The Open University of Sri Lanka
B.Sc/B.Ed. DEGREE, CONTINUING EDUCATION PROGRAMME
OPEN BOOK TEST (OBT) 2010/2011
Level 04 Applied mathematics
APU 2140– Statistical Distribution Theory

Duration: - One and Half Hours.

DATE: - 09-09-2010. **Time: - 4.00 p.m. – 5.30 p.m.**

Non programmable calculators are permitted. Statistical tables are provided.

Answer <u>All</u> Questions.

(1)

A company that produces a certain electrical product claims that the life time of the product X (in years) has the density function.

$$f_X(x) = ke^{-kx};\ x > 0, k > o$$

The past data indicate that it is reasonable to take that the median of the lifetime to be five years.

(a) Calculate the value k.

(b) Find the mean lifetime of the product.

(c) What is the probability that a randomly selected product will fail within 7 years?

(d) Find the variance of the lifetime of the product.

(2)

A newly married couple decides to have children until they have three children of the same sex. Assume that Pr(Male birth) = Pr(Female birth) = 0.5. Let X be the number of children in the family at the end.

(a) Write down the possible values for X

(b) Find the probability mass function of X.

(c) Find the probability that there will be less than four children in the family.

(d) What is the expected number of children in the family?

(e) Suppose another married couple decides the same rule given above regarding the number of children they wish. What is the expected number of total children in the two families?

(3)

(a) Explain the distinctive features of Binomial and Poisson distributions.

(b) Some traffic lights have three phases: ***stop 45%*** of the time, ***wait or get ready 10%*** of the time and ***go 45%*** of the time. Assuming that you only cross a traffic light when it is in the ***go*** position and that you have to pass 8 such traffic lights on your way to school, model the number of times that you have to ***wait or stop*** on your way to school.
State any assumptions that must be made and give possible values for the parameters n and p.

Hence find the mean number of times that you have to ***wait or stop*** on your way to school.

(c) The number of admissions to an emergency ward of a hospital on a Saturday morning during the period beginning at 12.00 midnight and ending at 2.00 a.m. is found to have a Poisson distribution with an average of 3.5 admissions. During this period of a particular Saturday morning.

(i) What is the probability that none will be admitted?

(ii) What is the probability that two to six persons (inclusive) will be admitted?