Practice Questions

1. Compute the electric field at 2 m if common mode signal of 10 MHz, 40dBμA is flowing through a pair of lines running parallel for 1 cm.



1. A wire of infinite length has a charge density of 1μC.m-1. Compute the electric field strength and its direction at a point 1 m away.



The direction will be Towards the conductor.

1. Calculate the flux induced in the toroid core (μr) around a wire carrying power line current of 50 Amp. mean radius of the core is 2cm and the cross sectional area is 0.75cm2.



This is flux density.

The flux will be 0.150119 X 0.75 X 10-4Wb (Webbers)

1. Calculate the inductance if 25 turns were wound around the core in ‘3’. Calculate the inductance.



1. Toroid core was used to measure current. 10 Amp current is passed through the conductor. Will the emf induced at the coil by 50 Hz power current and that by 400 Hz (avionic) power current be same? If not what will be the ratio.

They will not be the e.m.f by the 400 Hz signal will be 8 times. (as the rate of change of flux/ time derivative is 8 times)

1. A DUT is supplied by high impedance source. A CLC-pi filter is used to supress the CE emissions at 10kHz. Calculate the attenuation if C= 1μF, L=1mH.



1. The differential filter or choke is an inductor. It also offers attenuation.

Required attenuation is the = (CE noise Level)/ Acceptable level. 96dBμA/ 76 dBμA= 20 dB.

20 dB is suppression by 10. Therefore, the inductor must offer impedance of 9 times the source impedance. E.g. 50Ω X 9 = 450.

Considering CE noise of 30 kHz, required inductor is..

450 / (30 X 103 x 2π) = 2.38 X 10-3.

We then calculate the Power handled by the inductor (*LI)2/2*

Power handling capacity (kW/m3) of core material is given in data book (Fig 3.8 (a)).

Calculate the volume for this power. The core volume is also given in data book.

Select the core of desired volume. It gives cross sectional area and magnetic circuit length.

Calculate the number of turns required to achieve the desired inductance.

1. A coaxial transmission line operating at frequency of 1 GHz has inner conductor radius as 0.65mm and outer conductor radius as 2.1 mm. if the dielectric filling the coaxial cable has a dielectric constant of 2.1 and loss tangent of 0.0013 and conductor is having the surface resistance of 25 find the total attenuation constant
2. Antenna operating at frequency of 3 GHz transmits power of 1 W and has a gain of 5dB. If the power receiving antenna has an effective aperture of 3 cm and is at a distance of 3m from the transmitter. Find the antenna factor