University of Sargodha

BS 2nd Semester/Term Exam 2021

Subject: IT & CS **Paper: Probability and Statistics (Math-102)**

Time Allowed: 02:30 Hours **Maximum Marks: 60**

Note: Objective part is compulsory. Attempt any three questions from subjective part.

Objective Part (Compulsory)

Q.1. Write short answers of the following in 2-3 lines each on your answer sheet. (2*12)

i. Write any use of Statistics in computer science
ii. Explain the difference between discrete and continuous variables
iii. Define mean?
iv. State multiplication law of probability of two independent events
v. When we use t-test?
vi. Define secondary data
vii. Write two properties of variance
viii. Write two properties of Poisson distribution
ix. Write two properties of hypergeometric distribution
x. Define sampling
xi. Define alternative hypothesis
xii. Define correlation

Subjective Part (3*12)

Q.2. a) Discuss types of statistics and write some applications in computer science.

b) In an experiment to study the relationship of hypertension and smoking habits, the following data are collected for 180 individuals.

	Nonsmokers	Moderate smokers	Heavy Smokers
H	21	36	30
NH	48	26	19

Where H and NH in the table stand for Hypertension and Non hypertension respectively. If one of these individuals is selected at random find the probability that the person is

(i). Experiencing Hypertension, given that the person is a heavy smoker

(ii). A nonsmoker given that the person experiencing no Hypertension

Q.3. a) Write a procedure for testing of independence

b) Two tire-quality experts examine stacks of tires and assign quality ratings to each tire on a 3-point scale. Let X denote the grade given by expert *A* and *Y* denote the grade given by *B*. The following table gives the joint, distribution for A' and *Y*.

$f(x,y)$		y		
x		1	2	3
	1	0.10	0.05	0.02
	2	0.10	0.35	0.05
	3	0.03	0.10	0.20

(i). Find μ_x

(ii).Find μ_y

Q.4. a) As part of a sales strategy, 20% of randomly chosen new internet service subscribers receive a getaway break prize from the subscriber. If all 20 households in a particular housing estate subscribe, what is the probability that

i. none of the households get the break
ii. less than half of the households get the break
iii. at least four of them get the break.

b) In a shipment of 200 Pentium processors, there are 10 defectives. A quality control inspector selects a sample of five processors at random for inspection.

i. Obtain the probability that the sample will contain 0, 1, 2, 3, 4, or 5 defectives
ii. The batch is rejected if it contains one or more defectives. What is this probability?

Q.5. a) In a certain industrial facility, accidents occur infrequently. It is known that the probability of an accident on any given day is 0.005 and accidents are independent of each other.

i. What is the probability that in any given period of 400 days there will be an accident on one day?
ii. What is the probability that there are at most three days with an accident?

b) In a study conducted by the Water Resources Research Center and analyzed by the Laboratory for Interdisciplinary Statistical Consulting at Virginia Tech, two different wastewater treatment plants are compared. Plant A is located where the median household income is below \$22,000 a year, and plant B is located where the median household income is above \$60,000 a year. The amount of waste-water treated at each plant (thousands of gallons/day) was randomly sampled for 10 days. The data are as follows:

Plant A: 21, 19, 20, 23, 22, 28, 32, 19, 13, 18
Plant B: 20, 39, 24, 33, 30, 28, 30, 22, 33, 24

Can we conclude, at the 5% level of significance, that the average amount of wastewater treated at the plant in the high-income neighborhood is more than that treated at the plant in the low-income area? Assume normality.

Q.6. a) Write a procedure for testing the equality of two population proportions

b) The grades of a class of 9 students on a midterm report (x) and on the final examination (y) are as follows:

x: 77, 50, 71, 72, 81, 94, 96, 99, 67
y: 82, 66, 78, 34, 47, 85, 99, 99, 68

i. Estimate the linear regression line.
ii. Estimate the final examination grade of a student who received a grade of 85 on the midterm report.
