R18

Code No: 153BN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 2022

PROBABILITY AND STATISTICS

(Civil Engineering)

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

Answer any five questions

All questions carry equal marks

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1.a) Two digits are selected at random from the digits 1 through 9.
i) If the sum is odd, what is the probability that 2 is one of the digit selected.
ii) If 2 is one of the digits selected, what is the probability that the sum is odd?

b) A given lot of product contains 2% defective products. Each product is tested before delivery. The probability that the product is good given that it is actually good is 0.95 and the probability that the product is defective given that it is actually defective is 0.94. If a tested product is defective, what is the probability that it is actually defective? [7+8]

2.a) A random variable X takes the values -2, -1, 0, 1, 2 such that $P(X=0)=P(X<0)=P(X>0)$. Obtain the probability distribution and the cumulative distribution function of X.

b) Define the r^{th} moment about mean and r^{th} moment about origin. Express one interms of the other. [8+7]

3.a) Derive mean and variance of the Binomial distribution.

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?

c) If on an average 1 vessel in every 10 is wrecked, find the probability that out of 5 vessels expected to arrive at least 4 will arrive safely. [5+5+5]

4.a) If X is a poisson random variable then find the ratio of $P(X=r+1)$ and $P(X=r)$.

b) Show that for a binomial distribution B(n,p), the mean is np and variance is npq (p+q=1). [8+7]

5.a) Show that for the exponential distribution $dP = y_0 e^{-x/\sigma}, 0 \le x \le \infty$, the mean and standard deviation are both equal to σ.

b) A pair of dice is rolled 180 times and their score recorded. Find:
i) $P(x \le 20)$
ii) $P(20 \le x \le 30)$ [7+8]

6.a) Show that area under the normal curve is unity.

b) Find the mean and variance of the gamma distribution. [7+8]

7.a) Fit a regression line of Y on X for the following data and hence predict Y if X = 67.5.

X	65	66	67	67	68	69	71	73
Y	67	68	64	68	72	70	69	70

b) Ten participants in a contest are ranked by two judges as follows

x	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient. [7+8]

8.a) 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.

b) A random sample of boots worn by 40 combat soldiers in a desert region showed an average life of 1.08 years with a standard deviation of 0.05 years. Under standard conditions the boots are known to have an average life of 1.28 years. Is there reason to assert at a level of significance of 0.05 that use in the desert causes the mean life of such boots to decrease? [7+8]

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