

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Midterm Examination: Semester 2

Academic Year: 2549

Date: 22 December 2549

Time: 9.00-12.00

Subject: 211-221 Fundamentals of Electrical Machines

Room: R300

คำสั่ง - ข้อสอบมีทั้งหมด 5 ข้อ ข้อละ 20 คะแนน

- อนุญาตให้จัดสูตรในกระดาษ A4 1 แผ่น และนำเข้ามาในห้องสอบได้
- อนุญาตให้ใช้เครื่องคิดเลขได้

1. A magnetic circuit made of sheet steel core, as shown in figure 1. The center leg has a cross-sectional area of 18 cm^2 , and each of the side legs has a cross-sectional area of 10 cm^2 . A flux of 1.2 mWb is required in the air gap. Determine the flux in the center leg.

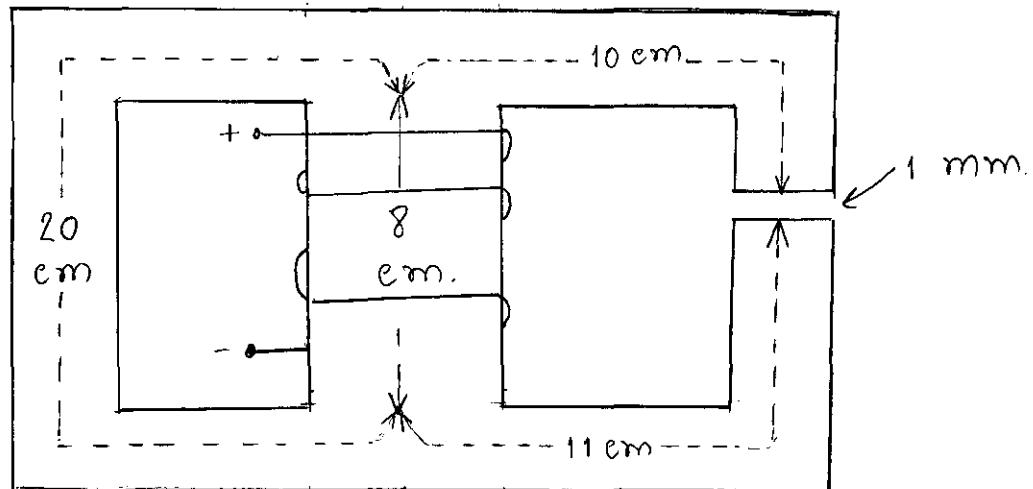


figure 1

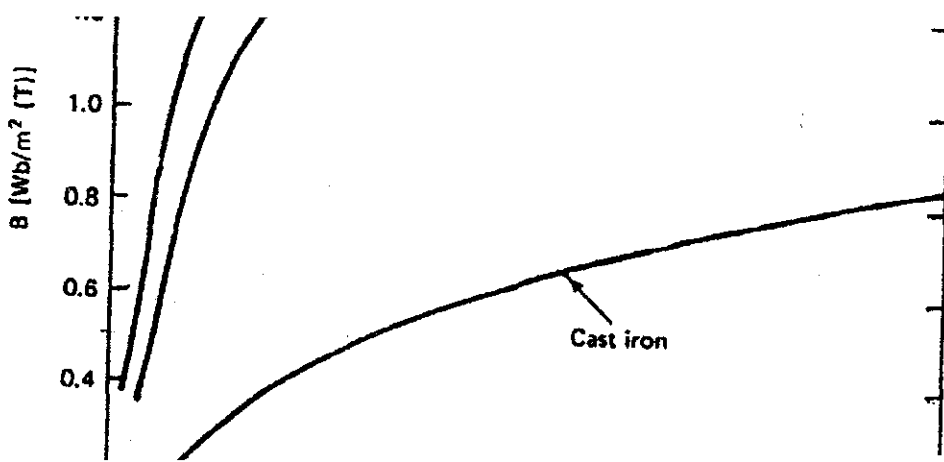
2. A two-pole motor has an armature diameter of 32 cm, and has the armature length of 16 cm. Only 70 % of the conductors lie directly under the poles, with a field of 0.8 T at the conductor locations. The conductor current is 30 A. If the motor develops 5 hp at 600 r/min. Determine:
 - a. The total force created by the conductors.
 - b. How many conductors are on the armature .

