

**2007 Advanced Coding Theorem HW#3 Due date :2007.06.06**

1. Do set partition for 2x16QAM (do one branch for every layer only).
2. Consider two coded sequences  $S_1$  and  $S_2$  for 3x8PSK

$$\text{If } \underline{S}_1 \oplus \underline{S}_2 = \left\{ \begin{pmatrix} \vdots \\ 0 \\ 0 \\ 1 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} \vdots \\ 1 \\ 0 \\ 1 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \vdots \\ 0 \\ 1 \\ 0 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} \vdots \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \vdots \\ 0 \\ 1 \\ 0 \\ 1 \\ 0 \end{pmatrix} \right\},$$

Which signal set partition has the largest SED of  $\underline{S}_1$  and  $\underline{S}_2$  among those possible set partition for 3x8PSK?

3. Assume that it is desired to transmit binary data using a 16-dimensional shaped uncoded constellation at the rate of 7bits/2D. The 2D circular constellation is partitioned into M regions, let  $M \leq 8$ , and shaping CER of 1.5 is acceptable.
  - (1) To obtain the shaping gain, what's the maximum value of M? For this M, what's the number of input information bit per shaping block?
  - (2) For M=6, do shell mapping if  $R_0 = 56$ 
    - i. Show  $g_2(p) \forall p, p_4(p)$  for  $p = 0 \sim 3, g_8(p)$  for  $p = 0 \sim 3$ ?
    - ii. What's the total cost?
    - iii. What's the cost of each symbol?

The rule of priority:

