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Code No: 821AD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA I Semester Examinations, May - 2022
PROBABILITY AND STATISTICS

Time: 3 Hours **Max.Marks:75**

Answer any five questions
All questions carry equal marks
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1.a) Two persons A and B toss a dice. The person who first throws 4 or 5 wins. A starts the game. Show that the probabilities of A's and B's winning are in the ratio 3:2.
b) Show that for any two events A and B, $P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$.[7+8]

2.a) A, B, C in order toss a coin. The first one to toss head wins the game. What are the probabilities of winning, assuming that the game may continue indefinitely?
b) Suppose three companies X, Y, Z produce T.V.'s. X produces twice as many as Y while Y and Z produce the same number. It is known that 2% of X, 2% of Y and 4% of Z are defective. All the T.V.'s produced are put into one shop and then one T.V. is chosen at random. Suppose a T.V. chosen is defective, what is the probability that this T.V. is produced by company X? [7+8]

3. Show that for normal distribution the quartile deviation, mean deviation and standard deviation are approximately 10:12:15. [15]

4.a) The probability of a man hitting a target is 1/3:
i) if he fires 5 times what is the probability of his hitting the target at least twice.
ii) How many times must he fires so that the probability of his hitting the target at least once is more than 90%?
b) A manufacturer of pins knows that 2% of his product is defective. If he sells pins in boxes of 100 and guarantees that not more than 4 pins will be defective. What is the probability that a box will fail to meet the guaranteed quality. [7+8]

5.a) Construct 95% confidence interval for the true proportion of computer literates if 47 out of 150 persons from rural areas are computer literates.
b) Write the properties of a good estimator. [7+8]

6. A professor's feeling about the mean mark in the final examination in probability of a large group of students expressed subjectively by normal distribution with $\mu_0 = 67.2$ and $\sigma_0 = 1.5$
a) If the mean mark lies in the interval (65, 70) determine the prior probability the professor should assign to the mean mark.
b) Find the posterior mean μ_1 and standard deviation σ_1 if the examinations are conducted on a random sample of 40 students yielding mean 74.9 and S.D 7.4.
c) Determine the posterior probability which he will thus assign to mean mark being in the interval (65, 70) using results obtained in (b).
d) Construct a 95% Bayesian interval for μ. [15]

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7.a) In a random sample of 400 persons from a large population, 120 are females. Can it be said that males and females are in the ratio 5:3 in the population? Use 0.05% LOS.

b) The owner of a machine shop must decide which of two snack vending machines to install in his shop. If each is tested 250 times, the first machine fails to work 13 times and the second machine fails to work 7 times. Test at the 0.05 level of significance whether the difference between the corresponding sample proportions is significant. [7+8]

8. Heights of fathers and sons are given in centimeters.

Heights of fathers(x)	150	152	155	157	160	161	164	166
Heights of sons(y)	154	156	158	159	160	162	161	164

Find the two lines of regression and calculate the expected average heights of the son when the height of the father is 154 cm. [15]

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