BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

PROGRAMMES: BSc HONOURS DEGREE IN ECONOMICS

EC 108: STATISTICS FOR ECONOMISTS 2

DURATION: 3 HOURS

JUN 2024

INSTRUCTIONS:

1. Attempt all questions.
2. Each question carries 25 marks.
3. NO CELLPHONES ALLOWED IN THE EXAMINATION ROOM.

Question 1

a. Define the following terms that are common in statistics;

   i. Sampling distribution

   ii. Type I error

   iii. Type II error

   iv. Margin of error

   v. Significance level **(7 marks)**

b. Explain the differences that one encounters when sampling from a finite and an infinite population giving practical examples of both sampling situations. **(5 marks)**

c. Explain and show graphically where possible the three main properties of point estimators. **(8 marks)**

d. Briefly explain the central limit theory highlighting its importance in inferential statistics. **(5 marks)**

Question 2

a. The average annual fuel cost for motorists in Bindura is ZWL125500 for 2023. Suppose we would like to take a sample of motorists in Chipadze to see whether the mean fuel cost is different from the reported mean of ZWL125500 for the population.

i. State the null and alternative hypotheses you would use to test whether the mean annual fuel cost for Chipadze motorists are different from the population mean. **(5 marks)**

ii. Suppose a sample of 40 Chipadze motorists gives a sample mean annual fuel costs of ZWL118000. Assume a population standard deviation of ZWL30000 and compute the *p*-value. **(5 marks)**

iii. At the 5% level of significance, what is your conclusion? **(3 marks)**

iv. Repeat the preceding hypothesis test using the critical value approach. **(3 marks)**

b. Explain any three other sampling methods besides simple random sampling and explain the rationale behind their use. **(9 marks)**

Question 3

a. Suppose a sample of 100 expecting black mothers gives a mean maternity labour time of 14 hours and a sample standard deviation of 4.5 hours.

i. At 95% confidence, calculate the margin of error **(4 marks)**

ii. Find the 95% confidence interval estimate of the population mean maternity labour time for expecting black mothers **(4 marks)**

iii. Using the given standard error, how large a sample should be selected to provide a 95% confidence interval with a margin of error of 10? **(4 marks)**

b. In an attempt to determine the quality of chicks from a poultry breeder, a simple random sample of 800 chicks indicated that 240 chicks were defective.

i. Provide a 90% confidence interval for the non defective population proportion. **(4 marks)**

ii. Provide a 95% confidence interval for the defective population proportion. **(4 marks)**

iii. Suppose the permitted defective proportion for chicks is 0.35, what sample size should be drawn to provide a 95% confidence interval with a margin of error of 0.05?**(5 marks)**

Question 4

a. BUSE admission department believes that 30% of the students they enroll come from private high schools. A random sample of 100 freshmen will be used to estimate the proportion of private high school graduates.

i. Find the sampling distribution of $\bar{p}$ for this study assuming that the admission department is correct and p=0.3. **(5 marks)**

ii. Calculate the probability that the sample proportion will be between 0.20 and 0.40. **(4 marks)**

iii. Calculate the probability that the sample proportion will be between 0.20 and 0.22. **(4 marks)**

iv. Explain what is meant by sampling distribution of a statistic. **(3 marks)**

b. The mean salary of a teacher in Zimbabwe is USD200 with a standard deviation of USD50. Suppose a simple random sample of size 100 teachers is selected and is used to estimate the population mean.

i. Calculate the standard error of the mean salary of teachers in Zimbabwe. **(2 marks)**

ii. What happens to the stand error of the population mean if the sample size is increased? **(2 marks)**

iii. Find the probability that the sample mean will be within USD5 of the population mean. **(3 marks)**

iv. Find the probability that the sample mean will be within USD10 of the population mean. **(2 marks)**

END OF PAPER