

1. A plane electromagnetic wave of circular frequency ω propagates in free space in the direction of the unit vector n_1 . Setting the wave number $k = k n_1$, show that

$$\begin{aligned} k \cdot E &= 0, & k \times E - \omega \mu_0 H &= 0, \\ k \cdot H &= 0, & k \times H + \omega \epsilon_0 E &= 0. \end{aligned} \quad (20 \%)$$

2. A thin disk of iron of radius a and thickness t is magnetized in the direction parallel to its axis. Calculate H and B on the axis, both inside and outside the iron. (20 %)

3. Determine the resistance of the insulation in a length ℓ of coaxial cable, as shown in Fig. 1. (20 %)

4. The magnetic circuit shown in Fig. 2 is cast iron with a mean length $\ell_i = 0.44$ m and square cross section 0.02×0.02 m². The air gap length is $\ell_a = 2$ mm and the coil contains 400 turns. Find the current I required to establish an air gap flux of 0.141 mWb. (20 %)

5. Write Maxwell's equations and explain their physical meaning. (20 %)

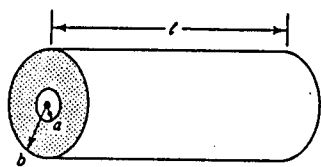


Fig. 1

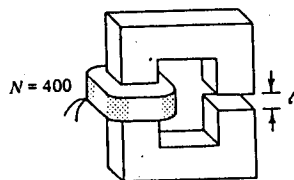


Fig. 2

