

### 2019 Spring EECE 588 Homework 3

1. A uniform linear array consists of 10 half-wave dipoles with an inter-element separation  $d = \lambda/4$  and equal current amplitude. Find the excitation current phase difference  $\beta$  such that the main beam direction is at  $60^\circ$  ( $\phi_{\max} = 60^\circ$ ). (25 points)
2. Design a uniform linear phased scanning array whose maximum radiation direction is in  $30^\circ$  ( $\phi_0 = 30^\circ$ ). The desired half-power beamwidth is  $2^\circ$  while the element separation is  $d = \lambda/4$ . Determine the excitation current phase  $\beta$ , the length of the array  $L$ , and the number of elements  $N$  in the array. (30 points)
3. A uniform circular array with a radius  $a = 0.5\lambda$  and the number of elements  $N = 8$ . The maximum radiation direction of the array factor AF is at  $(60^\circ, 30^\circ)$ . What should be the excitation phases  $\beta_n$  for the elements? (25 points)
4. Describe how this antenna functions in much as detail as you can. (i.e. 왜 이렇게 설계가 되었나요? 이 형상의 장점은 무엇이고 우리가 강의 시간에 배운 안테나를 어떻게 활용하였을까요?) (20 points)

