University of Sargodha

BS 2nd Term Examination 2016

Subject: Computer Sc./I.T **Paper: Probability & Statistics (Math:2110)**

Time Allowed: 2:30 Hours **Maximum Marks: 80**

OBJECTIVE PART (Compulsory)

Q#1 Answer the following short questions. Each question carries **02** marks. (16*2=32)

i. Define sampling.
ii. Differentiate between Variance and Standard Deviation.
iii. Differentiate between Observational Study and Retrospective Study.
iv. Define probability density function.
v. Define covariance of Random Variables.
vi. State Law of Addition for not mutually exclusive events.
vii. Write down the *pdf* of negative binomial distribution.
viii. What are the parameters of gamma distribution?
ix. What is meant by more efficient estimator?
x. Define confidence interval.
xi. Define Statistical Hypothesis.
xii. What is Level of Significance?
xiii. Describe goodness of fit test.
xiv. What is meant by robustness of χ^2 -test to assumption of normality?
xv. Write down Simple Linear Regression Model.
xvi. Define adjusted R^2.

SUBJECTIVE PART (16×3)

Note: Attempt any three questions. All questions carry equal marks.

Q#2 A study of the effects of smoking on sleep patterns is conducted. The measure observed is the time, in minutes, that it takes to fall asleep. These data are obtained:

Smokers:	69.3	56.0	22.1	47.6	53.2	48.1	52.7	34.4	60.2
	43.8	23.2	13.8						
Non-smokers:	28.6	25.1	26.4	34.9	29.8	28.4	38.5	30.2	30.6
	31.8	41.6	21.1	36.0	37.9	13.9			

Find the sample mean and sample standard deviation for each group and comment on what kind of impact smoking appears to have on the time required to fall asleep.

Q#3 a) A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In fact, plans 1, 2, and 3 are used for 30%, 20%, and 50% of the products, respectively. The defect rate is different for the three producers as follows:

$$P(D|P_1)=0.01 \qquad P(D|P_2)=0.03 \qquad P(D|P_3)=0.02$$

where $P(D|P_j)$ is the probability of defective product, given plan j. if a random product was observed and found to be defective, which plan was most likely used and thus responsible?

b) During a laboratory experiment, the average number radioactive particles passing through a counter in 1 millisecond is 4. What is the probability that 6 particles enter the counter in a given millisecond?

Q#4 In a random sample of n = 500 families owning television sets in the city of Hamilton, Canada, it is found that x = 340 subscribe to HBO.

a) Find a 95% confidence interval for the actual proportion of families with television sets in this city that subscribe HBO.
b) How large a sample is required if we want to be 95% confident that our estimate of p in above situation is within 0.02of the true value?

Q#5 a) Test the hypothesis that the average content of containers of a particular lubricant is 10 liters if the contents of a random sample of 10 containers are 10.2, 9.7, 10.1, 10.3, 10.1, 9.8, 9.9, 10.4, 10.3, and 9.8 liters. Use a 0.01 level of significance and assume that the distribution of contents is normal.

b) A study is conducted to compare the lengths of time required by men and women to assemble a certain product. Past experience indicates that the distribution of times for both men and women is approximately normal but the variance of the times for women is less than for men. A random sample of times for 11men and 14 women produced the following data:

Men:	$n_1 = 11$	$s_1 = 6.1$
Women:	$n_2 = 14$	$s_2 = 5.3$

Test the hypothesis that $\sigma_1^2 = \sigma_2^2$ against the alternative that $\sigma_1^2 > \sigma_2^2$. $(\alpha = 0.05)$

Q#6 A study was done to study the effect of ambient temperature 'x' on the electric power consumed by a chemical plant 'y'. Other factors are held constant, and the data were collected from an experimental pilot plant.

y	250	285	320	295	265	298	267	321
x	27	45	72	58	31	60	34	74

Estimate the linear regression line. Also find standard error of estimate.