

**MULUNGUSHI** **UNIVERSITY**

**SCHOOL OF SCIENCE, ENGINEERING AND TECHNOLOGY**

**MSS 242 – BUSINESS STATISTICS II**

**SEMESTER TWO FINAL EXAMINATION**

**DURATION: TWENTY FOUR (24) HOURS**

**INSTRUCTION TO CANDIDATES**

1. Attempt **ANY FOUR (4)** questions in this paper.
2. You must show **ALL** your workings clearly to get **FULL** marks.
3. You may use statistical tables and a non-programmed calculator in this examination.

***GOOD LUCK!***

**QUESTION ONE**

1. How many 11 letter words can be formed by rearranging the letters of the word CORONAVIRUS? [5 Marks]

1. A supermarket chain conducted a study to determine where to place its generic-brand products in order to increase sales. Sales (in thousands of Kwacha) for one week were as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Shop A | Shop B | Shop C |
| High Shelf | 60 | 55 | 50 |
| Eye-level shelf | 55 | 60 | 58 |
| Low shelf | 57 | 57 | 56 |

Using the level of significance, do the shelves differ significantly in attracting customers to buy these generic brand products?

[15 Marks]

1. Briefly describe the three branches of statistics. [5 Marks]

**QUESTION TWO**

1. Give two limitations of a Chi-square test. [2 Marks]
2. A tourism student wishes to find out if level of satisfaction a person derives from the use of public parks is related to the income of that person. From administering 400 questionnaires, the following information was obtained:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Level of Satisfaction | | |
|  | Above Average | Average | Below Average |
| High income | 20 | 10 | 10 |
| Middle income | 30 | 50 | 80 |
| Low income | 10 | 60 | 130 |

At the 5% level of significance, is income independent of the level of satisfaction derived from the use of public parks. [13 Marks]

1. Let the population be given by the numbers. Take all random samples of size 3 without replacement and obtain the sampling distribution of the sample mean.

[10 Marks]

**QUESTION THREE**

1. The administration of an inner-city college has generally assumed that the average age of a student is no more than 20 years. The standard deviation of the age of students is known to be 3.6 from previous data. However, lately the students have appeared to be older than before, and some administrators say that the average age could be higher than 20 years. You collect a random age sample of 50 students and calculate a mean of 20.76. At the 90% level of confidence, can you conclude that the average age of students has indeed increased? [10 Marks]
2. Describe briefly two purposive sampling techniques with their uses and limitations.

[5 Marks]

1. Football fans of both Dockers and Eagles were asked their opinion of the quality of the facilities at the Subiaco Oval. The following table cross-classifies the information provided by the fans.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Outstanding | Good | Fair | Unsatisfactory | Total |
| Dockers | 27 | 35 | 33 | 25 | 120 |
| Eagles | 13 | 15 | 27 | 25 | 80 |
| Total | 40 | 50 | 60 | 50 | 200 |

At the 99% level of confidence is there a relationship between the opinion of the quality of the oval and the club the fan supports? [10 Marks]

**QUESTION FOUR**

1. Give five advantages of a completely randomized design, CRD.

[5 Marks]

1. Suppose you are interested in developing a counselling technique to reduce stress within marriages. You randomly select two samples of married individuals out of ten churches in the association. You provide Group 1 with *group counselling* and study materials. You provide Group 2 with *individual counselling* and studymaterials. At the conclusion of the treatment period, you measure the level of maritalstress in the group members. Here are the scores:

**Group 1 Group 2**

: 24.13 22.88

: 5.64 6.14

Are these groups significantly different in marital stress? Test at 5% level of significance.

[10 Marks]

1. A manufacturer claims that the average weight of a tin of baked beans is 440 g and the standard deviation is known to be 20 g. From a random sample of 100 cans you calculate the average weight to be 435 g. At the 95% level of confidence, is there a change in the average weight of a can of baked beans? [10 Marks]

**QUESTION FIVE**

1. A machine which fills orange squash bottles should be set to deliver 725 ml. A sample of 50 bottles is checked and the mean quantity is found to be 721 ml and the sample s.d. is 13 ml. Does this differ significantly from 725 ml at the 1% level? Find the probability of Type I error for this test. [10 Marks]
2. Prove the formula. [5 Marks]
3. A random sample of 10 hot drinks from Dispenser A had a mean volume of 203ml and a standard deviation of 3ml. A random sample of 15 hot drinks from Dispenser B gave corresponding values of 206ml and 5ml. The amount dispensed by each machine maybe assumed to be normally distributed. Test at the 5% significance level, the hypothesis that there is no difference in the variability of the volume dispensed by the two machines.

[10 Marks]

**QUESTION SIX**

A scientist, working in an agricultural research station, believes there is a relationship between the hardness of the shell of eggs laid by chickens and the amount of a certain food supplement put into the diet of the chickens. He selects ten chickens of the same breed and collects the data given below:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Chicken | A | B | C | D | E | F | G | H | I | J |
| Food supp x(g) | 7.0 | 9.8 | 11.6 | 17.5 | 7.6 | 8.2 | 12.4 | 17.5 | 9.5 | 19.5 |
| Hardness of shells y | 1.2 | 2.1 | 3.4 | 6.1 | 1.3 | 1.7 | 3.4 | 6.2 | 2.1 | 7.1 |

1. Calculate the equation of the regression line of y on x
2. Calculate the correlation coefficient, (r).
3. Calculate the coefficient of determination and interpret its meaning

[25 Marks]

***END OF EXAMINATION PAPER***