ALUPE UNIVERSITY COLLEGE

...*Bastion of Knowledge*....

P. O.Box 845-50400 Busia(K)
principal@auc.ac.ke
Tel: +254 741 217 185
+254 736 044 469
off Busia-Malaba road

OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH
UNIVERSITY EXAMINATIONS

2020 /2021 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION

COURSE CODE: **MAT 114**

COURSE TITLE: **PROBABILITY AND STATISTICS I**

DATE: 28/7/2021   **TIME: 0800-1100HRS**

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

THIS PAPER CONSISTS OF 4 PRINTED PAGES   **PLEASE TURN OVER**

MAT 114: PROBABILITY AND STATISTICS I

STREAM: EDU   **DURATION: 3 Hours**

INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

===

SECTION A [31 Marks]. Answer ALL questions.

QUESTION ONE [15 Marks]

a) Define clearly each of the following terms as used in statistics.   [3 Marks]
    i) Range.
    ii) Skewness.
    iii) Kurtosis.

b) By citing an example for each as, identify and describe briefly two sources of data.
                                                             [4 Marks]

c) A good measure of central tendency must possess some desirable qualities. Give any three of them   [3 Marks]

d) The following data shows heights in centimetres for seedlings from a particular nursery in village A; 13.8, 12.4, 10.2, 9.6, 11.8, 17.7, 15.3, 16.2, 12.6, 10.4
    Compute i) Arithmetic mean   [2 Marks]
                 ii) Standard deviation.   [3 Marks]

QUESTION TWO [16 Marks]

a) Distinguish between census and sample survey   [2 Marks]
b) State **two** merits of mean over the other measures of central tendency   [2 Marks]
c) Construct an ogive to represent the data the following distribution   [3 Marks]

Temperature (^{0}F)	6-10	11-15	16-20	21-25	26-30	31-35	36-40
Frequency	1	2	3	5	4	3	2

d) State **three** properties that characterizes binomial events   [3 Marks]
e) Suppose the heights of students in a first year class are as shown below. Estimate modal height   [2 Marks]

Height in cm	130-134	135-139	140-144	145-149	150-154	155-159
No. of students	3	6	10	8	2	1

f) Calculate coefficient of kurtosis, α_4 for the following data: 9, 4, 5, 6 ,7, 6, 5   [4 Marks]

SECTION B [39 Marks] Answer any THREE questions]

QUESTION THREE [13 Marks]

a) Write an expression for Bernoulli distribution.   [1 Mark]
b) Give two properties of normal distribution   [2 Marks]
c) Suppose that in an annual survey conducted by an insurance company on prospective clients indicated that for clients having the same age the probability that they will be alive in 40 years' time is $\frac{2}{3}$. If a sample of five people was insured now, find the probability of having the following possible outcomes in 40 years.
    i) All are alive   [2 Marks]
    ii) At least 3 are alive   [3 Marks]
    iii) At most one is alive   [2 Marks]
d) Assume that customers arrive at a checkout counter according to a Poisson distribution at an average of two per hour. During a given hour interval there will be at most three arrivals.
                                                                                                  [3 Marks]

QUESTION FOUR [13 Marks]

a) Give two examples of bivariate data.   [2 Marks]
b) With the growth of internet service providers, a researcher decides to examine whether there is a correlation between cost of internet service per month(X) and degree of customer satisfaction(Y) among school going children between 15 to 20 years old, the data below was captured

Age of child	15	16	17	18	19	20
Cost of internet ($)	250	200	150	120	100	80
Satisfaction	200	150	90	48	30	16

Calculate Karl Pearson correlation of coefficient and comment on your results. [6 Marks]

c) Consider the data below on student performance, Maths score (P) and English score (Q)

Subject	A	B	C	D	E	F	G	H	I	J
P	8.3	8.6	9.2	9.8	8.0	7.8	9.4	9.0	7.2	8.6
Q	2300	2250	2380	2400	2000	2100	2360	2350	2000	2260

Calculate Spearman's rank correlation coefficient.   [5 Marks]

QUESTION FIVE [13 Marks]

a) Give a situation where one is required to perform regression analysis.   [2 Marks]

b) Researchers interested in determining if there is a relationship amongst ten students between death anxiety and religiosity scores conducted a study and obtain the table below.

Subjects	1	2	3	4	5	6	7	8	9	10
Religiosity (X)	82	74	60	76	45	88	96	100	66	98
Death anxiety (Y)	80	86	74	78	62	80	88	98	74	90

   i) Develop a regression equation which may be used to predict death anxiety scores from the religiosity scores.   [6 Marks]

   ii) Estimate death anxiety scores for an individual who religiosity score of 55   [1 Mark]

c) The table shows number of goals scored in hockey matches, given that standard deviation is 1.2, calculate Karl Pearson coefficient of skewness.   [4 Marks]

No of goals	2	3	4	5	6	7	8	9
No of matches	3	3	4	5	6	8	6	5

QUESTION SIX [13 Marks]

a) Derive Bayes Theorem.   [8 Marks]

b) Suppose that in a certain printing section, it is found out that computers P, Q and R make 30%, 25%, and 45%, respectively, of the print outs daily. From past experience, it is known that 2%, 4% and 3% of the print outs made by computer P, Q and R, respectively, are erroneous. Suppose that a print out is randomly selected, find the probability that it is erroneous and that it was made by the computer R.   [5 Marks]

QUESTION SEVEN [13 Marks]

a) A continuous random variable X has a pdf given by $f(x) = \begin{cases} \frac{1}{2}x & 0 \le x \le 2 \\ 0 & elsewhere \end{cases}$, find the mean and standard deviation   [4 Marks]

b) If $X \sim HYP(n_1, n_2, r)$, show that

   i) $E(X) = r\frac{n_1}{n_1+n_2}$ [2 Marks]

   ii) $Var(X) = r\left(\frac{n_1}{n_1+n_2}\right)\left(\frac{n_2}{n_1+n_2}\right)\left(\frac{n_1+n_2-r}{n_1+n_2-1}\right)$ [4 Marks]

c) Assume that there are three loan defaulters in a medium size company of 50 employees. A sample of size ten employees is taken at random and without replacement. Let X denotes the number of loan defaulters, what is the probability that the sample contains at most one loan defaulters?   [3 Marks]

****