EE 703: Digital Message Transmission (Autumn 2016)
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Assignment 4: 20 points — Date: October 23, 2016

1. [20 points] For the 16-QAM constellation shown below calculate E_b in terms of A. Assume that the transmitted symbol is corrupted by adding $N \sim \mathcal{CN}(0, N_0)$. If all the constellation points are equally likely to be transmitted, calculate the following in terms of E_b and N_0.
   (a) The exact error probability of the optimal decision rule.
   (b) The union bound on the exact error probability.
   (c) The intelligent union bound on the exact error probability.
   (d) The nearest neighbor approximation of the exact error probability.