Course: Special Machines **Code:** EE512 **Semester:** 2nd 2014/2015

Dr. Maged Mahmoud **Eng:** Ahmed Hebala

Sheet (3)

Review on Magnetic Circuit

Q1 The magnetic circuit shown in Fig. 1.2 has dimensions $A_c = A_g = 9\ \text{cm}^2$, $g = 0.050$ cm, $l_c = 30$ cm, and $N = 500$ turns. Assume the value $\mu_r = 70{,}000$ for core material. (*a*) Find the reluctances $\mathcal{R}_c$ and $\mathcal{R}_g$. For the condition that the magnetic circuit is operating with $B_c = 1.0$ T, find (*b*) the flux ϕ and (*c*) the current i.

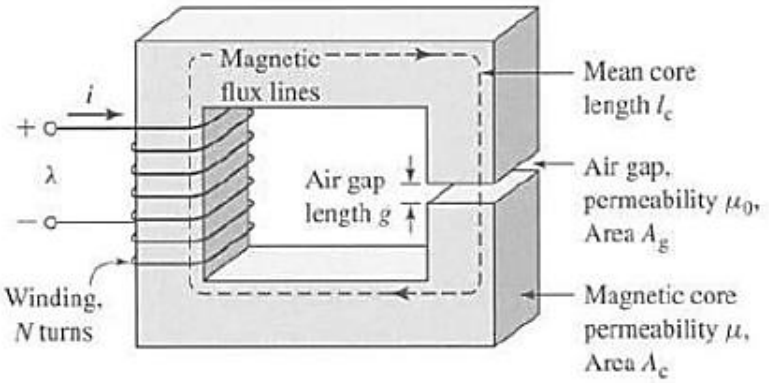

Figure 1.2 Magnetic circuit with air gap.

Q2 The magnetic structure of a synchronous machine is shown schematically in Fig. 1.5. Assuming that rotor and stator iron have infinite permeability ($\mu \to \infty$), find the air-gap flux ϕ and flux density B_g. For this example $I = 10$ A, $N = 1000$ turns, $g = 1$ cm, and $A_g = 2000\ \text{cm}^2$.

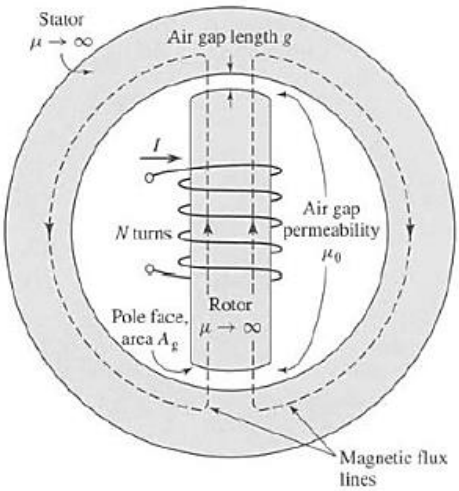

Figure 1.5 Simple synchronous machine.

Q3 The electromagnetic device shown in Figure 1.6 is considered for this problem. The magnet is of the neodymium variety with the remanent flux density of 1.1 T and coercivity of 0.86×10^6 A/m and has a straight line demagnetization characteristic. Determine the flux density in the air gap when the current in the coil is 10 A. The data for the device are given in Example 1.1.

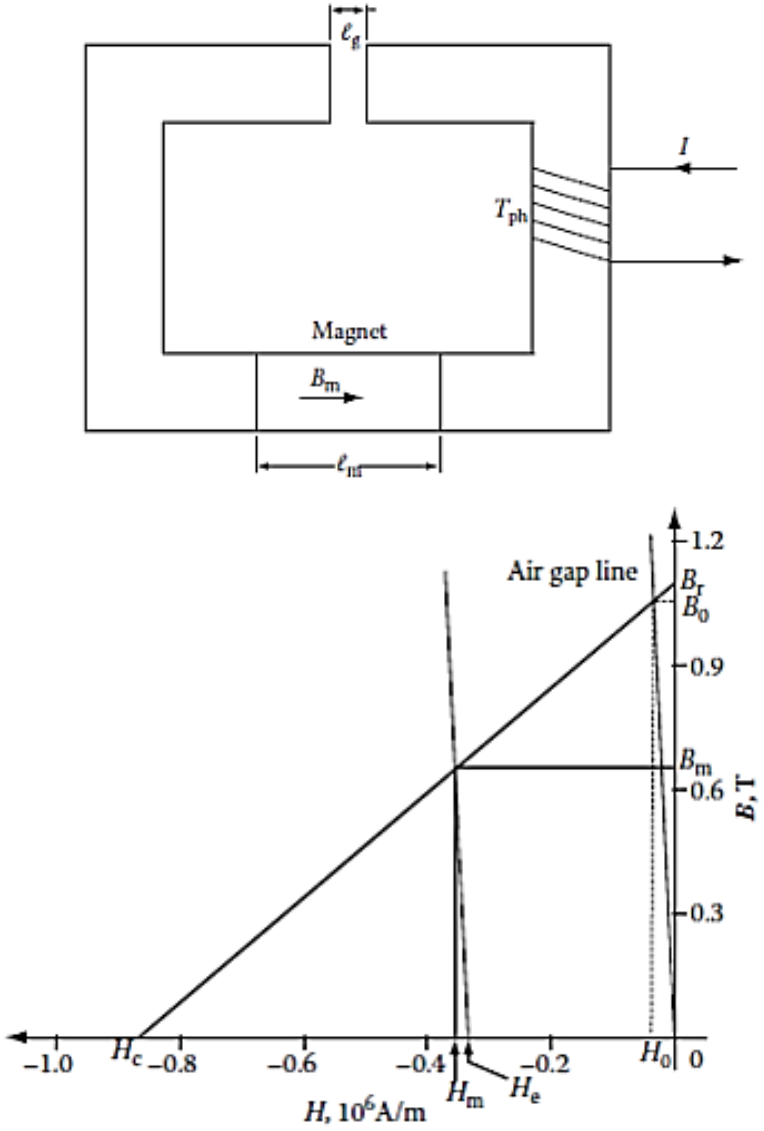

FIGURE 1.10 Operating point determination with external excitation for Example 1.2.