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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2019/2020 ACADEMIC YEAR TWO**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: STA 100e**

**COURSE TITLE: PROBABILITY AND STATISTICS I**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 16/12/2020 TIME: 12.00-2.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of TWO (2) printed pages *please turn over***

**QUESTION ONE**

1. Define the following terms as used in probability and statistics
2. Population
3. Sample
4. Random variable
5. Independent events
6. Quantitative variable
7. Linear regression **[6 marks]**
8. A fair coin is tossed ten times and the up face is recorded after each toss. Find the probability of observing at least one head **[3 marks]**
9. The table below shows a frequency distribution on marks of a final examination by Education students

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marks | 3.50-3.59 | 3.60-3.69 | 3.70-3.79 | 3.80-3.89 | 3.90-3.99 | 4.00-4.09 | 4.10-4.19 | 4.20-4.29 |
| No. of students | 1 | 2 | 2 | 4 | 5 | 6 | 3 | 2 |

Use the given data to compute the following

1. Mean
2. Mode
3. Median
4. Standard deviation
5. Mean absolute deviation
6. Quartile deviation **[9 marks]**
7. Assume that a population is composed of 900 elements with a mean of 20 units and a standard deviation of 12. What is the standard error of the sampling distribution if n=36 and if n=64 **[3 marks]**
8. Hospital records shows that 12% of all patients are admitted for surgical treatment, 16% are admitted for obstetrics and 2% receive both obstetrics and surgical treatment. If a new patient is admitted to the hospital, what is the probability that the patient will be admitted either for surgery, obstetrics or both?  **[5 marks]**
9. Define the term probability mass function **[2 marks]**

**QUESTION TWO**

1. Distinguish between mutually exclusive events and independent events 2 marks
2. The data reports the aggregate consumption and disposal income for a developing economy for the 12 years.

|  |  |  |
| --- | --- | --- |
| Years | Y | X |
| 1988 | 102 | 114 |
| 1989 | 106 | 118 |
| 1990 | 108 | 126 |
| 1991 | 110 | 130 |
| 1992 | 122 | 136 |
| 1993 | 124 | 140 |
| 1994 | 128 | 148 |
| 1995 | 130 | 156 |
| 1996 | 142 | 160 |
| 1997 | 148 | 164 |
| 1998 | 150 | 170 |
| 1999 | 154 | 178 |

1. Find the regression equation for the consumption schedule
2. Find the correlation coefficient **[13 marks]**
3. A fertilizer mixing machine is set to give 12kg of nitrate for every 100kg bag of fertilizer. Ten 100kg bags are examined. The percentages of nitrate are as follows: 11, 14, 13, 12, 13, 12, 13, 14, 11, 12. Is there a reason to believe that the machine is defective at  level of significance? **[5 marks]**

**QUESTION THREE**

1. The discrete random variable X has the probability distribution shown below. Find the value of d hence determine Var (X) **[5 marks]**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | -3 | -2 | -1 | 0 | 1 |
| P(X=x) | 0.1 | 0.25 | 0.3 | 0.15 | D |

1. Define the following terms
2. Level of significance
3. Hypothesis
4. Point Estimate **[3 Marks]**
5. Use the Bowley’s coefficient of skewness and the percentile coefficient of kurtosis for the data below and interpret the results **[6 Marks]**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| class | 1-4 | 5-8 | 9-12 | 13-16 | 17-20 | 21-24 |
| Frequency | 10 | 14 | 20 | 16 | 12 | 8 |

(d) A sample of ten plants gave the following shoot lengths

10.4, 21.6, 11.9, 12.0, 14.6, 11.9, 19.2, 11.4, 22.6, 10.2 An earlier study reported that the mean shoot length is 15cm. Test whether the experimental data confirms the old view at 1% level of significance? **[7 Marks]**

**QUESTION FOUR**

1. The amount of time required at a customer care desk has been found to be approximately normally distributed with mean of 3 minutes and a variance of 2500 square seconds. What is the Probability that a randomly selected customer will:
2. Spend more than 7 minutes
3. Spend between 1 minute and 3 minutes
4. Take more than 150 seconds at the desk **[9 marks]**
5. Estimate the lower quartile, 4th deciles and the 85th percentile for the frequency table below.  **[6 marks]**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| class | 11-14 | 15-18 | 19-22 | 23-26 | 27-30 | 21-34 |
| Frequency | 10 | 14 | 20 | 16 | 12 | 8 |

1. A game is played as follows: throw a fair four sided die and the scores eight times the number that faces down unless it is a 4. If it is four, you are given a second chance in which you score only four times the number that faces down. Let X be a random variable denoting the score for each player. Represent this information in a tree diagram showing the value of X and the corresponding probability hence or otherwise find the mean of the scores **[5 marks]**

**QUESTION FIVE**

a) The following data are the measures of the diameters of 36 rivet heads in 1/100 of an inch.

6.72 6.77 6.82 6.70 6.78 6.70 6.62 6.75 6.66 6.66 6.64 6.76 6.73 6.80 6.72 6.76 6.76 6.68 6.66 6.62 6.72 6.76 6.70 6.78 6.76 6.67 6.70 6.72 6.74 6.81 6.79 6.78 66. 6 6.76 6.76 6.72

* 1. Organize the data into a frequency distribution table **[4 marks]**
  2. Compute the sample mean and sample standard deviation. **[3 marks]**
  3. Compute the median and mode **[3 marks]**
  4. Construct a relative frequency histogram and o- give curve of the data**. [4 marks]**
  5. Comment on whether or not there is any clear indication that the sample came from a population that has a normal distributio **[1 mark]**

**b)** What is linear correlation? Illustrate different kinds of linear correlation.  **[5 Marks]**