ANTENNAS - July 13, 2017

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Surname and Name _____

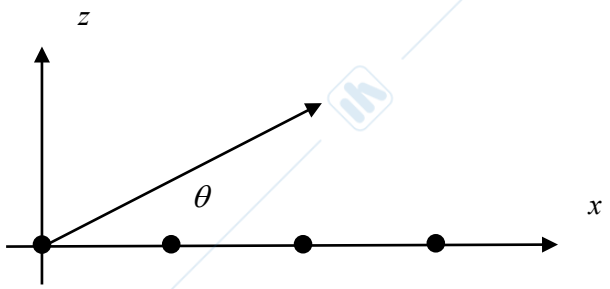
Id. number _____ Signature _____

Problem 1

Design an array of 4 elements with the following specifications:

- Frequency of operation 2.4 GHz
- Maximum radiation at $\theta = 80°$
- A zero must be present at $\theta = 40°$

Find in particular the phase distribution of the excitations, and the distance between elements.
For the final design, find all other zeroes and the 3 dB beamwidth.



Problem 2

Consider a point-to-point communication link with the following characteristics:

- transmitted power 10 dBm
- minimum power at receiver –90 dBm
- distance between points 50 km
- frequency 20 GHz

a) Design two identical parabolas (TX and RX) to use in the link so that a power margin of 10 dB is ensured (design the parabola diameter).

b) Design the focal F of the parabola assuming to use a feed horn with $\Delta\theta°_{3dB} = 60°$ and imposing an edge illumination of -12 dB.

Problem 3

A rectangular aperture in xy plane of size a=20 cm, b=10 cm has a constant aperture field E_0. Find, at the frequency of 25 GHz

- The zeros on the two main planes
- The beamwidth on the two main planes

Supposing you want to obtain a maximum of radiation at $\phi = 0$, $\theta = 30°$ (angles of the spherical coordinates), what is the linear phase shift you should apply to the aperture field?