University of Sargodha

BS 2nd Term Examination 2022

Subject: IT/CS **Paper: Probability & Statistics (MATH-102/MATH-2110)**

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. Define inferential statistics. **ii.** Define sample space. **iii.** State the additive law of probability of two mutually exclusive events. **iv.** Why we prefer CV over variance? **v.** Write any two advantages of sampling. **vi.** Define Type-I error. **vii.** Write the hypothesis to test the variations among the life of five laptop brands. **viii.** Define discrete random variable. **ix.** Define p-value. **x.** Write any two properties of the least square estimator. **xi.** Write the names of tests to test the equality of two population variances and more than two population proportions. **xii.** Write two properties of mathematical expectation

Subjective Part (3*12)

Q.2. a) Define the following terms;

i) Event ii) Independent Events iii) Conditional Probability

b) According to consumer digest (July/August, 1996). The people location for personal computers (PC) is as follows

Location of PC	Probability
Adult bedroom	0.03
Child bedroom	0.15
Other bedroom	0.14
Office or den	0.40
Other rooms	0.28

i. What is the probability that a PC is in a bedroom?
ii. What is the probability that it is not in a bedroom?
iii. Suppose a household is selected at random from household with a PC. In what room would you expect to find a PC.

Q.3. a) Define Binomial and Hypergeometric distributions. Also discuss their properties.

b) According to chemical engineering progress, approximately 30% of all pipework failures in chemical plants are caused by operator error.

i) What is the probability that out of the next 20 pipework failures at least 10 are due to operator error?

ii) What is the probability that no more than 4 out of 20 such failures are due to operator error?

Q.4. In a study conducted by the Department of Mechanical Engineering and analysed by the Laboratory for Interdisciplinary Statistical Consulting at Virginia Tech, steel rods supplied by two different companies were compared. Ten sample springs were made out of the steel rods supplied by each company, and the "bounciness" was studied. The data are as follows:

Company A: 9.3, 8.8, 6.8, 8.7, 8.5, 6.7, 8.0, 6.5, 9.2, 7.0

Company B: 11.0, 9.8, 9.9, 10.2, 10.1, 9.7, 11.0, 11.1, 10.2, 9.6

Can you conclude that there is virtually no difference in means between the steel rods supplied by the two companies?

Q.5. a) Write a procedure for testing the equality of two population variances.

b) A study was performed on a type of bearing to find the relationship of amount of wear y to x= oil viscosity.

Y	193	172	113	230	91	125
x	1.6	22	33	15.5	43	40

i. Fit the simple linear regression model and interpret the parameter estimates.
ii. Find and interpret the coefficient of determination.

Q.6. a) Write a procedure for testing goodness of fit test.

b) The length of life of an electronic component has an exponential pdf with mean 1,000 hours.

i. Find the probability that a component lasts at least 1,500 hours.
ii. Suppose a component has been in operation for 1,000 hours, what is the probability that it will last for another 500 hours?

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