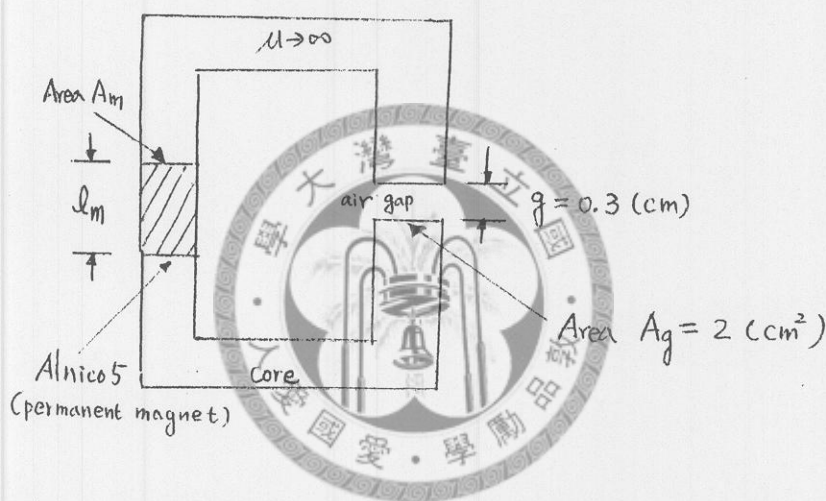


1. Consider the following magnetic circuit. Find the minimum magnet volume required to achieve an air-gap flux density of 1.0 (T) . The maximum energy product $(BH)_{\max}$ of Alnico 5 is -40 (T kA/m) . (20分)



2. With the instruments located in the high-voltage side and the low-voltage side short-circuited, the short-circuit test readings for the $50 \text{ kVA } 2400:240 \text{ (V)}$ transformer are 48 (V) , 20.8 (A) and 620 (W) . An open-circuit test with the low-voltage side energized gives instrument readings on that side of 240 (V) , 5.41 (A) , and 190 (W) . Determine the efficiency at full load, 0.9 power factor lagging. (20分)

3. In a translational motion actuator, the $\lambda-i$ relationship is given by

$$i = [1 + 0.5(x-1)^2] \lambda$$

for $0 < x < 1$ (m), where i is the current in the coil of the actuator. Determine the force on the moving part at $i = 1$ (A) and $x = 0.5$ (m). (20分)

4. Show that if the rotor frequency f_2 is kept constant, the torque developed by an induction machine is proportional to the square of the flux in the air gap. (10分)

5. Explain how to measure d-axis reactance, X_d and q-axis reactance, X_q of salient-pole synchronous machine by slip test. (10分)

6. Calculate the speed of the rotor for 50 (MVA), 11 (kV), 60 (Hz), 4 pole synchronous generator. (20分)