

National University of Computer and Emerging Sciences, Lahore Campus



Course: Probability and Statistics
Program: BS(Computer Science)
Duration: 3 Hours
Paper Date: 19-12-2016
Section: ALL
Exam: Final

Course Code: MT-206
Semester: Fall 2016
Total Marks: 50
Weight: 50%
Page(s): 2
Roll No: 413-4088

Instruction/Notes: Attempt all questions.

Question # 1 The probability that a man will alive in 25 years is $\frac{3}{5}$ and the probability that his wife will be alive in 25 years is $\frac{2}{3}$. Find the probability that (6)

- (a) Both will be alive; $\frac{2}{15}$
- (b) Only the man will be alive; $\frac{11}{15}$
- (c) At least one will be alive. $\frac{14}{15}$

Question # 2 If the continuous random variable X has a probability distribution function; (6)

$$f(x) = \begin{cases} \frac{3}{4}(3-x)(x-5) & 3 \leq x \leq 5 \\ 0 & \text{elsewhere} \end{cases}$$

- (a) Calculate the mean and standard deviation;
- (b) Find the cumulative distribution function $F(x)$.

Question # 3 In testing a certain kind of truck tire over a rugged terrain it is found that 20% of the trucks fail to complete the test run without a blowout. Of the next 20 trucks tested find the probability that exactly 4 trucks have blowouts. (4)

Question # 4 Suppose that a random system of police patrol is devised so that a patrol officer may visit a given beat location $Y = 0, 1, 2, 3, \dots$ times per half-hour period, with each location being visited an average of once per time period. Assume that Y possesses, approximately, a Poisson probability distribution. Calculate the probability that the patrol officer will miss a given location during a half-hour period. What is the probability that it will be visited once? Twice? At least once? (8)

Question # 5 Wires manufactured for use in a computer system are specified to have resistances between 0.12 and 0.14 ohms. The actual measured resistances of the wires produced by company A have a normal probability distribution with mean 0.13 ohm and standard deviation 0.005 ohm.

- (a) What is the probability that a randomly selected wire from company A's production will meet the specifications?

- (b) If four of these wires are used in each computer system and all are selected from company \bar{A} , what is the probability that all four in a randomly selected system will meet the specifications? (6)

Question # 6 If a certain machine makes electrical resistors having a mean resistance of 40 ohms and a standard deviation of 2 ohms. What is the probability that a random sample of 36 of these resistors will have a mean resistance;

- (a) of more than 40.5 ohms;
(b) At least 39 ohms.

(4)

Question # 7 To reach maximum efficiency in performing an assembly operation in a manufacturing plant, new employees require approximately a 1-month training period. A new method of training was suggested, and a test was conducted to compare the new method with the standard procedure. Two groups of nine new employees each were trained for a period of 3 weeks, one group using the new method and the other following the standard training procedure. The length of time (in minutes) required for each employee to assemble the device was recorded at the end of the 3-week period. The resulting measurements are as shown in Table below.

Procedure	Measurements								
Standard	32	37	35	28	41	44	35	31	34
New	35	31	29	25	34	40	27	32	31

- (a) Estimate the true mean difference ($\mu_1 - \mu_2$) with confidence coefficient .95. Assume that the assembly times are approximately normally distributed, that the variances of the assembly times are approximately equal for the two methods, and that the samples are independent.
(b) Test the hypothesis at the 0.01 level of significance that new procedure will increase the efficiency.

(10)

Question # 8 A machine puts out 16 imperfect articles in a sample of 500. After the machine is overhauled, it puts 3 imperfect articles in a batch of 100. Has the machine been improved? Use 5% level of significance. Use p- value for your conclusion and also find 99% confidence interval for the difference between population proportion.

(6)