

- 1) State and briefly explain three different categories of radio wave propagation.
- 2) Explain how ground and sky wave interference can occur. What are the different regions associated with this situation.
- 3) If you are to choose a frequency for a communication link, what factors will be for choosing VLF (3-30KHz) and what factors will be against that. What frequency will you choose for a two way radio over 100 Km range.
- 4) A satellite to earth communication link at $F=4\text{GHz}$ uses 1m and 4m diameter paraboloidal reflector antennas respectively, with illumination efficiency of 0.54 for each. If the satellite antenna transmit 2 W and the distance is 36000 KM find the available power at the matched receiver. What is the electric field intensity at the receiving antenna.
- 5) One vertical monopole is 100m high. It is supplied with 100 A (rms) base current. Find the radiated power and the unattenuated field at 1km. a) $f=300\text{ kHz}$ b) $f= 1\text{MHz}$.
- 6) A ground wave propagation path consist of 150 Km of land with ($\sigma=10\text{mS/m}$, $\epsilon=4$) followed by 100 km of sea ($\sigma=4000\text{ mS/m}$, $\epsilon=80$). $F=700\text{KHz}$ and $E_1= 4500\text{ mV/m}$. Find the electric field strength at the receiver
- 7) Find the path loss, the received power, field strength at receiver and signal to noise ratio for a sky wave radio link with : $P_t=40\text{ dBW}$, $f=10\text{ MHz}$, $d= 2500\text{ Km}$, $h=300\text{ Km}$. $R_{12}=110$, $F_H=1.25$, latitude $\phi=50$, time= December noon with $\chi = 77$, transmitting and receiving antenna gains are 10 dB. Bandwidth of the channel is 3.4 kHz. and $F_{am}=33\text{ dB}$. Also Define F_{am} .

Determine the electric field strength at distance $d=10$ Km a land with conductivity of 1 mS/m and relative permittivity of 7 . At $F=3$ MHz and $E_1= 1500$ mV/m.

- 1) What is the effect of the complex dielectric constant on the wave passing through the ionosphere.

Define the skip distance

What does the term “ required protection ratio is 200:1 “ mean. Explain by an example.

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Define the critical frequency in sky wave propagation and drive its expression.

Define MUF and OUF

What part of wave parameters defines its polarization. Describe a simple method of generating or Receiving a circularly polarized wave.