TUT5

MW transmission

Problem1

Find the transmission loss in free space for a radio link given the following parameters: r=10 km, λ=3 cm, G_t=15 dB, G_r=20 dB

Problem2

Calculate the reflection coefficient of moist soil for Horizontal & Vertical polarized waves given the following:

a) ε_r=10 σ =0.01 S/m $\psi=1^0$ (grazing angle) λ=10cm

b) ε_c=4-j1 σ =0.01 S/m $\psi=3^0$ (grazing angle) λ=10cm

Problem3

(a) Determine the midpath clearance needed to coincide with the first Fresnel zone for a microwave link cover a distance of 60 km at frequencies: 7, 30, 120,300 and 3000 GHz.

(b) For a 50 Km link operating at 3GHz, calculate the antenna heights (assume equal) to get at least 0.6 of the first Fresnel zone radius midpath clearance for 4/3 earth condition.

Problem4

A microwave link is established between two terminals separated by 40 km over ground with (ε_r=10, σ=0.01 s/m). The transmitting antenna radiates horizontal polarized wave of power 5W. Both antennas have gain of 30 dB. The heights are equal & f=3 GHz.

a- Calculate the minimum antenna height to obtain at least 0.6 of the Fresnal zone radius free of obstacles for atmospheric conditions 1<k<2, k=a'/a.

b- Calculate the optimum antenna height for the best received signal (use standard troposphere).

c- Calculate the optimum path gain factor.

d- Calculate the received power in optimum case.

Problem5

A microwave link is established between two terminals separated by 20 km over ground with (ε_r=10, σ=0.01 s/m). The transmitting antenna radiates horizontal polarized wave of power 10W at f=3 GHz. Both antennas are dish and have gain of 30 dB and their heights are h_1=20m and h_2=25m. Determine :

(a) the path gain factor

(b) the received power

(c) the dish diameter if the aperture efficiency is 0.8