



Ministry of Higher Education & Scientific Research

University of Technology

Communication Eng. Department

Final Examination (2016/2017)

Subject: **Probability & Statistics** Date: / 06 / 2017

Division: **ALL**

Time: **3 Hrs.**

Year: **First**

Examiner: **Assoc.Prof.Thamer**

Number of pages : **3 pages + Attached Z Tables**



Attempt 4 questions only

Q1: A) If it is known that the cure rate of a particular disease using a particular type of medical drug is 0.60, If taken this drug 5 infected with this disease. If X is the random variable is defined as the number of respondents (cases of cure) for this drug, then:

- What is type of X variable?
- Define type of the probability distribution function of X variable ? Then write the general equation of this function?
- Calculate the following probabilities?
 - Probability of 3 patients are likely to respond to this drug?
 - Probability of at least 1 patient will responding?
 - Probability of at most 2 patients will responding?
- Calculate the expected value and standard deviation of the number of response states ?

(10 MARKETS)

B) A box contains 10 lamps including 3 damaged lamps. If we pull out two lamps , then calculate the probability that the two lamps are not damaged if the withdrawn :-

- Return the drawing lamps to the box?
- Without returning the draw lamps to the box?

(5 MARKETS)

Q2: A) Suppose that z is standard normal distribution , then find the following:-

- $P(z < 1.57)$, $P(z < -2.33)$
- $P(z > 1.96)$, $P(-2.01 < z < 1.28)$

(8 MARKETS)

B) In the experiment of tossing a fair coin two times , If X is the r.v. giving the number of heads obtained , find and sketch the cdf $F_X(x)$ of X ?

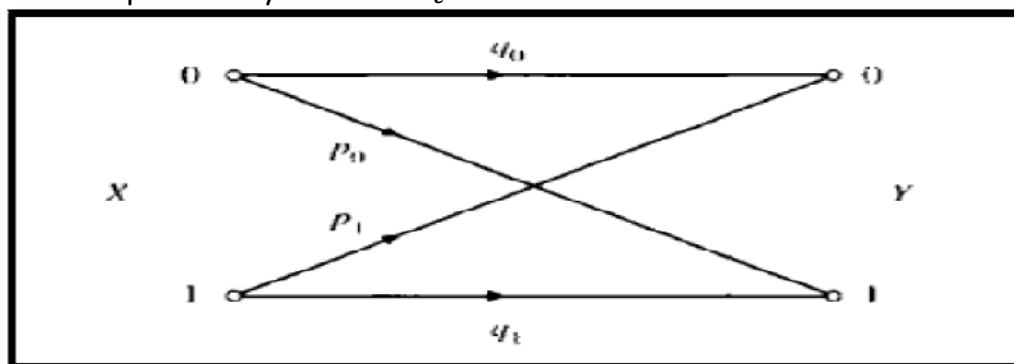
(7 MARKETS)

Q3: A) For the binary communications channel shown bellow, Where x_0 and x_1 denotes the events ($X=0$) and ($X=1$) , respectively and y_0 and y_1 denotes the events ($Y=0$) and ($Y=1$) respectively. If $P_0 = 0.1$, $P_1 = 0.2$, $P(x_0) = 0.5$, The channel is characterized by the transition probabilities:- $p_0 = P(y_1/x_0)$ and $p_1 = P(y_0/x_1)$,

$q_0 = P(y_0/x_0)$ and $q_1 = P(y_1/x_1)$, then :-

- Find $P(y_0)$ and $P(y_1)$?
- If a 0 was observed at the output , then what is the probability that a 0 was the input state?
- If a 1 was observed at the output , then what is the probability that a 1 was the input state?

(d) Calculate the probability of error P_e ?



(10 Markets)

B) Find the probability of getting 4 or 5 in one thrown of dice?

(5 Markets)

Q4: A) A uniform random variable X has the following pdf :-

$$f_x(x) = \begin{cases} \frac{1}{b-a} & a < x < b \\ 0 & \text{otherwise} \end{cases}$$

find the following:-

- a) Sketch the pdf?
- b) Find and sketch the cdf ?
- c) Calculate the mean and variance of X ?

(10 Markets)

B) If two dice are throw together , then find the probability that each one is being 4?

(5 Markets)

Q5:A) An information source generates symbols at random from. a four-letter alphabet $\{a, b, c, d\}$ with probabilities $P(a) = 1/2$, $P(b) = 1/4$, and $P(c) = P(d) = 1/8$. A coding scheme encodes these symbols into binary codes as follows:

a	0
b	10
c	110
d	111

If X be the Random Variable denoting the length of the code,

- 1: Find the probabilities $P(X = 1)$, $P(X = 2)$, $P(X = 3)$, and $P(X > 3)$?
- 2: Sketch the cdf $F_X(x)$ of X and specify the type of X ?
- 3: Find $P(X \leq 1)$, $P(1 < X \leq 2)$, $P(X > 1)$, $P(1 \leq X \leq 2)$?

(10 Markets)

B) Complete the table shown bellow?

A	B	$A \cap B$	$A \cup B$
0	0		
0	1		
1	0		
1	1		

(a)

A	\overline{A}
0	
1	

(b)

(5 Markets)

GOOD LUCK