United International **University**

School of Science and Engineering

Mid-Term Exam Trimester: Spring 2023

Course Title: Probability and Statistics

Course Code: Math 2205/Stat 205 Marks: 30 Time: 1 Hour 45 Minutes

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[You have to answer all the questions]

Q1. (a). The frequency distribution table of CGPA of the some UIU students is given below.

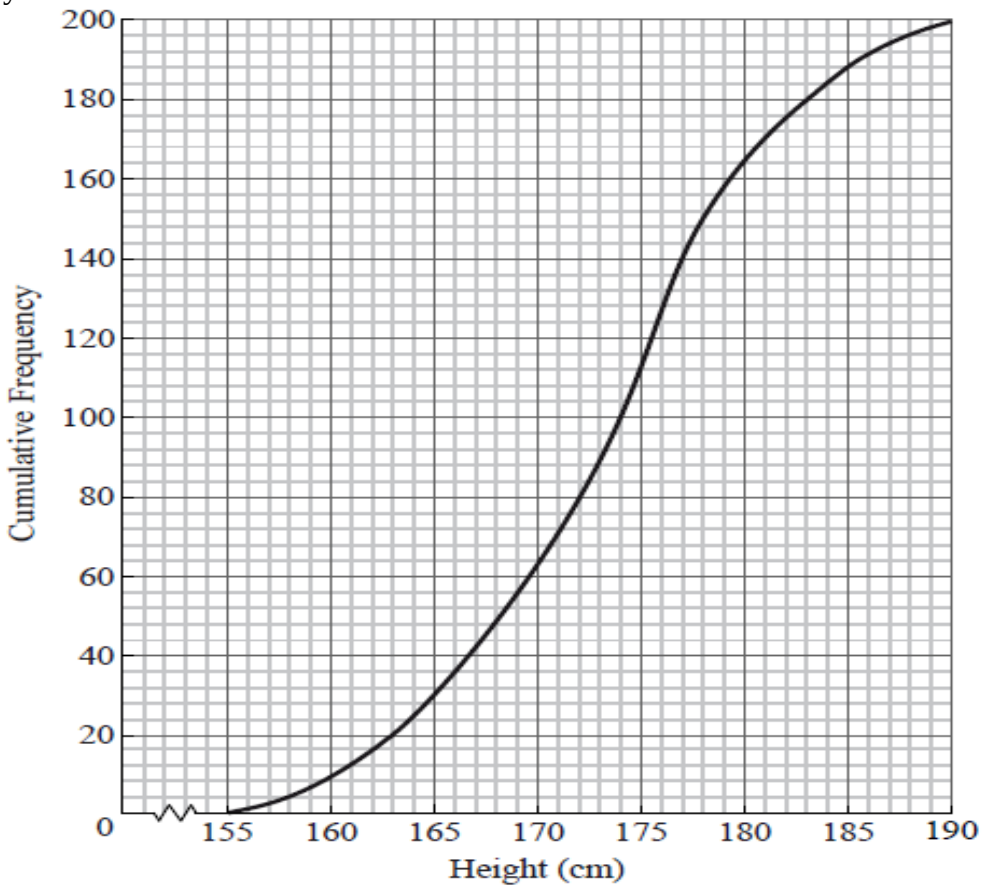
CGPA	$1-1.5$	$1.5-2$	$2-2.5$	$2.5-3$	$3-3.5$	$3.5-4$
Frequency	4	18	a	25	9	5
Cumulative frequency	4	22	51	b	85	90

i. Find the values of a & b to complete the frequency distribution table. [1]

ii. Sketch the histogram and hence find the mode. [3]

iii. Find the median class and hence find the percentage of the frequency of that class. [2]

(b). The height (in cm) of 200 students is illustrated in the following cumulative frequency curve.



i. Find the number of students' heights that are more than $180cm$ and less than $175cm$. [2]

ii. Find the position of the height of 40^{th} percentile and 70^{th} percentile. [2]

Q2. (a). Consider the following sets of data that represent the weekly working hours of the workers in a garment.

Males	42, 36, 27, 34, 37, 38, 49, 36, 36, 33, 32, 20, 30, 37
Females	33, 45, 21, 35, 41, 36, 37, 39, 35, 46, 47, 40, 20

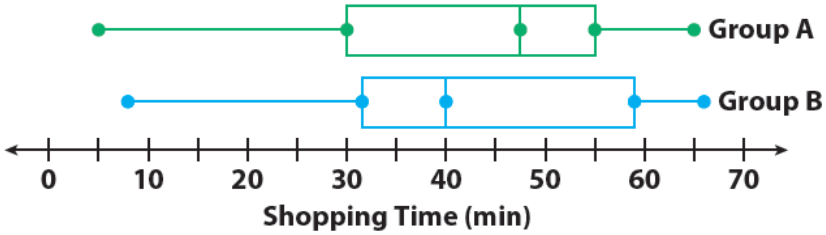
i. Design a back-to-back Stem-Leaf diagram. [2]

ii. Find the median and hence determine which group of the workers achieved a better position in the sense of maximizing the working hours? [2]

iii. Find the mode of the male workers. [1]

iv. Find the average of the female workers. [1]

(b). Distributions of the shopping time (in minutes) for two groups of people are given in the following Box-Whisker plot.



i. Find inter-quartile range (IQR) and hence investigate the consistency of the shopping time for the target groups. [2]

ii. Describe the nature (skewness) of the distributions. [2]

Q3. (a). The years of experience (x) and the annual turnover ($\$y$) are presented in the following table. Fit a regression line for x depending on y. Also, from the graph of the regression line predict x for $y = 111$. [5]

x	3	4	4	6	9	10
y	80	94	102	105	115	123

(b). Find the rank correlation coefficient between obtained places of 8 students in two programming contests. [3]

Mathematics	3	1	6	5	7	4	8	2
Physics	8	3	1	2	6	5	4	7

(c). Describe the strength of the relation by using the correlation coefficients $r = -0.37$ and $r = 0.71$? Interpret them through the scatter diagrams. [2]

Formulae: For the regression line: $\hat{y} = a_0 + a_1 x$ $\quad a_0 = \frac{\sum y \sum x^2 - \sum x \sum xy}{n\sum x^2 - (\sum x)^2}$ and $a_1 = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$

For the regression line: $\hat{x} = b_0 + b_1 y$ $\quad b_0 = \frac{\sum x \sum y^2 - \sum y \sum xy}{n\sum y^2 - (\sum y)^2}$ and $b_1 = \frac{n\sum xy - \sum x \sum y}{n\sum y^2 - (\sum y)^2}$

Spearman's rank correlation coefficient: $r = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$