

PROBLEMS

1. The characteristic impedance of a uniform transmission line varies with the physical length of the line (True/False, Why?).
2. The inductance per-unit length of a microstrip line increases if the dielectric layer height is increased (True/False, Why?).
3. The capacitance per-unit length of a strip line increases if the width of the signal metal trace is increased (True/False, Why?).
4. The inductance per-unit length of a coaxial cable increases if the dielectric layer thickness is decreased (True/False, Why?).
5. The current distribution over the cross section of a copper wire (circular cross section) is uniform regardless of the operating frequency (True/False, Why?).
6. Ohmic losses in a transmission lines linearly increase with frequency (True/False, Why?).
7. A transmission line can be non-dispersive only if it is lossless (True/False).

SOLUTIONS

1. False. The characteristic impedance of a uniform transmission line depends on the cross-sectional geometry of the line and the materials used.
2. True. Inductance increases since it is proportional to the separation between the two main signaling conductors.
3. True. Capacitance per unit length of planar transmission lines is proportional to the area of the two main planar conductors.
4. False. Inductance per-unit length decreases since it is proportional to the separation between the two main signaling conductors.
5. False. Current density concentrates on the conductor surface as frequency is increased, due to the skin effect.
6. False. Ohmic losses increase approximately with the square root of the frequency, due to the skin effect.
7. False. A lossy transmission line can be non-dispersive if it satisfies Heaviside conditions.