United International University

School of Science and Engineering
Mid Term Exam Trimester: - Spring 2022
Course Title: Probability and Statistics, Section – B & C
Course Code: Math 2205/Stat 205 Marks: 30 Time: 2 Hours

[Note that the number of marks is given in brackets at the end of each question or part question. You have to answer all the questions]

Q1 Each member of an athletics club was asked to monitor the distance run in training during a particular week. The table below summarizes the results. **[1+4= 5]**

Distance to nearest Km	30-40	40-50	50-60	60-70	70-80	80-90
Number of athletes'	2	4	7	12	9	6

(i) Identify the modal Class
(ii) Estimate the mean distance and the standard deviation of this population of athletes

Q2 **[3+3 = 6]**

(a) Two fair six-sided dice, each with faces marked 1, 2, 3, 4, 5, 6, are thrown at the same time. For a single throw of the two dice, the score is the sum of the numbers on the top faces.

(i) Find the probability that the score is 6 on a single throw of the two dice.

(ii) Find the probability that the score is more than 9 on a single throw of the two dice.

(iii) Find the probability that the score is not less than 4 on a single throw of the two dice.

(b) A teacher calculates that 70% of the students do their homework regularly. If a student regularly completes their homework the probability that they will pass the examination is 0.8 and that if the students do not do the homework the probability of passing is only 0.4. Calculate the probability that a randomly selected student:

(i) does not do the homework regularly and passes the examination.
(ii) will pass the examination.

Q3 Ten candidates were ranked as follows by two independent examiners, according to the score they obtained in an interview. **[4]**

Candidate Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ranked by Ex. 1	7	9	1	3	8	4	10	5	6	2
Ranked by Ex. 2	9	5	1	4	6	7	8	2	10	3

Calculate the Spearman's rank correlation Coefficient and interpret the result.

Q4 A department store has the following statistics of sales (Y) for a period of 2 years of 10 salespersons who have varying years of experience (X) in sales promotion. **[6]**

Salesperson	1	2	3	4	5	6	7	8	9	10
Experience (X) in Years	1	3	4	4	6	8	10	10	11	13
Average Annual sales (Y) in thousand	80	97	92	102	103	111	119	123	117	136

(a) Find the regression line of Y on X in the form $Y = a + bX$.
(b) Predict the annual sales volume of persons what have 12 and 15 years' experience.

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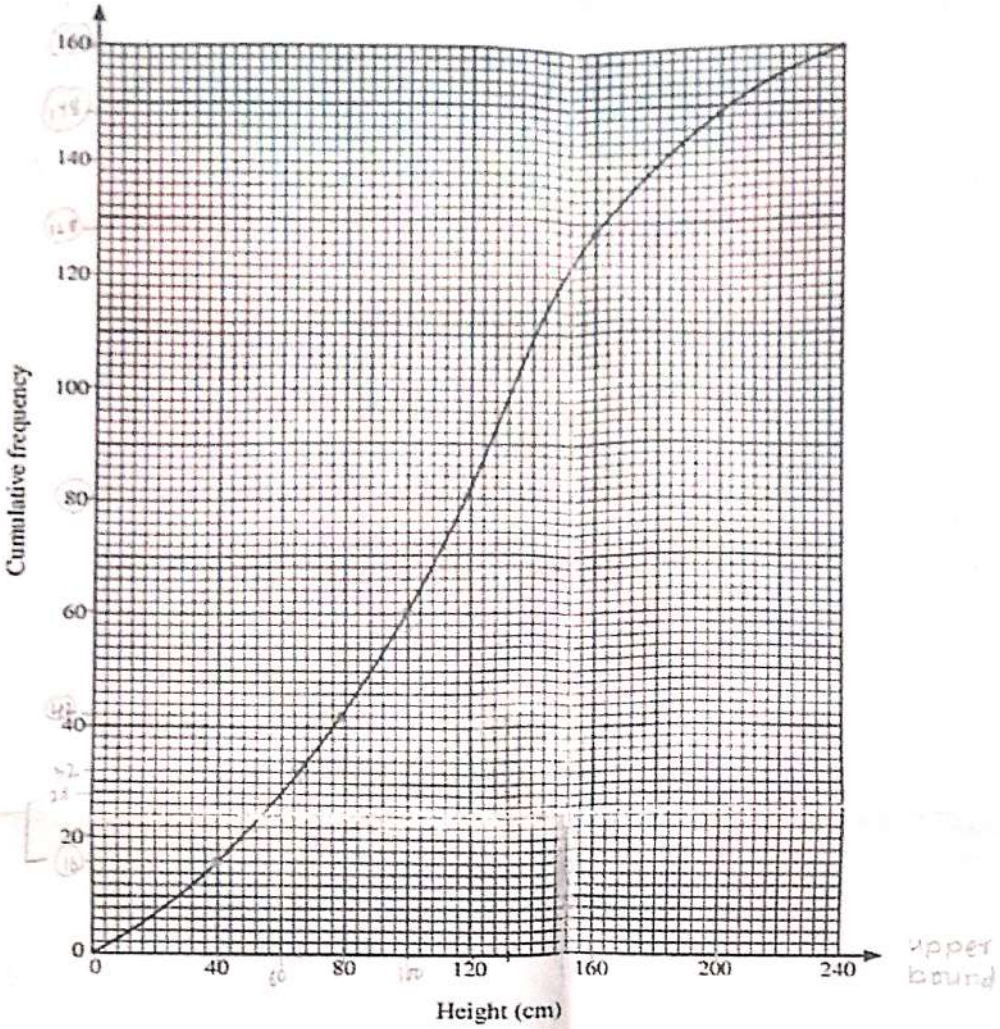
Q5 The heights in cm of 160 sunflower plants were measured. The results are summarized on the following cumulative frequency curve. [6]



(a) Use the graph to estimate the range of the plants heights.
(b) Use the graph to estimate the number of plants with heights less than 100 cm.
(c) Use the graph to estimate the 4th decile of the distribution.
(d) Use the graph to estimate the median and interquartile range of the heights of these plants.
(e) Use the graph to estimate what percentage of the plants height lies between 40 cm to 60 cm.

Q6 Interpret the following results **[3]**

(i) The product -moment coefficient of correlation $r = -0.17$.
(ii) $\beta_1 = -1.25$ and $\beta_2 = 4.27$.

Formulae:

For the linear regression $y = a + bx$

$$a = \frac{\sum y \sum x^2 - \sum x \sum xy}{[n\sum x^2 - (\sum x)^2]} \quad \text{and} \quad b = \frac{n\sum xy - \sum x \sum y}{[n\sum x^2 - (\sum x)^2]}$$

Spearman's rank correlation Coefficient:

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)}$$