



King Fahd University of Petroleum and Minerals

Electrical Engineering Department

Second Exam EE 532

Thursday January 3rd, 2008

Duration: 1 hours and 30 mins.

Student Name	Student ID#
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Problem #1	
Problem #2	
Problem #3	
TOTAL /30	

Good Luck

Problem I: (10 points)

Design a Dolf Tschebyscheff broadside array of 5 elements with a -30 dB sidelobe level.

1. Determine the normalized amplitude excitation coefficients. (*Make the elements at the edges of the array equal to unity*)
2. Determine the maximum spacing between the elements (in λ) so that all sidelobes are maintained at -30 dB.
3. For the spacing of part 2, determine the directivity (dimensionless).

Problem II: 10 points)

Design a four –element binomial array with element placed along the z-axis.

1. Derive the excitation coefficients.
 2. Write a simplified expression of the array factor.
 3. For a spacing of $d = 3\lambda / 4$, determine all the angles θ (in degrees) where the array factor processes nulls.
 4. For a spacing of $d = 3\lambda / 4$, determine all the angles θ (in degrees) where the array factor processes main maxima.
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Problem III: (10 points)

The Schelkunoff polynomial representation of an array factor is given by

$$AF = (z^4 - 1),$$

Determine the

1. The number of elements of the array. (including any elements with zero excitation coefficients).
2. Position of each element (including that of zero excitation element) along the z-axis.
3. Magnitude and phase (in degree) excitation of each element.
4. angles where the pattern vanishes when the total array length (including null elements) is 2λ .