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**University Examinations 2014/2015**

SECOND YEAR, SPECIAL / SUPPLEMENTARY EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

**SME 2200: ENGINEERING MATHEMATICS III**

**DATE: OCTOBER, 2015 TIME: HOURS**

**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE - (30 MARKS)**

1. State the difference between measures of central tendency and measures of dispersion.

(2 Marks)

1. Define the following terms as used in statistics;
2. Null hypothesis (1 Mark)
3. Type II error (2 Marks)
4. State four methods of studying correlation. (4 Marks)
5. Given the data ;66,30,34,60,20,75,42,70,34,69. Calculate;
6. Mean
7. Median
8. Standard deviation (3 Marks)
9. If the probability of defective belts is 0.1, find the mean and standard deviation for the distribution of defective belts in a total of 500. (3 Marks)
10. A study has shown that 80% of all the families living in a certain residential in Nairobi own a television set. If 6 families are randomly selected from this area, calculate the probability;
11. All have television set (2 Marks)
12. Between 2 and 4 … have television sets (3 Marks)
13. At most 4 own television set (3 Marks)
14. At least 3 own television set (3 Marks)

**QUESTION TWO (15 MARKS)**

1. As a result of tests on 20,000 electric bulbs manufactured by a company, it was found that the lifetime of the bulb was normally distributed with an average life of 2040 hours and standard deviation of 60 hours. On the basis of this information, estimate the number of the bulbs that are expected to burn for more; (i) More than 2150 hours (5 Marks)

(ii) Less than 1960 hours (5 Marks)

1. If 10% of the tools produced in a certain manufacturing process turn out to be defective, find the probability that in a sample of 10 tools chosen at random exactly two will be defective by using the poisson distribution. (5 Marks)

**QUESTION THREE ( 15 MARKS)**

Consider the probability distribution below;

|  |  |  |  |
| --- | --- | --- | --- |
| x | 0 | 1 | 5 |
| p(x) | 1/3 | 1/3 | 1/3 |

1. Find (2 Marks)
2. Find the sampling distribution of the sample mean for a random sample of n=2 measurements from this distribution. (4 Marks)
3. Show that is an unbiased estimator for (2 ½ Marks)
4. Find the sampling distribution of the sample variance S2 for a random sample of n=2 measurements from this distribution. (4 Marks)
5. Show that S2 is an unbiased estimate for r2. (2½ Marks)

**QUESTION FOUR (15 MARKS)**

1. State central limit theorem. (3 Marks)

A manufacturer of automobile batteries claims that the distribution of the lengths of life of its best battery has a mean of 54 months and the standard deviation of 6 months.

Suppose a consumer group decides to check the claim by purchasing a sample of 50 of these batteries and subjecting them to tests that determine their lifes.

1. Assuming that the manufacturer’s claim is true, describe the sampling distribution of the mean lifetime of a sample of 50 batteries. (4 Marks)
2. Assuming that the manufacturer’s claim is true, what is the probability the consumer group’s sample has a mean life of 52 or fewer months? (4 Marks)
3. Use the results of part (b) to calculate and . Confirm that and that

= = (4 Marks)

**QUESTION FIVE (15 MARKS)**

From the distribution given below calculate;

1. Mean (3 Marks)
2. Mode (3 Marks)
3. Median (4 Marks)
4. Standard deviation (5 Marks)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Weight in gms | 110-119 | 120-130 | 130-139 | 140-149 | 150-159 | 160-169 | 170-179 | 180-189 |
| Frequency | 5 | 7 | 12 | 20 | 16 | 10 | 7 | 4 |