ECS 452: In-Class Exercise # 7

Instructions

1. Separate into groups of no more than three persons. **The group cannot be the same as any of your former groups.** Only one submission is needed for each group.
2. **Write down all the steps** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
3. **Do not panic.**

Date: 16 / 02 / 2018			
Name	ID (last 3 digits)		
Prapun	5	5	5

1. Consider a DMC whose transition matrix $\mathbf{Q}$ and joint pmf matrix $\mathbf{P}$ are given below.

$$\mathbf{Q} = \begin{array}{c|cccc} x \backslash y & 1 & 2 & 3 & 4 \\ 1 & 0.10 & 0.20 & 0.30 & 0.40 \\ 2 & 0.25 & 0.25 & 0.25 & 0.25 \\ 3 & 0.50 & 0.30 & 0.10 & 0.10 \end{array} \qquad \mathbf{P} = \begin{array}{c|cccc} x \backslash y & 1 & 2 & 3 & 4 \\ 1 & 0.02 & 0.04 & 0.06 & 0.08 \\ 2 & 0.10 & 0.10 & 0.10 & 0.10 \\ 3 & 0.20 & 0.12 & 0.04 & 0.04 \end{array}$$

a) Find the MAP detector. Put your answer in the decoding table below.
Also find the corresponding error probability.

y	$\hat{x}_{\text{MAP}}(y)$
1	3
2	3
3	2
4	2

$P(C) = 0.20 + 0.12 + 0.10 + 0.10 = 0.52$
$P(E) = 1 - P(C) = 1 - 0.52 = 0.48$

b) Find the ML detector. Put your answer in the decoding table below.
Also find the corresponding error probability.

y	$\hat{x}_{\text{ML}}(y)$
1	3
2	3
3	1
4	1

$P(C) = 0.20 + 0.12 + 0.06 + 0.08 = 0.46$
$P(E) = 1 - P(C) = 1 - 0.46 = 0.54$