(*Knowledge for Development*)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR TWO SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF
BACHELOR OF SCIENCE COMPUTER SCIENCE

COURSE CODE : STA 205

COURSE TITLE : INTRODUCTION TO STATISTICS AND PROBABILITY

DATE: 18/06/2021 **TIME:** 02:00 P.M – 4:00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (30 MARKS)

a) Define the following terms (4 Marks)

(i) A sample

(ii) Probability

(iii) Simple hypothesis

(iv) Type II error

b) Urn 1 has 2 white and 3 black balls, Urn II has 4 white and 1 black ball and Urn III has 3 white and 4 black balls. An urn is selected at random and a ball drawn at random is found to be white. Find the probability that urn 1 was selected. (3 Marks)

c) A manager wants to determine at 5% level of significance if the hourly wages for semi-skilled workers are the same in two cities. In order to do this, she took a random sample of hourly wages in both cities and found that

$\overline{x_1} = \$6 \qquad S_1 = \$2 \qquad for \quad n_1 = 40$

$\overline{x_2} = \$5.4 \qquad S_1 = \$1.8 \qquad for \quad n_2 = 54$

Determine whether her hypothesis is true (5 Marks)

d) 1000 students at college level were graded according to their IQ and economic conditions of their homes. Using the Chi-square test to find out whether there is an association between economic condition at home and IQ (α=5%) (6 Marks)

	IQ		
Economic conditions at home	High	Low	Total
Rich	460	140	600
Poor	240	160	400
Total	700	300	1000

e) A random variable has the density function

$f(x) = c(x + 3)\ ,\ 0 \leq x \leq 4$

(i) Determine c (2 Marks)

(ii) Compute E(x) (3 Marks)

f) In a test given to two groups of students the marks obtained are as follows

1st group	29	28	26	35	30	44	46		
2nd group	18	20	36	50	49	36	34	41	49

At 5% level of significance, examine whether there is significant difference in the arithmetic mean of the marks secured by the two groups (7 Marks)

QUESTION TWO (20 MARKS)

a) A group of 50 people were asked which of the three newspapers A, B or C they read. The results showed that 25 read A, 16 read B, 14 read C, 5 read both A and B, 4 read both B and C, 6 read both C and A and 2 read all the three.

i) Represent this information using a venn diagram (3 Marks)

ii) Find the probability that a person selected at random from this group reads

I At least one of the newspapers (3 Marks)

II Only one of the newspapers (2 Marks)

III Only A (2 Marks)

b) 11 students were given intensive coaching and 2 tests were conducted in a month. The scores of tests 1 and 2 are given below

No of students	1	2	3	4	5	6	7	8	9	10	11
1 St test	50	42	51	26	35	42	60	41	70	55	62
2 nd test	62	40	61	35	30	52	68	51	84	63	72

At 5% level of significance, does the scores from 1test and 2 test show an improvement?

(10 marks)

QUESTION THREE (20 MARKS)

a) Define the following terms (2 Marks)

(i) Hypothesis testing

(ii) Exhaustive events

b) State three assumptions made in determination of F-test (3 Marks)

c) Two random samples were drawn from two normal population and their values

A	64	66	74	78	82	85	87	92	93	95	97
B	66	67	75	76	82	84	88	90	92		

At 5% level of significance test whether the two populations have the same variance (8 Marks)

d) Given the eight sample observations 31, 29, 26, 33, 40, 28, 30 and 25. Test at 1% level of significance whether the mean of sample observation is equal to 35. (7 Marks)

QUESTION FOUR (20 MARKS)

a) State three uses of Chi-square test (3 Marks)

b) The members of a sports team are interested in whether the weather has an effect on their results. They play 50 matches with the following results. Test for this at 5% level of significance using the following scores. (10 Marks)

		Weather		
		Good	Bad	**Total**
Results	Win	12	4	16
	Draw	5	8	13
	Lose	7	14	21
	Total	24	26	50

c) A manufacturer of car batteries guarantees that his batteries will last, on the average of 3 years with a standard deviation of 1 year. If 5 of these batteries have lifetimes of 1.9, 2.4, 3.0, 3.5 and 4.2 years. Is the manufacturer still convinced that his batteries have a standard deviation of 1 year at $\alpha = 0.05$? (7 Marks)

QUESTION FIVE (20 MARKS)

a) A machine puts out 10 defective units in a sample of 200 units. After the machine is overhauled it puts out 4 defective units in a sample of 100 units. At 5% level of significance test whether the machine has improved. (7 Marks)

b) The numbers of telephone cells arriving at an exchange in 6 minutes periods were recorded over a period of 8 hours with the following results. Can these results be modeled by a poison distribution at $\alpha = 0.05$? (7 marks)

Number of cells	0	1	2	3	4	5	6	7	8
Frequency	8	19	26	13	7	5	1	1	0

c) For several years a teacher has kept records of how long it takes students to solve a difficult problem in statistics. If 64 randomly selected took an average of 32.5 mean with a variance of 10.89. Construct a 99% C.I for the mean average time it takes a student to solve this problem. (6 Marks)