1. In the magnetic circuit of Fig. 1, the coil F2 is supplying 500 AT in the direction indicated. Find the AT that the coil F1 must provide to produce a flux of 4 mWb in the airgap. The relative permeability of the core is 4500.

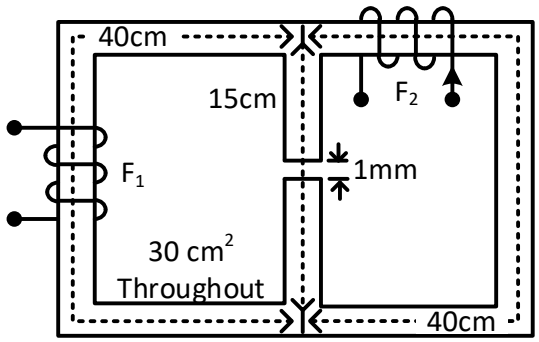


Figure 1

2. For the magnetic circuit shown in Fig. 2, the points of magnetization curve are as follows:

| H (AT/m) | 200 | 400 | 500 | 600 | 800 | 1000 | 1400 |
|---|---|---|---|---|---|---|---|
| B (T) | 0.46 | 0.87 | 0.98 | 1.08 | 1.23 | 1.33 | 1.48 |

Calculate the exciting current required to create a flux of 0.25 mWb in the airgap. What is the flux in the central limb?

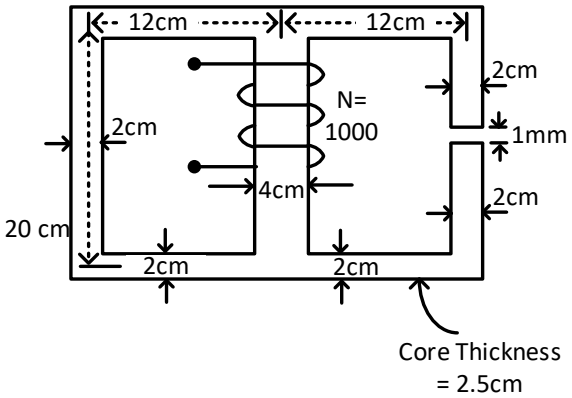


Figure 2

3. A 4-Pole, 50 Hz, 3 phase induction motor delivers full load torque at 1460 rpm. The speed of the stator field relative to the rotor is _____ rpm and of the rotor field relative to the rotor is _____ rpm.
4. A 3 phase, 400 V, 1460 rpm, 50 Hz, 100 HP, 4-pole induction motor is to be operated from 3 phase, 40 Hz supply. In order to maintain the airgap flux constant, the value of the supply voltage should be _____. This control technique is known as _____ control.
5. If the electromotive force in the stator of an 8 pole induction motor has a frequency of 50 Hz, and that in the rotor 1.5 Hz, at what speed is the motor running and what is the slip?
6. A shunt machine, connected to 250 V mains, has an armature resistance (including brushes) of 0.12 ohm, and the resistance of the field circuit is 100 ohm. Find the ratio of the speed as a generator to the speed as a motor, the line current in each case being 80 A. (1.08)

7. A separately excited generator, when running at 1200 rpm, supplies 200 A at 125 V to a circuit of constant resistance. What will be the current when the speed is dropped to 1000 rpm if the field current is unaltered? Armature resistance: 0.04 ohm, total drop at brushes: 2 V, ignore the effect or armature reaction. (166)
8. A shunt generator delivers 50 kW at 250 V and 400 rpm. The armature and field resistance are 0.02 ohm and 50 ohm, respectively. Calculate the speed of the machine running as a shunt motor and taking 50 kW input at 250 V. Allow 1 V per brush for contact drop and neglect armature reaction. (382 rpm)

9. A separately excited DC motor rotates at 1200 rpm when armature terminal voltage is 200 V and armature current is 1 A. The armature resistance is 1 ohm, field winding voltage is 100 V, and the field winding resistance is 100 ohm. Now, the motor is required to rotate at 1250 rpm, with armature current of 1 A, but the armature terminal voltage cannot be increased beyond 200 V. How to achieve the required speed? Give relevant details.