Benha University Engineering Mathematics and Physics Department 1<sup>st</sup> semester 2012-2013



Faculty of Engineering (Shoubra) Electrical Engineering (communication) Mathematics 3A – Code: EMP 281 Mid term exam (13 marks) Section: B.N.

Student Name in Arabic:

## Answer the following questions

1- Suppose there are 5 black, 10 white, and 15 red marbles in an urn. You reach in and randomly select six marbles without replacement. What is the probability that you pick exactly two red marbles? Find E(X) and var(X)

$$n = 6, N = 30, k = 15$$
, therefore  $P(X = 2) = [{}^{15}C_2 ] [{}^{15}C_4 ] / [{}^{30}C_6 ]$ 

E(X) = n (k/N) = 6(15/30) = 3, and  $V(X) = (\frac{N-n}{N-1})n(\frac{k}{N})(1-\frac{k}{N}) = \frac{36}{29}$ 

2- Two fair dice are rolled, what is the probability that the first turns up six, given that the sum is k, for each k from two through 12?

A={ first turns up six }= { 
$$(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)$$
}

B = { the sum is k, for each k from two through 12}, therefore P(A/B) = 0 for k =2,3,...,6.

At k = 7, B = { (1,6), (2,5), (3,4), (4,3), (5,2), (6,1) }, thus 
$$P(A/B) = 1/6$$

$$k = 8, B = \{ (2,6), (3,5), (4,4), (5,3), (6,2) \}, thus P(A/B) = 1/5$$

 $k = 9, B = \{ (3,6), (4,5), (5,4), (6,3) \}, thus P(A/B) = \frac{1}{4}$ 

 $k = 10, B = \{ (4,6), (5,5), (6,4) \}, thus P(A/B) = 1/3$ 

 $k = 11, B = \{ (5,6), (6,5) \}, \text{ thus } P(A/B) = \frac{1}{2}$ 

 $k = 12, B = \{(6,6)\}, \text{ thus } P(A/B) = 1$ 

3- The density function of X is given by  $f(x) = \begin{cases} a - bx^2 & 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$ If E(X) = 3/5, find a and b. Since  $\int_{0}^{1} x(a - bx^2) dx = 0.6$ , therefore  $[a \frac{x^2}{2} - b \frac{x^4}{4}]_{0}^{1} = 0.6$ , thus 2a - b = 2.4, but  $\int_{0}^{1} (a - bx^2) dx = 1$ , therefore  $[ax - b \frac{x^3}{3}]_{0}^{1} = 1$ , thus 3a - b = 3, so a = 0.6 and b = -1.2 Good Luck Dr. eng. Khaled El Naggar