

PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Midterm Examination: Semester 1

Academic Year: 2549

Date: 5 August 2549

Time: 13.30-16.30

Subject: 211-221 Fundamentals of Electrical Machines

Room: A400

คำสั่ง - ข้อสอบมีทั้งหมด 5 ข้อ ข้อละ 20 คะแนน

- อนุญาตให้จดสูตรในกระดาษ A4 1 แผ่น และนำเข้ามาในห้องสอบได้
- อนุญาตให้ใช้เครื่องคิดเลขได้

1. A cast iron pipe has a 100-turn coil wound on it, as illustrated in figure 1.

The dimensions (in cm) are as indicated.

- For a coil current of 10 A, determine the flux set up in the material.
- If a cast steel pipe has been used, what coil current would be required to establish the same flux as in part (a).

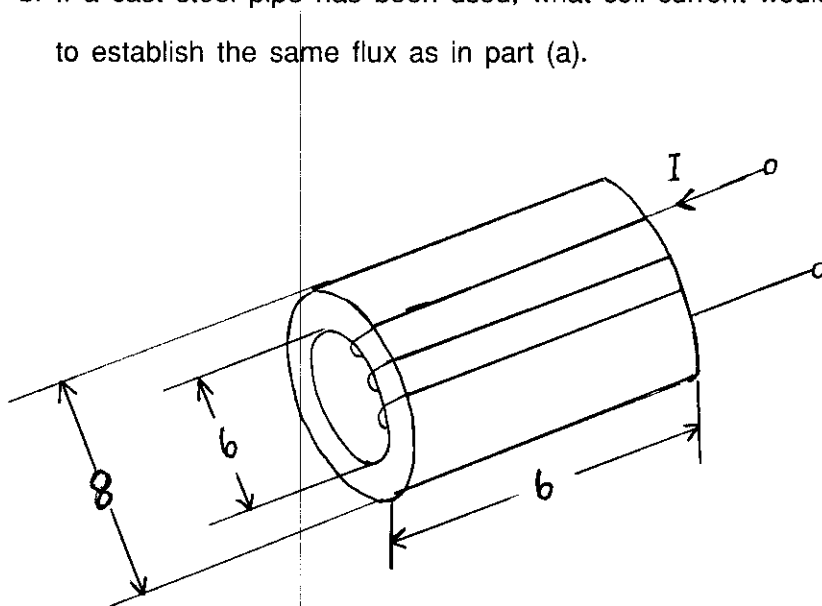


figure 1

2. A two-pole motor has an armature diameter of 32 cm, and has the armature length of 16 cm. Only 70 % of the conductors lie directly under the poles, with a field of 0.8 T at the conductor locations. The conductor current is 30 A. Determine:

- a. The total armature current if the winding is lap-connected.
 - b. How many conductors are on the armature if the motor develops 5 hp at 600 r/min. (1hp = 746 watts)
3. A long-shunt compound generator delivers 50 A at 500 V to a resistive load. The armature, series field and shunt field resistances are 0.16Ω , 0.08Ω and 200Ω respectively. Calculate:
- a. The generated EMF.
 - b. The armature current.
 - c. If the rotational losses are 520 watts, determine the efficiency of the generator.
4. A 50 hp 460 V shunt motor has a full load speed of 900 r/min. The shunt field resistance is 230Ω and the armature resistance is 0.24Ω . If the motor efficiency is 88 %, determine:
- a. The rotational losses.
 - b. The speed regulation.
5. A 240 V shunt motor runs at 850 r/min when the armature current is 70 A. The armature circuit resistance is 0.10Ω . Calculate the required resistance to be placed in series with the armature to reduce the speed to 650 r/min when the armature current is then 50 A.
- (Hint: For the method of speed control by adding a resistor in series with the armature, the field current stays constant, the counter EMF is proportional to the speed.)

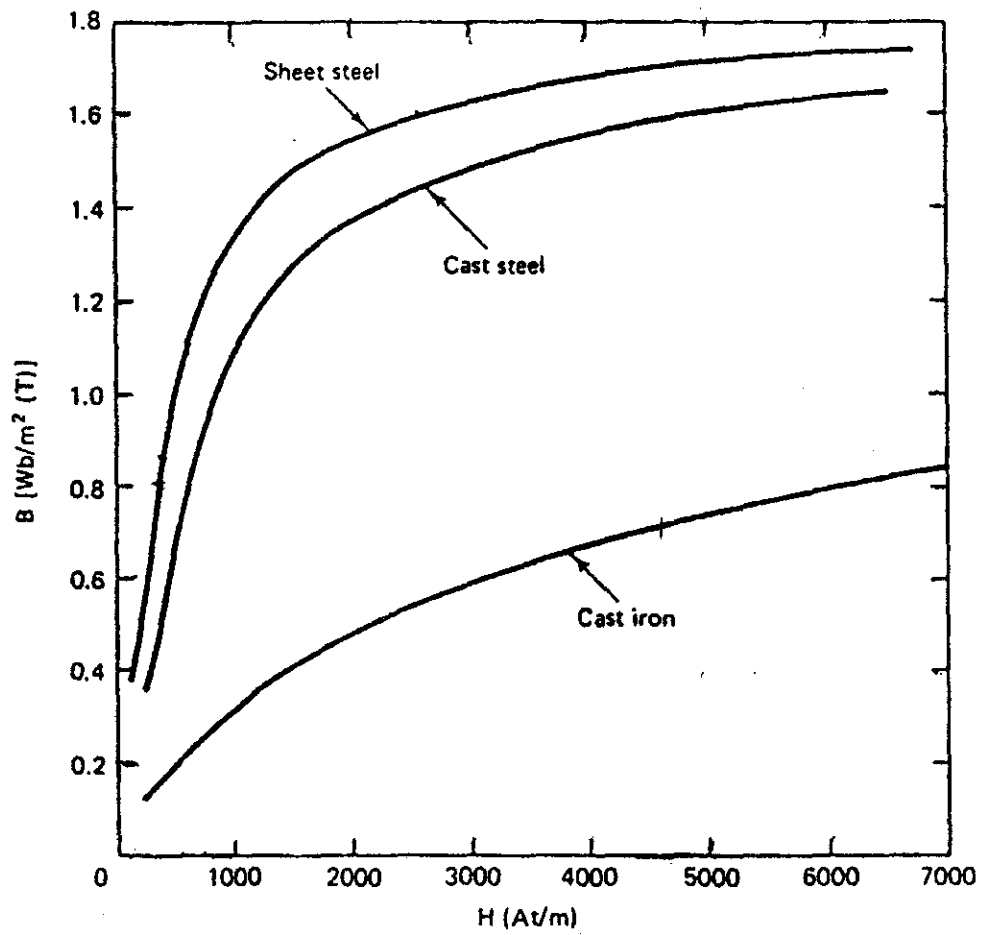


FIGURE 1.11. Magnetization curves for commonly used magnetic materials.