Inspiring Innovation and Leadership

KARATINA UNIVERSITY

UNIVERSITY EXAMINATIONS
2024/2025 ACADEMIC YEAR

THIRD YEAR **FIRST** SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF

BACHELOR OF BUSINESS MANAGEMENT , BACHELOR OF EDUCATION ARTS & BACHELOR OF ARTS WITH EDUCATION

COURSE CODE: BBM 350

COURSE TITLE: MANAGERIAL STATISTICS

DATE: 10th December 2024 TIME: 9am-11am

INSTRUCTION TO CANDIDATES

- SEE INSIDE

INSTRUCTIONS: Answer ***ALL*** questions in section A and any other **TWO** questions in section **B.**

SECTION A (30 marks)

QUESTION ONE (30 marks)

a) Differentiate between the following terms:

i) Point and interval estimators (4 marks)

ii) Type I and Type II errors. (4 marks)

iii) One – tailed and two – tailed tests. (4 marks)

iv) A statistic and a parameter (2 marks)

b) A paint manufacturer wants to determine the average drying time of a new interior wall paint. If for 12 test areas of equal size he obtained a mean drying time of 66.3 minutes and a standard deviation of 8.4 minutes, construct a 95% confidence interval for the true mean μ. (4 marks)

c) Given $f(x,\lambda) = \begin{cases} \frac{e^{-\lambda}\lambda^{x}}{x!}, x = 0,1,2,\ldots \\ 0, elsewhere \end{cases}$ and $x_1, x_2, \ldots, x_n$ is a random sample from the poisson distribution with parameter λ. Find the method of moment estimator for λ. (6 marks)

d) A business trainer believed employees going through her training are able to increase their performance by reducing the proportion of rejected items out of the total production. The training was offered to employees of Kampala branch in February 2010. Given that in January 2010 out of 500 units produced, 60 were rejected while in March 2010 out of 800 units produced, 80 were rejected. Test the appropriate hypothesis at the 5% level. (6 marks)

SECTION B (40 marks)

QUESTION TWO (20 marks)

a) State and briefly explain any one properties of a good estimator. (2 marks)

b) Five different brands of tyres used by a car rental agency in the process of deciding the brand of tyre to purchase as standard equipment for their fleet, found that each of five tyres of each brand last the following number of kilometres (in '000):

Tyre Brand				
A	**B**	**C**	**D**	**E**
36	46	35	45	41
37	39	42	36	39
42	35	37	39	37
48	37	43	35	35
47	48	38	32	38

i) Obtain the analysis of variance table. (10 marks)

ii) Test whether or not there is a significant difference in the performance of the four machines; use $\alpha = 0.05$. (2 marks)

c) A new drug has been developed for the treatment of a certain disease. A group of 400 patients suffering from the disease were treated with the new drug. Another group of 500 patients were treated with an alternative drug. At the end of two weeks, 320 of the patients receiving the new drug recovered, while 260 of those taking the alternative drug recovered. Construct a 99% confidence interval for the difference in the true proportion of patients who might be expected to respond to the two drugs. (6 marks)

QUESTION THREE (20 marks)

a) A lifespan of a certain product is approximately normally distributed with $\sigma = 20\ years$. If a sample of 30 of these products has an average lifespan of $200\ years$. Construct a 95% confidence interval for the population mean lifespan of these products. (3 marks)

b) Explain the applications of Chi-square Tests. (4 marks)

c) Two market researchers adopted different sampling techniques while investigating the same group of customers for their opinion on the performance of a certain laptop brand. The customers rated the performance into four groups. The results are as shown below:

Researcher	Excellent	Good	Fair	Poor	Total
Mary	325	597	216	52	1190
John	1527	1712	304	96	3639
Total	1852	2309	520	148	4829

Are the sampling techniques adopted significantly different at 5% level of significance? (13 marks)

QUESTION FOUR (20 marks)

a) A home owner claims that the current market value of his house is Ksh. 4 million. Twelve real estate agents were asked independently to estimate the house's value and mean estimate was found to be Ksh. 3.75 million with a standard deviation of Ksh. 750,000. Test a hypothesis that the market value is below the home owners claim at 1% level of significance. (8 marks)

b) The Educational Testing Service conducted a study to investigate the difference between the scores of male and female students on the Scholastic Aptitude Test. The study identified a random sample of 562 female and 852 male students who had achieved the same high score on the mathematics portion of the test. That is, the female and male students were viewed as having similarly high abilities in mathematics. The verbal scores for the two samples are as given:

Female students: $\bar{x}_1 = 547;\ s_1 = 83$; Male students: $\bar{x}_2 = 525;\ s_2 = 78$

Do the data support the conclusion that given a population of female students and a population of male students with similarly high mathematics abilities, the female

students will have a significantly higher verbal ability? Test at a 5% level of significance. What is your conclusion? (5 marks)

c) Find the maximum likelihood estimate of p in a point binomial distribution with probability mass function $f(x_i; p) = \{p^x(1-p)^{1-x}\ for\ x = 0,1$ (7 marks)

QUESTION FIVE (20 marks)

a) Given $f(x, \lambda) = \begin{cases} \frac{e^{-\lambda}\lambda^x}{x!}, x = 0, 1, 2, \cdots \\ 0, elsewhere \end{cases}$ and $x_1, x_2, \ldots, x_n$ is a random sample from the poisson distribution with parameter λ. Find the maximum likelihood estimator for λ. (7 marks)

b) To compare the efficiency of standard and electric typewriters, ten typists are chosen at random and trained in the use of both kinds of typewriters. They are then asked to type on each kind of typewriter for half an hour and their speeds measured in average number of words per minute, are observed and given in the table below:

Typist	A	B	C	D	E	F	G	H	I	J
Standard	60	64	72	76	75	75	79	74	84	82
Electric	55	62	70	90	70	72	78	70	90	100

Can it be said that the two samples come from a population having the same

(i) Mean (7 marks)

(ii) Variance (6 marks)