STA1EA1/STA1A1E **2022** **Paper C**

TIME ALLOWED: 120 MINUTES **MARKS: 56**

SURNAME AND INITIALS: ....
STUDENT NUMBER: ....

TELEPHONE NUMBERS: ....

SIGNATURE: ....

- Answer all questions.
- Non programable calculators may be used.
- Motivate all answers clearly.
- If you need extra space to answer a question, please use the opposite blank page and indicate that clearly.

1. A certain factory manufactures electronic components. At the end of every week the components are inspected and the number of defective components are recorded. The data for a period of 26 weeks are as follows:

85	81	74	80	89	82	64	72	81
84	81	71	89	74	93	60	81	67
89	70	80	74	80	95	67	70	

(a) Find the range of the data. (1)

(b) Calculate the average number of defective components manufactured per week. (2)

(c) Calculate the median for the ungrouped data above. (2)

(d) By using the data in question 1, construct a frequency distribution by using 5 class intervals. Your table must include class intervals, frequencies, relative frequencies and midpoints. (10)

(e) By using the information in question $1(d)$, draw a histogram and interpret it. (5)

2. A certain school in the neighbourhood has 500 boys enrolled at the school. 69% of the boys play rugby while 51% of the boys play soccer after school in the afternoons. Some boys play both soccer and rugby. However, 11% are to young and play neither soccer nor rugby.

   (a) Draw a Venn diagram to demonstrate the situation. (3)

   (b) Calculate the probability that a randomly selected boy plays soccer or rugby. (3)

   (c) Find the number of boys that play both rugby and soccer. (3)

(d) Suppose we randomly select a boy. Determine the probability that the boy only plays rugby or only plays soccer. (3)

(e) If a boy is selected randomly, find the probability that he plays rugby if it is given that he plays soccer. (3)

(f) It is found that $P\{\text{a boy plays rugby}\} \times P\{\text{a boy plays soccer}\} = 0,69 \times 0,51 = 0,3519$. Validate statistically whether these two events are independent or not. (3)

3. A box in a certain supply store contains four $40 - W$ light bulbs, five $60 - W$ light bulbs and six $75 - W$ light bulbs. Two light bulbs are selected randomly from the box.

(a) Find the probability that both bulbs are $75-W$. (2)

(b) Calculate the probability that at least one bulb is $75-W$. (3)

(c) Calculate the probability that both bulbs are $75-W$ if it is given that at least one bulb is $75-W$. (4)

4. Let A and B be independent events in some sample space $\mathbb{S}$ and suppose P is a probability function defined on $\mathbb{S}$. Prove that A' and B' are independent events. [Hint: $A' \cap B' = (A \cup B)'$.] (4)

5. JOBURG WATER has two pumps that provide a certain neighbourhood of water, an older pump and a new pump. The older pump works 40% of the time and the newer pump works 70% of the time due to accessive load shedding. Suppose the pumps work independently.

   (a) Find the probability that the newer pump is not working if it is given that the older pump is not working. (3)

   (b) What is the probability that at least one of the two pumps are working? (2)