4. The torque constant and the armature resistance of a PMDC motor are 30 mNm/A and $10 \text{ }\Omega$, respectively. The motor, powered by a 12 V DC source, draws 0.6 A current and provide 3.24 W mechanical power to the load. Assuming that only mechanical power loss is due to bearing friction, how much is the friction torque?
5. The back emf constant and the armature resistance of a PMDC motor are 20 mV/rad/s and $5 \text{ }\Omega$, respectively. When powered by a 10 V source, it draws 1.16 A current to drive a load. If power loss due to friction and other mechanical factors is 0.07 W , what is the efficiency of the motor at this operating point?
6. A PMDC motor powered by 12 V DC supply draws negligible current (can be assumed as 0 A) when no load is attached to the shaft and spins at 5000 RPM . When the shaft is clamped with 12 V DC still connected, the current is increased to 2.4 A . What is the power developed by this motor when it spins at 2000 RPM ?