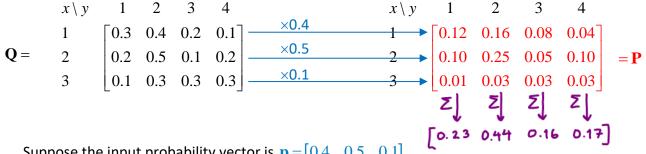
## ECS 452: In-Class Exercise # 6

## **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.
- Do not panic. 3.
- 1. Consider a DMC whose transition matrix  $\mathbf{Q}$  is



Suppose the input probability vector is  $\mathbf{p} = \begin{bmatrix} 0.4 & 0.5 & 0.1 \end{bmatrix}$ .

- a) Find the joint pmf matrix **P**. Put your answer next to the **Q** matrix above.
- b) Find the output probability vector **q**.

[0.23 0.44 0.16 0.17]

c) Suppose the naïve decoder is used. Find the corresponding  $P(\mathcal{E})$ .

 $A = Y_{x \setminus y}$ 1 2 3 4 P(C) = 0.12 + 0.25 + 0.030.12 0.16 0.08 0.04  $\mathbf{P} = \frac{1}{2}$ = 0.40 0.10 (0.25) 0.05 0.10 P(E) = 1 - P(C) = 1 - 0.40 = 0.603 0.01 0.03 (0.03) 0.03

d) Suppose the following decoder is used. Find the corresponding  $P(\mathcal{E})$ .

v	$\hat{x}(y)$	$x \setminus y$	, 1	2	3	4	
1	3	_ 1	[0.12	0.16	0.08	0.04]	P(C) = 0.01 + 0.16 + 0.08 + 0.03
2	1	$\mathbf{P} = \frac{1}{2}$		0.25			= 0.28
3	1	- 3				0.03	P(E) = 1 - P(C) = 1 - 0.28
4	3	5		0.03	0.05	0.05	= 0.72

e) Suppose the decoder is  $\hat{x}(y) = 2.5 - |y - 2.5|$ Find the corresponding  $P(\mathcal{E})$ .

Date: <b>15</b> / <b>02</b> / 2019					
Name	ID (last 3 digits)				
Prapun	5	5	5		
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