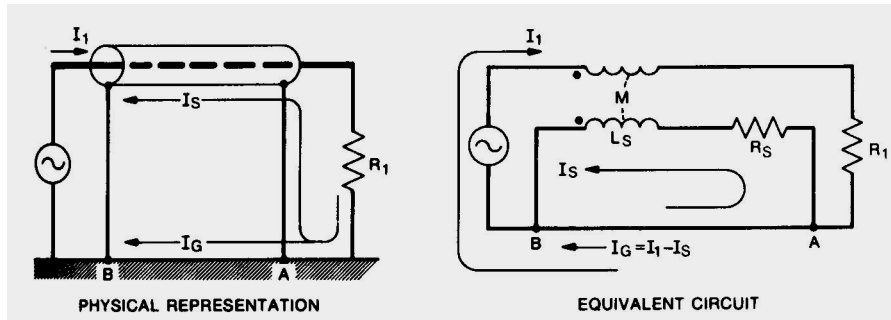


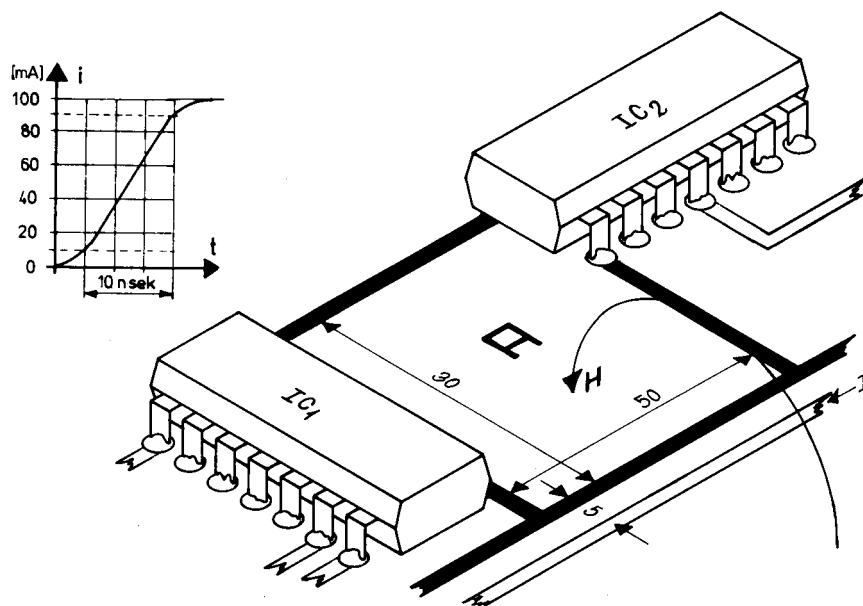
EMC Tasks 1

1.



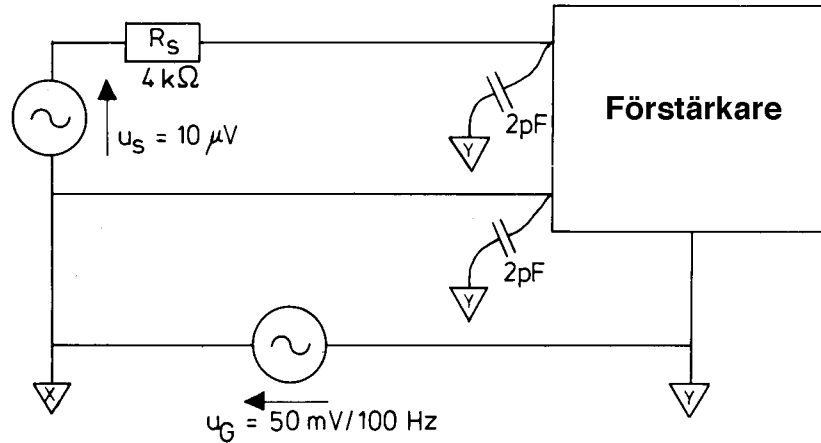
Calculate the shield current, I_S , in the figure above as a function of frequency. Assume that the impedance of the ground-system (A→B) is 0. What conclusion can be drawn from the result?

2.



The figure shows two cascaded amplifiers. The current, I , is changed from 10 mA to 90 mA according to the diagram. Calculate the induced voltage at the input of amplifier IC2. The input impedance is much larger than the output impedance of amplifier IC1. How can the induced voltage be reduced?

3.



To measure small mechanical vibrations, a transducer is used with an output impedance of $4 \text{ k}\Omega$. The output voltage is around $10 \text{ }\mu\text{V}$.

The requirements are that the noise signals should be at least 100x lower than the transducer signal, and an instrumentation amplifier is used with a CMRR of 120 dB.

Between the transducer and the instrumentation amplifier ground connector, there is a 100 Hz/50mV AC-signal. The capacitances between the amplifier inputs and ground have been minimized in the design of the PCB and are 2 pF.

- Calculate an equivalent DM-signal between the inputs that generates the same output as the CM-signal based on the CMRR of the amplifier, assuming that the CM-signal is applied to both inputs.
- Calculate if the required signal/noise-ratio is fulfilled.
- Calculate the level of the CM AC-signal that is found across the impedance of the transducer.
- Calculate if the required signal/noise-ratio is fulfilled in this case.

4. Which are the possible coupling paths for disturbing signals into a circuit?
5. How is capacitively and inductively coupled noise modelled at the receiving end when coupling between two conductors?
6. How can capacitively coupled noise be reduced and show why, when coupled between two conductors?
7. Which are the principal types of grounding and when are they recommended to be used?
8. How is the inductance of a conductor influenced by its distance to a groundplane acting as current return path?