Analog Assignment
EE1205 Signals and Systems

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EE23BTECH11036

Question 11.9.3.8: Two towers on top of two hills are 40 km apart.This line joining them passes 50 m above a hill halfway between the towers.What is the longest wavelength of radio waves,which can be sent between the towers without appereciable diffraction effects?
Solution:

variable	value	description
d	40 km	distance between the towers
a	50 m	size of aperture
λ	$\frac{a^2}{Z_f}$	longest wavelength of radio wave
Z_f	20 Km	Fresnel distance, Z_f is the half of the distance between the towers

TABLE I
INPUT PARAMETERS

$$Z_f = \frac{a^2}{\lambda} \tag{1}$$

$$\lambda = \frac{a^2}{Z_f} \tag{2}$$

$$= \frac{50^2}{20000} \tag{3}$$

$$= 125 \times 10^{-3}\text{m} \tag{4}$$

$$= 12.5\text{cm} \tag{5}$$

the longest wavelength of radio waves, which can be sent in between the towers without considerable diffraction effects is 12.5 cm

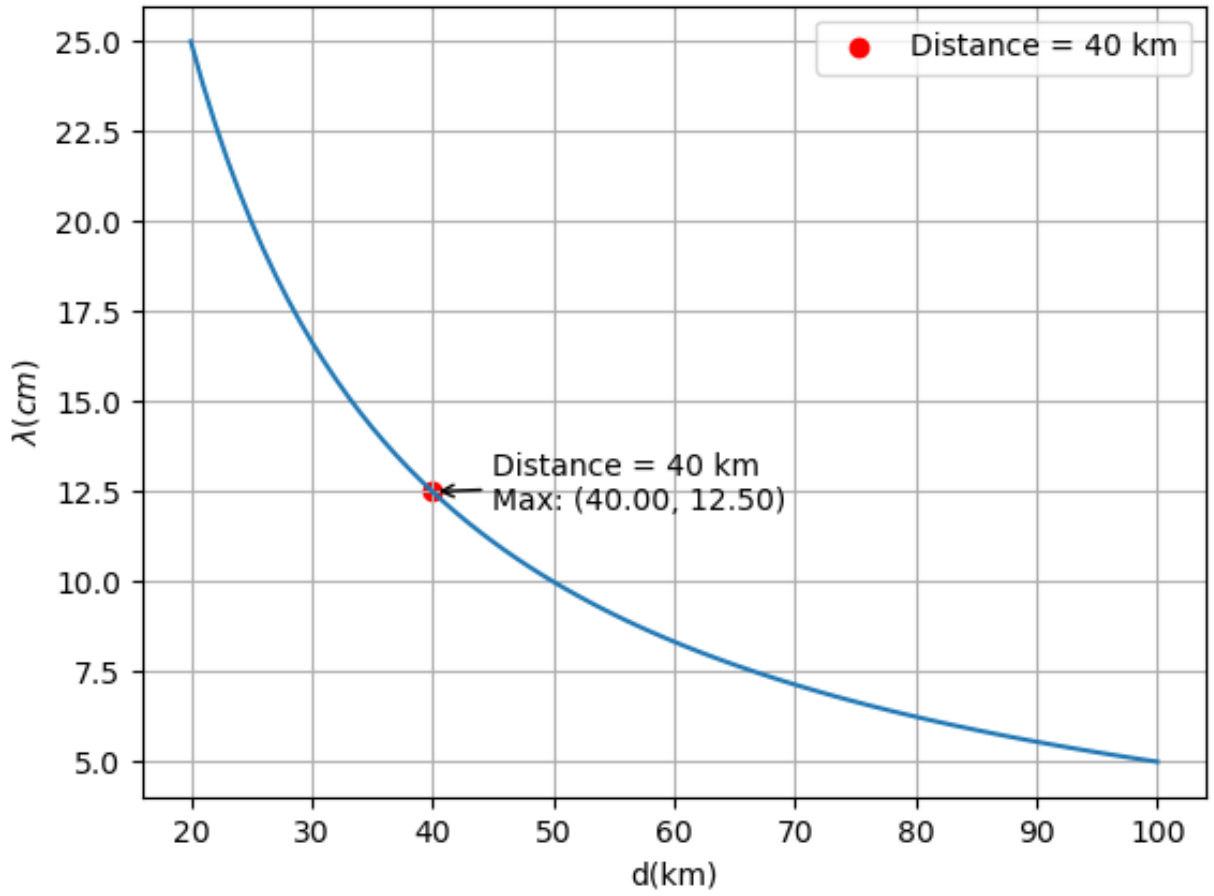

Fig. 1. THE GRAPH BETWEEN THE MAXIMUM WAVELENGTH(λ) Vs DISTANCE BETWEEN THE TOWERS(d)