



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATIC AND ACTUARIAL SCIENCES

UNIVERSITY ORDINARY EXAMINATION

2020/2021 ACADEMIC YEAR

**YEAR 2 SEMESTER EXAMINATION FOR BACHELOR OF APPLIED
STATISTICS**

AMS 208– PROBABILITY AND DISTRIBUTION THEORY II

DURATION: 2 HOURS

Instructions to candidates:

1. Answer question One and Any Other Two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

- a) Differentiate between continuous random variable and discrete random variable. Give examples in real life situation. (4marks)
- b) Using the fact that the mean of the chi-square distribution is $(n - 1)$, prove that

$$E(S^2) = \sigma^2$$
 (4marks)
- c) Why is the Central Limit Theorem so important to statistical analysis? (4marks)
- d) Given that $\sigma^2 = 25$, $n = 25$, use the chi-square distribution to determine the probability that the sample variance is less than 12. Use the chi-square table to solve. (4marks)
- e) Determine the sampling distribution of the sample mean for a sample of size 2. Graph this distribution with a simple bar graph (4marks)

X_1, X_2	\bar{X}
34, 34	34
34, 36	35
34, 38	36
36, 34	35
36, 36	36
36, 38	37
38, 34	36
38, 36	37
38, 38	38

- f) The CEO of light bulbs manufacturing company claims that an average light bulb lasts 300 days. A researcher randomly selects 15 bulbs for testing. The sampled bulbs last an average of 290 days, with a standard deviation of 50 days. If the CEO's claim were true, what is the probability that 15 randomly selected bulbs would have an average life of no more than 290 days?

(4marks)

- g) Differentiate between F-distribution and T- distribution (4marks)
 h) State the laws of large numbers. (2marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

- a) The table below defines a probability distribution for X is a discrete random variable

X	1	2	3	4	5
P(X =x)	0.09	0.03	0.52	0.24	0.12

Calculate

- (i) Expected value X , E(X) (5marks)
 (ii) Variance of X, Var(X) (5marks)
- b) If x is discrete random variable of the number of ‘heads’ after 3 flips of a fair coin. By use of barcharts, plot the probability distribution for random variable x. (10marks)

QUESTION THREE (20 MARKS)

Two random samples were drawn from to normal populations and their values are

A: 16, 17, 25, 26, 32, 34, 38, 40,42

B: 14, 16, 24, 28, 32, 35, 37, 42, 43, 45, 47

- (a.) State the null and the alternative hypothesis. (2marks)
 (b.) Compute the F value (calculated F-value) (15marks)
 (c.) Compute the F value (tabulated F- value) (1mark)
 (d.) Test whether the two populations have the same variance at 5% level of significance. (2marks)

QUESTION FOUR (20 MARKS)

The manufacturer of a certain make of LED bulb claims that his bulb have a mean of 20 months. A random sample of 7 such bulbs gave the following values.

Life of bulbs in months: 19, 21, 25, 16, 17, 14, 21.

- a) State the null and alternative hypothesis (2marks)
- b) Compute the t-statistic calculated t-value) (13marks)
- c) Compute the t-value (tabulated t-value) (2marks)
- d) Can you regard the procedure claim to be valid at 1% level significance? (3marks)