



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

**B.Sc. (General) Degree in Applied Sciences
Third Year - Semester I Examination – November/December 2016**

MAT 3214 – APPLIED STATISTICS

Time: Two (2) hours

Answer **only Four** questions including **first** question.

Calculators and Statistical tables will be provided.

01 Select the most suitable answer and justify.

(100 marks)

- a) You take a random sample from some population and form a 96% confidence interval for the population mean μ , which quantity is guaranteed to be in the interval you form?
- | | |
|-----------|----------------|
| i. 0 | iii. \bar{x} |
| ii. μ | iv. 0.96 |
- b) Suppose you conduct a significance test for the population proportion and your p-value is 0.184. Given a 0.10 level of significance, which of the following should be your conclusion?
- i. accept H_0
 - ii. accept H_1
 - iii. fail to reject H_1
 - iv. fail to reject H_0
- c) Decreasing the sample size, while holding the confidence level the same, will do what to the length of your confidence interval?
- i. make it bigger
 - ii. make it smaller
 - iii. it will stay the same
 - iv. cannot be determined from the given information

- d) Decreasing the confidence level, while holding the sample size the same, will do what to the length of your confidence interval?
- make it bigger
 - make it smaller
 - it will stay the same
 - cannot be determined from the given information
- e) If you increase the sample size and confidence level at the same time, what will happen to the length of your confidence interval?
- make it bigger
 - make it smaller
 - it will stay the same
 - cannot be determined from the given information
- f) Which of the following is a property of the Sampling Distribution of \bar{x} ?
- if you increase your sample size, \bar{x} will always get closer to μ , the population mean.
 - the standard deviation of the sample mean is the same as the standard deviation from the original population σ .
 - the mean of the sampling distribution \bar{x} is μ , the population mean.
 - \bar{x} always has a Normal distribution.
- g) Which of the following is true about p-values?
- a p-value must be between 0 and 1.
 - if a p-value is greater than 0.01 you will never reject H_0 .
 - p-value have a $N(0,1)$ distribution.
 - None of the above are true.
- h) Suppose our p-value is 0.044. What will our conclusion be at alpha levels of .10, .05, and .01?
- We will reject H_0 at $\alpha=.10$, but not at $\alpha=.05$
 - We will reject H_0 at $\alpha=.10$ or .05, but not at $\alpha=.01$
 - We will reject H_0 at $\alpha=.10$, .05, or .01
 - We will not reject H_0 at $\alpha=.10$, .05, or .01
- i) A 95% confidence interval for the mean number of televisions per American household is (1.15, 4.20). For each of the following statements about the above confidence interval, choose true or false.
- The probability that μ is between 1.15 and 4.20 is .95.
 - We are 95% confident that the true mean number of televisions per American household is between 1.15 and 4.20.
 - 95% of all samples should have x-bars between 1.15 and 4.20.

- iv. 95% of all American households have between 1.15 and 4.20 televisions.
 - v. Of 100 intervals calculated the same way (95%), we expect 95 of them to capture the population mean.
- j) Select a sampling procedure in which initial respondents are selected by probability methods, and then additional respondents are obtained from information provided by initial respondents.
- i. Stratified sampling
 - ii. Cluster sampling
 - iii. Quota sampling
 - iv. Snowball sampling
- k) A researcher divides the population of product users into three groups based on degree of use. If the researcher then draws a random sample from each user group independently, she has created a _____ sample.
- i. Stratified
 - ii. Cluster
 - iii. Quota
 - iv. Snowball

02 a)

(40 marks)

- i. Discuss the difference between Census and Sample survey and advantages of sample survey over census survey.
- ii. Explain briefly about Simple random sampling and Quota Sampling method.
- iii. What is your idea about using postal questionnaire method instead of telephone interview method in data collecting?

- b) Engineers must consider the breadths of male heads when designing motorcycle helmets. Men have head breadths that are normally distributed with mean of 6.0 in. and a standard deviation of 1.0 in.

(60 marks)

- i. If one male is randomly selected, find the probability that his head breadth is less than 6.2 in.
- ii. Find the probability that 100 randomly selected men have an average head breadth that is less than 6.2 in.
- iii. A production manager of ABC Helmet Company plans an initial run of 100 helmets. Seeing the results from part (ii), the manager claims that all helmets should be made for men with head breadth less than 6.2 in., because they would fit all but few men. Can the claim be accepted? Discuss.

03

- a) During a day time from 8.00 AM to 12.00 PM, customers arrive at a shop at a constant rate of 11 per hour. A customer has just arrived. Let T be the time until the next customer arrives. **(50 marks)**
- Calculate the probability that it will be more than 10 minutes until the next customer arrives.
 - Suppose that 5 minutes have passed and no customer has arrived. Calculate the probability that it will be more than further 10 minutes until the next customer arrives. (**Hint:** Use memory less Property)
- b) Inquiries arrive at the rate 15 inquiries per minute as a Poisson process. **(50 marks)**
- Define a Poisson Process.
 - What is the probability that 5 inquiries arrive in 20 seconds.
 - Find the probability that in a one minute period, 3 inquiries arrive during first 10 seconds and 2 inquiries arrive during last 15 seconds.

04

- a) Explain two types of errors used in hypothesis testing. **(10 marks)**
- b) The CEO of an airport hypothesizes that variance for the number of passengers for U.S. Airport is different from the variance for the number of passengers for foreign Airports. The data in millions of passenger per year are shown for selected airports. Assume the variable is normally distributed. **(90 marks)**

U.S. Airports		Foreign Airports	
36.8	73.5	60.7	51.2
72.4	61.2	42.7	38.6
60.5	40.1		

- At $\alpha = 0.10$, Is there enough evidence to support the hypothesis.
- According the decision that you have taken from the above part(i) , test whether there is significance difference in two population means at 10% significance level.
- Calculate the 90% CI on the difference of population means.

05

- a) It is claimed that the number of telephone calls to a help line is Poisson distributed. Suppose that the actual number of calls per hour were observed in 200 hours period. Using Chi Squared goodness of fit test, test whether these data consistent with the above claim. **(50 marks)**

Number of Calls	0	1	2	3	4	5	6	7	8
Frequency	14	31	47	41	29	21	10	5	2

- b) Fit the normal distribution to the following data using Kolmogorov-Smirnov goodness of fit test. **(50 marks)**
- 0.58 0.42 0.52 0.33 0.43 0.23 0.58 0.76 0.53 0.64
- ($D_{10,(0.05)} = 0.410$)

END

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