

SKIT COLLEGE
Faculty of Applied Science and Engineering
ME-201– QUIZ #3
Discrete Random Variables & Probability Distributions

Instructor: Prof. CM sir

30 AUGUST 2019

Name: _____

Roll Number: _____

This exam contains 7 pages (including this cover page) and 4 questions. Total of points is 15.
Good luck and Happy reading work!

Distribution of Marks

Question	Points	Score
1	0	
2	0	
3	7	
4	8	
Total:	15	

1. In a particular game, a fair die is tossed. If the number of spots showing is either 4 or 5 you win 1, *if the number of spots showing is 6 you win 4*, and if the number of spots showing is 1, 2, or 3 you win nothing. Let X be the amount that you win. Which of the following is the expected value of X ?
- (a) 1.00
 - (b) 2.50
 - (c) 4.00
 - (d) 6.00

2. The weight of written reports produced in a certain department has a Normal distribution with mean 60 g and standard deviation 12 g. The probability that the next report will weigh less than 45 g is
- (a) 0.1056
 - (b) 0.3944
 - (c) 0.1045
 - (d) 0.8944

3. A small store keeps track of the number X of customers that make a purchase during the first hour that the store is open each day. Based on the records, X has the following probability distribution. The standard deviation of the number of customers that make a purchase during the first hour that the store is open is
- (a) (4 points) $P(X = 1)$
 - (b) (3 points) $P(X \geq 4)$

4. A reservation service employs five information operators who receive requests for information independently of one another, each according to a Poisson process with rate $\mu = 2$ per minute.
- (a) (4 points) What is the probability that during a given 1-min period, the first operator receives no requests?
 - (b) (4 points) What is the probability that during a given 1-min period, exactly four of the five operators receive no requests? (*Hint*: treat either as a binomial process of 5 trials with 4 successes or consider 5 combinations of Poisson processes, e.g. only 1st operation receives a request or only 2nd operation receives a request and so on)

Probability mass/distribution functions

Binomial Distribution

$$f(x; n, p) = b(x; np) = \binom{n}{x} p^x (1-p)^{n-x}$$

$$\mu = E(x) = np$$

$$\sigma_x^2 = np(1-p)$$

Hypergeometric Distribution

$$P(X = x) = h(x; n, M, N) = \frac{\binom{M}{x} \binom{N-M}{n-x}}{\binom{N}{n}}$$

$$\mu = E(X) = \frac{nM}{N}$$

$$\sigma_x^2 = n \frac{M}{N} \frac{N-M}{N} \frac{N-n}{N-1}$$

Poisson Distribution

$$P(x; \mu) = e^{-\mu} \frac{\mu^x}{x!}$$

$$E(X) = \text{Var}(X) = \mu$$

This page is intentionally left blank to accommodate work that wouldn't fit elsewhere and/or scratch work.