57

(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

COURSE CODE: **STA 205**

COURSE TITLE: **INTRODUCTION TO STATISTICS AND PROBABILITY**

DATE: 18/01/18 **TIME:** 8 AM -10 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 6 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS)

a) Define the following terms (4 Marks)

i) Hypothesis testing

(i) Exhaustive events

(ii) Type I error

(iii) Set

b) A random variable has the density function

$$f(x) = \frac{1}{8}x,\ 0 \leq x \leq 4$$

Find

(i) E(x) (2 Marks)

(ii) Var(x) (3 Marks)

c) 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. (6 Marks)

d) A driving school examined the results of 100 candidates who took their test for the first time. It was found that out of the 40 men, 28 passed and out of the 60 women, 34 passed. Do these results indicate, at the 5 % significance level, a relationship between the sex of candidate and the ability to pass the driving test at the first attempt? (6 Marks)

	Results of driving Test		
	Pass	Fail	Total
Male	28	12	40
Female	34	26	60
Total	62	38	100

e) 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)

f) Suppose in a given experiment each sample air has 10% chance of containing particular rare molecule. Assume that the sample are independent with regard to the presence of rare molecule.

(i) Find the probability that in the next 18 samples exactly 2 contain the rare molecule (2 Marks)

(ii) Find the probability that atleast four samples contain the rare molecule (2 Marks)

QUESTION TWO (20 MARKS)

In a certain college, 75% of the students are full-time students, 45% of the students are female while 25% of the students are male full-time students.

a) Find the probability that

i) A student chosen as a random from all the students in the college is a part-time student. (2 Marks)

ii) A student chosen as a random from all the students in the college is a female and a part-time student. (3Marks)

iii) A student chosen as a random from all the female students in the college is a part-time student. (2 Marks)

b) 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)

c) For a random sample of 10 persons fed on diet A and B, the increased weight in pounds in a certain period were

A	10	6	17	13	12	8	14	15	9	16		
B	7	13	22	15	14	18	8	21	23	10	12	17

Test at 5% level of significance whether the diets A and B differ significantly as regards their effect on increase in weight (7 marks)

QUESTION THREE (20 MARKS)

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

b) Two random sample were drawn from two normal populations and their values were

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

At 5% level of significance test whether the two populations have the same variance.

(8 Marks)

c) 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 (2 Marks)

II Only one of the newspapers (2 Marks)

III Only A (2 Marks)

QUESTION FOUR (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 table below gives observed frequencies in the nine different length-of-stay and type-of-insurance categories into which the sample has been divided. Prof. Simwa wishes to test the hypothesis at $\alpha = 0.01$

H_O: length of stay and type of insurance are independent

H_1: length of stay depends on type of insurance

Fraction of cost covered by insurance	Days in hospital				Total
		< 5	5-10	>10	
	< 25%	40	75	65	180
	25-50%	30	45	75	150
	>50%	40	100	190	330
	Total	110	220	330	660

Find whether to reject or accept the null hypothesis (13 marks)

QUESTION FIVE (20 MARKS)

a) Define the following terms as used in statistical inference

i. Confidence interval

ii. Estimator

iii. Parameter (3 Marks)

b) 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)

c) The mean score on a widely given freshman mathematics examination is 75. A mathematics teacher at a very large university wants to determine whether there is statistical evidence for claiming that this year's class is not average. Test for this at 5% level of significance using the following scores. (10 marks)

94	69	89	49	88	89	85
95	55	93	86	62	83	96
48	51	69	74	83	71	89
58	89	81	79	52	73	
75	91	68	100	63	81	