*Solution*

Name:_____ Student ID:_____

**Close notes and books.** Quizzes suspected of cheating and/or turned in late will not be marked. You have 10 minutes to answer the following questions:

Q1 (20pts): Assume given voltage $V$ (rms), current $I$ (rms), and the power factor angle $\phi$ (the phase angle between voltage and current). Express real the power $P$, reactive power $Q$, apparent power $S$, and the power factor ($PF$)

$$P = VI \cdot \cos\varphi$$

$$Q = VI \cdot \sin\varphi \qquad PF = \cos\varphi = \frac{P}{VI}$$

$$S = VI$$

Q2 (20pts): Describe the Faraday's Law and the term "**emf**" (you can write equation and support it by one or two short sentences)

$$\oint_C E \cdot dl = -\frac{d\varphi}{dt} = emf$$

Electromotive force induced in a closed contour C is proportionale to the rate of change of the flux $\varphi$ through that contour

Q3 (40pts): For the given magnetic system with two coils,
   a) Draw an **equivalent magnetic** circuit and label all reluctances, mmf sources (**include directions!**).
   b) Draw an **equivalent electric circuit** and label voltages, currents, resistances, inductances, etc.
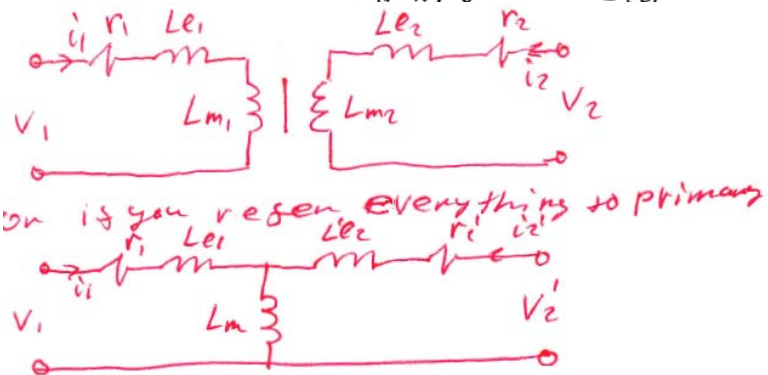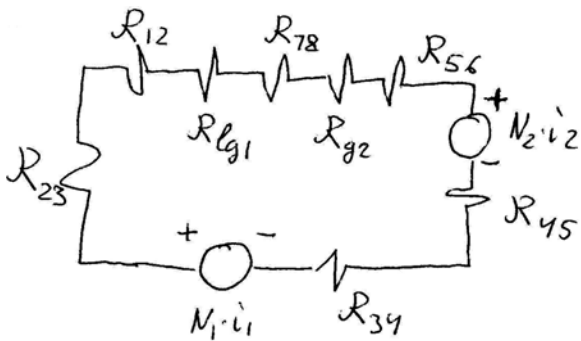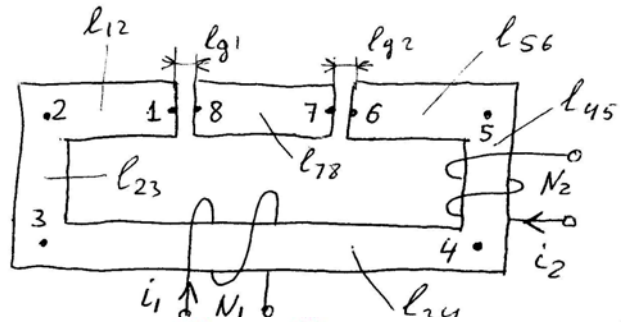


Q4 (20pts): What are the residual magnetization and coercivity force? Sketch a hysteresis loop and show.



Br - residual magnetism

Hc - coercivity force