

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Explain the following terminologies on the basis of electromagnetism: (40%)
 - (a) radiation resistance of an antenna (10%), (b) directivity of an antenna (10%), (c) definition of the magnetic dipole moment (10%), (d) conservative field (10%).
2. Find the magnetic flux density in vector form at the center of a octagonal loop lying in the xy -plane, with the side a carrying a direct current I in counter-clockwise. (15%)
3. By using the stored magnetic energy approach, determine the inductance per unit length of an air coaxial transmission line that has a solid inner conductor of radius a and very thin outer conductor of inner radius b as shown in Fig. 1. (15%)
4. For an isolated Hertzian dipole made of a metal wire of radius a , length d , and conductivity σ , find the radiation efficiency with an operating frequency f . (15%)
5. Two very small conducting spheres with the same mass m are suspended at a common point by very thin non-conducting threads with a negligible mass of a length l . A charge Q is placed on each sphere. An equilibrium state is reached when the suspending threads make an angle of θ . Derive the formula for finding the charge Q , assuming that the gravitational force is g . (15%)

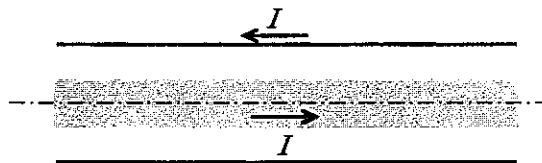


Fig. 1