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Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Spring 2022
Course Code: STA221 (Day), Course Title: Statistics and Probability
Level: 2 Term: 2 Section: All
Teacher Initial: MAR/ MKH

Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. While browsing through the magazine rack at a bookstore, a statistician decides to examine the relationship between the price of a magazine and the percentage of the magazine space that contains advertisements. The data are given in the following table. **[Marks] 13** **CO 4**

Percentage containing ads	37	43	58	49	70	28	65	32
Price ($)	5.5	6.95	4.95	5.75	3.95	8.25	5.5	6.75

i. Construct a scatter diagram for these data. Does the scatter diagram exhibit a linear relationship between the percentage of a magazine's space containing ads and the price of the magazine?
ii. Model the estimated regression equation of price on the percentage containing ads and interpret the values of β_0 and β_1.
iii. Identify the predicted value of the price of a magazine with 50% of its space containing ads and the price of a magazine with 99% of its space containing ads. Comment on this finding

2. *a.* Consider writing onto a computer disk and then sending it through a certifier that counts the number of missing pulses. Suppose this number X has a Poisson distribution with parameter $\lambda=0.2$. (Suggested in "Average Sample Number for Semi-Curtailed Sampling Using the Poisson Distribution," *J. Quality Technology,* 1983: 126–129.) **[Marks] 5** **CO 3**

i. Identify the probability that a disk has exactly one missing pulse?
ii. Identify the probability that a disk has at least two missing pulses?
iii. Identify the average number of missing pulses? And also find out the standard deviation of the missing pulses.

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2. At a certain college, 30% of the students major in engineering, 20% play club sports, and 10% both major in engineering and play club sports. A student is selected at random. [Marks] 10

i. Identify the probability that the student is majoring in engineering?
ii. Identify the probability that the student plays club sports?
iii. Identify the probability that the student plays club sports given that the student is majoring in engineering?
iv. Identify the probability that the student is majoring in engineering given that the student plays club sports?
v. Identify the probability that the student does not play club sports given that the student is majoring in engineering?
vi. Identify the probability that the student is not majoring in engineering given that the student plays club sports?

3. Recently many companies have been experimenting with telecommuting, allowing employees to work at home on their computers. Among other things, telecommuting is supposed to reduce the number of sick days taken. Suppose that at one firm, it is known that over the past few years' employees have taken a mean of 5.4 sick days. This year, the firm introduces telecommuting. Management chooses a simple random sample of 80 employees to follow in detail, and, at the end of the year, these employees average 4.5 sick days with a standard deviation of 2.7 days. Let μ represent the mean number of sick days for all employees of the firm. [Marks] 5 CO 3

Test the hypothesis at 5% level of significance (tabulated value ±1.65)

H0: μ = 5.4 versus H1: μ < 5.4

4. a. Explain the following terms: [Marks] 5 CO 2
Kurtosis, Mean deviation, Laws of probability

b. Explain the correlation coefficient values in terms of strength and direction, [Marks] 2
r = 0, r = -1.2, r = .95, r = -0.8.