



National University of Computer & Emerging Sciences, Karachi
Spring-2020 CS-Department
Final Assessment of Probability & Statistics
10th July 2020 (9:00 am to 12:00 noon)



Course Code: MT - 205	Course Name: Probability & Statistics
Instructor Name: Osama Bin Ajaz, Nadeem Khan, Fareeha Sultan, and Asma Maqsood	
Student Roll No:	Section No:

Instructions:

- Read each question completely before answering it. There are **04 questions and 2 pages**.
- In case of any ambiguity, you may make assumptions. But your assumption should not contradict any statement in the question paper.
- All the answers must be solved according to the sequence given in the question paper.
- Submit your own **handwritten scripts in a single PDF file**.
- The name of the answer file must start with Student ID and Name of the student followed by Course Code.
- Do not wait for the last moment to upload the answer scripts as there may be too much congestion around the end time

Time: 3 hrs. + (60 minutes for submission)

Max. Points = 70 (50%)

Q1) Consider the data file “achievement” and solve the following questions: **[23]**

- Select any one pair of variables randomly, apply a suitable hypothesis test, and give the interpretation. **[7]**
- Select any two variables randomly that can be considered independent, give a justification, and apply a suitable hypothesis test. **[7]**
- Select at least two variables and do a regression analysis. Give **justification** of dependent and independent variable(s). Regression analysis must include **correlation** coefficient, **scatterplot**, parameter **estimation**, and **summary** of main findings. **[1+3+1++1+3=9]**

Q2) (i) A new stain removal product claims to remove the stains on 75% of all stained garments. Assume that the product will be tested on 16 randomly selected stained garments, and let x denote the number of these garments from which the stains will be completely removed. Find $P(X < 13)$, if the stain removal product's claim is correct. If X actually turns out to be 11, what do you think of the claim? Also, find the mean and variance. **[5]**

(ii) In a grocery store, an analyst finds the probabilities that a customer buys 0, 1, and 2 or more grocery items are 0.2, 0.5, and 0.3 respectively. If 8 customers arrive at the store, find the probability that one buys nothing, three buys one item, and 4 buys two or more items. **[3]**

(iii) The mean number of non-defective products manufactured in a factory in one day is 34. What is the probability that on a given day there are exactly 28 non-defective products? [3]

(iv) The average height of 1-year-old is 30". A random sample of 30 1-year-olds in a large day care franchise resulted in the following heights. At a 0.01, can it be concluded that the average height differs from 30"? Assumes population variance 7.344. [4]

25 32 35 25 30 26.5 26 25.5 29.5 32
30 28.5 30 32 28 31.5 29 29.5 30 34
29 32 27 28 33 28 27 32 29 29.5

Q3) (i) A Polymer product has a quality rate A, B, and C. Polymer product is received from shipment 80% have an "A" quality 12 % have "B" quality and 8% have "C" quality. It is noted in previous cases that 5% product "A" failed to be an "A" quality. 2% product "B" failed to be a "B" quality. 1% product "C" failed to be a "C" quality. Find the probability that a failed product is received and have an "A" quality. [6]

(ii) For the following data set. Draw boxplot, dot plot and give interpretations.

[6+3=9]

580	540	500	533	577	567	595	590	580	620
700	655	630	648	639	750	710	725	695	760

Q4) (a) Consider the following cdf:

[2+2]

$$F(x) = \begin{cases} x^2, & 0 \leq x < 1 \\ 1, & 1 \leq x \\ 0, & x < 0 \end{cases}$$

(i) Sketch the graph of F (x)

(ii) Find (i) $P(1/2 < X \leq 3/4)$ & $P(1/4 \leq X < 2)$

(b) Consider the following joint density function:

[2 + 3 = 5]

$$f(\alpha, \beta) = k\alpha\beta, 0 < \alpha < 4, 1 < \beta < 5$$

= 0, else where

(i) Find the value of k

(iii) Find $P(\alpha + \beta < 3)$

(b) Talha and Abid decided to meet between 4:00 P.M. and 5:00 P.M., with the understanding that each will wait no longer than 30 minutes for the other. Find the probability that they will meet? [4]

(c) In a gambling scheme, there are 200 prizes of \$6, 20 prizes of \$25, and 5 prizes of \$100. Suppose 15000 tickets are to be sold, what would be the reasonable price to pay for a ticket?
[4]
