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

SECOND YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE)

COURSE CODE: **STA 205**

COURSE TITLE: **PROBABILITY AND STATISTICS**

DATE: 26/7/2021 **TIME: 1300-1600HRS**

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

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REGULAR – MAIN EXAM

STA 205: PROBABILITY AND STATISTICS

STREAM: CS **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 (15MKS)

a) Define the following terms
   i. Point estimate (1mk)
   ii. Standard error (1mk)
   iii. P value (1mk)

b) A biased coin is tossed six times. The probability of a head turning up on any toss is 0.3. Let X denote the number of heads that come up.
   Calculate:
   i) P(X=2) [2mks]
   ii) P(X=3) [2mks]
   iii) P(1 < X < 5) [2mks]

c) Consider a computer system with Poisson job-arrival stream at an average of 2 per minute. Determine the probability that in any one-minute interval there will be:
   i) 0 jobs [2mks]
   ii) Exactly 3 jobs [2mks]
   iii) At most three arrivals [2mks]

QUESTION TWO (16MKS)

a) Occasionally, a random sample of five jars of Tinker Belle Peanut Butter is selected from the output and weighed, to be sure that the system is under control. Here are data on ten such samples. Measurements are in kilograms.

Sample	1	2	3	4	5	6	7	8	9	10
	0.5	0.5	0.5	0.51	0.51	0.51	0.5	0.5	0.51	0.5
	0.47	0.48	0.49	0.51	0.5	0.5	0.51	0.52	0.48	0.51
	0.5	0.48	0.51	0.52	0.49	0.52	0.49	0.47	0.5	0.49
	0.49	0.48	0.47	0.51	0.52	0.51	0.5	0.49	0.49	0.5
	0.51	0.47	0.49	0.51	0.5	0.51	0.48	0.49	0.5	0.47
Total	2.47	2.41	2.46	2.56	2.52	2.55	2.48	2.47	2.48	2.47

i. What type of control chart should be used here? Why? (2marks)
ii. What is the centerline of the chart? (2marks)
iii. What is the lower control limit? The upper control limit? (2marks)
iv. What statistic should be plotted on the control chart for each sample? (1mark)
v. Draw the control chart on a piece of graph paper. (1mark)

b) Explain how sample bias can be eliminated in a survey study (2marks)
c) Explain the difference between stratified sampling and multi stage sampling (2marks)
d) State the factors to consider in choosing a sampling frame (2marks)
e) State and explain the steps in sampling process (2marks)

SECTION B (39 MARKS)

QUESTION THREE (13MKS)

a) Compute the p values associated with the following test statistics:

	Test Statistic Value	**Test Statistic Distribution**
i.	z=2.68	Standard normal distribution
ii.	t=1.25	T with 19 degrees of freedom
iii.	X^2=7.2	Chi-square with 1 degree of freedom
iv.	f=2.945	F with 5 and 14 degrees of freedom

(4 marks)

b) A study was taken to establish whether there is a difference in the mean salaries between the male and female employees. The salaries in Kshs1000 for the randomly selected employees by gender are shown below. Test the appropriate hypotheses using $\alpha = 0.05$ significance level.

Male	65	61	45	49	48	46	61	56	48	53	68	48
Female	46	50	39	40	53	49	41	53	43			

(9 marks)

QUESTION FOUR (13MKS)

a) State and explain the types of non-probability sampling methods (6marks)
b) The following table shows the ages and blood pressure of 8 persons

Age (x)	52	63	45	36	72	65	47	25
B. P (Y)	62	53	51	25	79	43	60	33

i. Obtain the regression equation model of Y on X (6marks)
ii. Find the expected blood pressure of a person aged 49 years old. (1mark)

QUESTION FIVE (13MKS)

a) State Baye's theorem (2marks)
b) Define a stochastic process (2 marks)

c) The following data gives the yields on 12 plots of land in three samples, each of 4 plots, under three varieties of fertilizers A,B, and C

A	B	C
25	20	24
22	17	26
24	16	30
21	19	20

Use Analysis of Variance (ANOVA) technique to test if there is any significant difference in the average yields of Land under the three varieties of fertilizers?

(9marks)

QUESTION SIX (13MKS)

a) State and explain the steps in testing of statistical hypothesis (4marks)

b) A single sided dice is rolled once, determine the probability that a 2 was rolled given an even number has been rolled (2 marks)

c) A study was conducted to determine the prevalence of HIV among 100 individuals. The data below summarizes the HIV status by marital status.

Marital Status	**HIV Status**	
	Positive	**Negative**
Single	8	18
Married	7	34
Divorced	2	10
Widowed	6	15

Test the hypothesis that there is no association between HIV prevalence and marital status. (7 marks)

QUESTION SEVEN (13MKS)

a) Differentiate between type I error and type II error (4marks)

b) Two critics were asked to rank in order of preference 10 television series

Tv series	A	B	C	D	E	F	G	H	I	J
Critics 1	4	3	6	9	2	1	7	10	8	5
Critic 2	7	1	3	8	2	6	5	10	9	4

Are the views of the two critics consistent (9marks)

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