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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2019/2020 ACADEMIC YEAR TWO**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: STA 217**

**COURSE TITLE: PRINCIPLES OF STATISTICAL INFERENCE**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 17/12/2020 TIME: 09.00-11.00 AM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE**

1. State the properties of a normal distribution curve.  **[2 marks]**
2. For a standardized normal variate Z,
3. Find P(0< z <0.4) [**2 marks]**
4. Find k if P(0 ≤ z ≤ k) = 0.4032 [**2 marks]**
5. Differentiate the following terms as used in test of hypothesis
6. Null and alternative hypothesis [**2 marks]**
7. Type I and Type II errors  **[2 marks]**
8. Simple and composite hypothesis [**2 marks]**
9. Discuss the two types of hypothesis tests. [**4 marks]**
10. Over a period of 3 months the daily number of components produced by two comparable machines was measured, giving the following statistics

Machine A: mean =242.8; Standard deviation = 20.5

Machine B: mean = 281.3; Standard deviation = 23.0

Which machine has less variability in its performance? **[4 marks]**

1. Differentiate between a parameter and a statistic as used in estimation give an example in each case. **[4 marks]**
2. A value is picked at random from a normal population with mean μ and variance 100 and is found to be 172. Test at 5% level whether the mean of this population could be;
3. Equal to 150 **[3 marks]**
4. Greater than 150 [**3 marks]**

**QUESTION TWO**

1. A batch of 5000 electric lamps has a mean life of 1000 hours and a standard deviation of 75 hours. Assuming a normal distribution
2. How many lamps will fail between before 900 hours? **[3 marks]**
3. How many lamps will fail between 950 hours and 1000 hours? **[4 marks]**
4. What proportion fails before 952 hours? **[3 marks]**
5. Given the same mean life, what would be Standard deviation have to be to ensure that no more than 20% of lamps fail before 916 hours. **[3 marks]**
6. Two salesmen X and Y are working in a certain district. From a sample survey conducted by the director, the following results were obtained. State whether there is any significant difference in the average sales between the two salesmen. Use a 90% level of confidence.

**A B**

No. of sales 20 18

Average sales (in sh.) 170 205

Standard deviation (in sh.) 20 25 **[7 marks]**

**QUESTION THREE**

A manufacturer wants to test the hypothesis that the mean life time of two brands of machines used are equal. The life time is measured by the number of operating hours between the overhauls.

The manufacturer keeps overhaul statistics on all his machines. A random sample of 15 machines gives the following details operating hours between details.

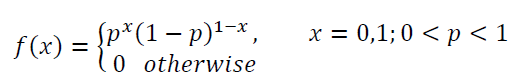
Brand X: 1050, 1150, 850, 800, 1000, 1350, 1100, 1300, 1450, 900, 1200, 1250, 1550, 825, 650

Brand Y: 1170, 970, 880,1410,700, 775, 940, 1650, 950, 1190, 600, 1600, 975, 450, 1290

Using Mann – Whitney test, will you conclude that the life times of two brands are equal? **[20 marks]**

**QUESTION FOUR**

1. Let  be a random sample from a Bernoulli population with parameter 



Find the maximum likelihood estimator of  [**10 marks]**

(b) Let  be a random sample from



Obtain by the maximum likelihood the estimator for μ and σ2. [**10 marks]**

**QUESTION FIVE**

Two catalysts are being analyzed to determine how they affect the mean yield of a chemical process. Specifically, catalyst I is currently in use, but catalyst II is acceptable. Since catalyst II is cheaper, it should be adopted provided it does not affect the process yield. A test is run in the pilot plant and the results are as shown below.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Catalyst I | 91.50 | 94.18 | 92.18 | 95.30 | 91.79 | 89.07 | 94.72 | 89.21 |
| Catalyst II | 89.19 | 90.95 | 90.46 | 93.21 | 91.79 | 97.04 | 91.07 | 92.75 |

1. Is there any significant difference between the yields? (test at α=5%). **[16 marks]**
2. What assumptions do you make? Explain. [**4 marks]**