MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

SECOND YEAR FIRST SEMESTER EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN APPLIED STATISTICS, BACHELOR OF SCIENCE IN MATHEMATICAL SCIENCES AND BACHELOR OF SCIENCE (MATHEMATICS & BUSINESS) WITH INFORMATION TECHNOLOGY

MAIN CAMPUS

MIT 201: STATISTICAL COMPUTING I

Date: 2nd December, 2016   Time: 3.30 - 6.30pm

INSTRUCTIONS:

- Answer Question ONE and any other TWO.

Question 1 [Compulsory – 30 marks]

a) Explain what is meant by a discrete uniform distribution. [3 Marks]

b) If a Simple Random Sampling With Replacement is used to select a sample, what is the probability of the:

    i)   Second selection of the sample [2 Marks]

    ii)   Eighth selection of the sample [2 Marks]

c) A sample of 120 was required from a population of 840 and =rand ( ) function in Excel was used to randomly select With Replacement. Explain why Simple Random Sampling with replacement was appropriate. [4 Marks]

d) Without risking the chance of an item being selected more than once, a Simple Random Sampling Without Replacement was used to sample 48 units out of 600. Explain briefly what is the probability of an item being the

    i)   Fourth selection of the sample [2 Marks]

    ii)   Tenth selection of the sample [2 Marks]

e) Write the main characteristics of binomial probability distribution [5 Marks]

f) The probability of getting a spoilt egg in a crate is 0.3, what is the probability of getting at least 3 spoilt eggs in the first 15 crates. [4 Marks]

g) A normal distribution is characterized by a mean μ and a standard deviation σ. Its curve is bell shaped and is symmetric around the mean μ. What happens when:

      i) the mean is increased   **[3 Marks]**

      ii) the standard deviation is increased   **[3 Marks]**

Question 2 [Optional – 20 Marks]

a)   Using appropriate examples differentiate between discrete probability distributions and continuous probability distribution   **[4Marks]**

b) Poisson distribution is a family of distributions that arises in a great number of business situations.

    i) Write any **two** assumptions that must be valid for a Poisson distribution.**[2Marks]**

ii) Give **four** situations where the Poisson distribution may be applicable.**[4Marks]**

c) The number of typographical errors in a textbook is Poisson distributed with a mean of 1.5 per 100 pages.

    i) Suppose 100 pages of the book are randomly selected, what is the probability that there are no typos?   **[4Marks]**

    ii) Suppose 400 pages of the book are randomly selected, what are the probabilities for having five or fewer typos?   **[6Marks]**

Question 3 [Optional – 20 Marks]

    a) Define the following terms as used in database management

    i.   Records   **[2Marks]**

    ii.   Relational database   **[2Marks]**

    iii.   Normalization   **[2Marks]**

    b) State and explain **eight** key steps to consider when designing a relational database

                  [14Marks]

Question 4 [Optional – 20 Marks]

a) What is standard normal distribution? [3 Marks]

b) Suppose the time required to build a computer is normally distributed with a mean of 50 minutes and a standard deviation of 10 minutes. What is the probability for the assembly time of a computer to be between 45 and 60 minutes?

[5 Marks]

c) Suppose the return of an investment in a stock over a given time period is normally distributed with a mean of 10% and a standard deviation of 5%. What is the probability of losing money over the given period? [5 Marks]

d) A factory turns out an article by mass production methods. From past experience it appears that 20 articles on an average are rejected out of every batch of 100.

   i) Find the variance of the number of rejects in a batch. [3 Marks]

   ii) What is the probability that the number of rejects in a batch exceeds 30?

   [4 Marks]

Question 5 [Optional – 20 Marks]

A researcher wanted to sample some 96 students from a population of 600 for research study. Available were the names of students, their score in the last semester's examination and their contact details. The list was ranked from the last semester's examination. The random sampling could be done in Excel using Uniform, Normal and Poisson distribution. Discuss which of the above distribution is appropriate.

[20 Marks]