

KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS  
ELECTRICAL ENGINEERING DEPARTMENT

EE 315  
Quiz #2

Name: Solution  
ID#: \_\_\_\_\_  
Section No: \_\_\_\_\_

Q1: Consider two events  $X$  and  $Y$  with the following information:

$$P[X \cup Y] = \frac{3}{4}, P[X \cap Y] = \frac{1}{2}, \text{ and } P[Y|X] = \frac{3}{4}$$

Find the following probabilities:

1.  $P[X]$
2.  $P[Y]$
3.  $P[X|Y]$
4.  $P[Y^c|X]$
5.  $P[X|Y^c]$

1.  $P[X]$

$$P[Y|X] = \frac{P[X \cap Y]}{P[X]}$$

$$\therefore P[X] = \frac{P[X \cap Y]}{P[Y|X]}$$

$$= \frac{\frac{1}{2}}{\frac{3}{4}}$$
$$= \frac{2}{3}$$

2.  $P[Y]$

$$P[X \cup Y] = P[X] + P[Y] - P[X \cap Y]$$

$$\therefore P[Y] = P[X \cup Y] + P[X \cap Y] - P[X]$$

$$= \frac{3}{4} + \frac{1}{2} - \frac{2}{3}$$

$$= \frac{7}{12}$$

$$3. P[X|Y] = \frac{P[X \cap Y]}{P[Y]}$$
$$= \frac{6}{7}$$

4.  $P[Y^c|X]$

$$P[Y^c|X] + P[Y|X] = 1$$

$$\therefore P[Y^c|X] = 1 - P[Y|X]$$
$$= \frac{1}{4}$$

5.  $P[X|Y^c]$

$$P[X|Y^c] = \frac{P[Y^c|X] P[X]}{P[Y^c]}$$

$$= \frac{\frac{1}{4} \times \frac{2}{3}}{1 - \frac{7}{12}}$$

$$= \frac{2}{5}$$