THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

AUGUST – DECEMBER 2018 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE

REGULAR PROGRAMME

MAT 262: PROBABILITY AND STATISTICS

Date: DECEMBER 2018	Duration: 2 Hours
INSTRUCTIONS: Answer Question ONE and any other TWO Questions	

Q1. a) Describe the following terms giving examples for each.   **(8marks)**
  i) Population
  ii) Sample
  iii) Parameter
  iv) Statistic

  b) A health-related survey of school children has been undertaken. One of the questions was "How long did you spend watching television after school yesterday? Give your answer to the nearest quarter of an hour". Some computer output relating to the responses that were given to this question by a random sample of boys and girls aged 15–16 is given below.

No. of hours	N	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Boys	97	1.799	0.164	1.613	0.000	0.500	1.250	2.875	6.250
Girls	92	1.473	0.126	1.205	0.000	0.500	1.250	2.000	5.500

  i) Write descriptive report on mean median and maximum using the main points shown in this table, paying particular attention to any differences between girls and boys. Your report should be written in such a way that it can be understood by non-technical readers.   **(5 marks)**

  c) Define the following terms as used in Hypothesis Testing

  i)   Hypothesis Testing

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ii) Type I Error

iii) Type II Error **(6 marks)**

d) Describe any three methods for tabular and graphical presentation of sample data? **(6 marks)**

e) A researcher is investigating whether there is a relationship between the population size of cities and the average walking speed of pedestrians in the city centre. Data for the population size, x thousands and the average walking speed of pedestrians Ms, of eight randomly selected cities region in table below.

X	18	43	52	94	98	215	74	15
Y	1.15	0.97	1.26	1.35	1.28	1.92	1.32	1.64

Calculate the value Pearson's coefficient of correlation and coefficient of determination and describe the relationship. **(5 marks)**

Q2. i) Construct a grouped frequency distribution of the following data on the amount of time (in hours) that 80 college students devoted to leisure activities during a typical school week: 23 24 18 14 20 24 24 26 23 21 16 15 19 20 22 14 13 20 19 27 29 22 38 28 34 32 23 19 21 31 16 28 19 18 12 27 15 21 25 16 30 17 22 29 29 18 25 20 16 11 17 12 15 24 25 21 22 17 18 15 21 20 23 18 17 15 16 26 23 22 11 16 18 20 23 19 17 15 20 10
(4 marks)

ii) Draw histogram to represent the data and describe skewness **(4 marks)**

iii) Calculate and interpret the following measure.
　　i) Median **(2 Marks)**
　　ii) Mean **(2 Marks)**
　　iii) Variance **(2marks)**
　　iv) Standard deviation **(2marks)**
　　v) Coefficient of variation **(2marks)**
　　vi) Standard error of the mean **(2 marks)**

Q3. a) Differentiate between primary and secondary data collection methods
(4marks)

b) Explain with examples survey errors **(4marks)**

c) Explain the following sampling methods with examples of how you select a sample in each of the methods **(12 marks)**
　　i) Simple Random Sampling
　　ii) Systematic Random Sampling
　　iii) Stratified Random Sampling

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iv)   Convenience Sampling

Q4.   a)   Describe the following terms as used in probability theory?
                  i)   Random variable
                  ii)   Joint probability
                  iii)   Conditional probability
                  iv)   Mutually exclusive events   **(8 marks)**

   b)   A contingent data table for beer drinkers and gender is as shown below

	M (male)	F (female)
B (beer drinker)	450	350
B' (not a beer drinker)	450	750

                  i)   Calculate joint probabilities   **(4 marks)**
                  ii)   Calculate Marginal probabilities   **(4 marks)**

   d)   Describe the normal distribution   **(4 marks)**

Q5.   A pilot records the takeoff distance for his light aircraft on runaways at various altitudes. The data are shown in the table below. Where a metre is the altitude and t metres is the take off distance. (also shown are summary statistics for these data.)

A	0	300	600	900	1200	1500	1800
T	635	704	776	836	923	1008	1105

   i)   Draw a scatter graph to illustrate the data   **(6 marks)**

   ii)   State which of the two variables a and t is the independent variable and which is the dependent variable. Briefly explain your answer. **(4 marks)**

   iii)   Calculate the coefficient of correlation and coefficient of determination   **(4 marks)**

   iv)   Calculate the equation of the regression line of t and a.   **(6 marks)**

END