3. A 10 kW 125 V short-shunt compound generator has rotational losses amounting to 580 W. The shunt field resistance is 62.5Ω , the series field resistance is 0.022Ω , and the shunt field current is 2 A. Calculate the armature resistance if the full-load efficiency is 85 %.

4. A shunt motor has a full load speed of 900 r/min from a 460 V supply. At no-load, the speed of this motor is 960 r/min. If the armature resistance is 0.25Ω .
Calculate :
 - a. The armature current at full load.
 - b. The developed power at full load.
 - c. The torque developed at full load.

(Hint: The flux is constant when assume that all losses and the armature reaction effects are negligible)

5. A 240 V shunt motor runs at 800 r/min at no-load. Determine the resistance to be placed in series with the field so that the motor run at 950 r/min when taking an armature current of 20 A. Field resistance is 160Ω , and the armature resistance is 0.4Ω . Assume the pole flux is proportional to the field current and neglect rotational losses.
(Hint: Added resistance R in the field circuit reduces the field current)



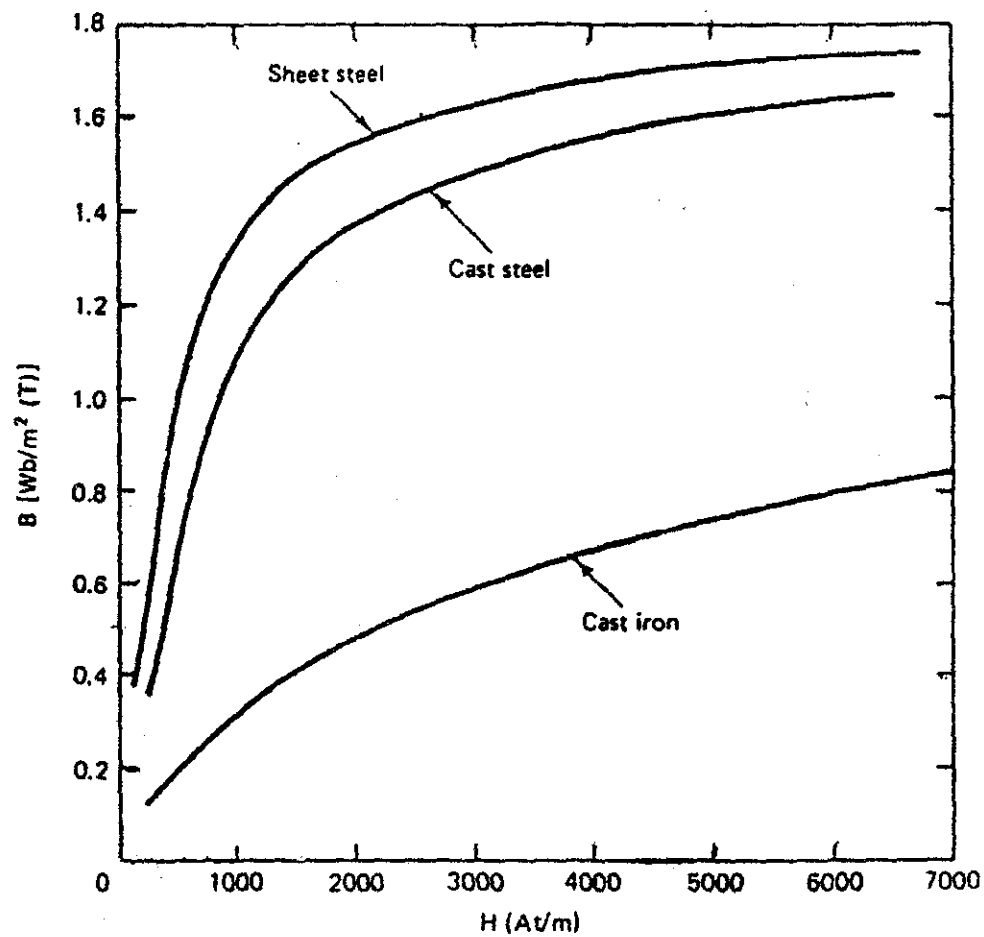


FIGURE 1.11. Magnetization curves for commonly used magnetic materials.