Nepal College of Information Technology

Assessment

Level: Bachelor | Semester: Fall | Year: 2023

Programme: BE | Full Marks: 100

Course: Probability and Statistics | Pass Marks: 45

Time: 3 hours

Candidates are required to give their answer in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempts all the questions:

1. a) An investigator wants to study the speed of vehicles at Araniko Highway and he collected the speed of 30 vehicles and the speed were, 7

30	35	37	42	45	47	48	50	55	67
70	75	80	90	95	94	48	55	60	71
63	70	65	80	55	40	35	36	85	79

From the above data construct frequency distribution with suitable number of class interval. Also construct the cumulative frequency curves and locate the median.

a) A factory produces two types of Refrigerators A and B. In an experiment relating to their life, the following results were obtained. 8

Life (Years)	Brand A	Brand B
0 – 2	5	4
2 – 4	11	30
4 – 6	26	12
6 – 8	10	8
8 – 10	8	6

Compare the variability of the life of the two types of refrigerators.

2. a) From a group of 3 Engineers, 4 Accountants and 5 Economist, a subcommittee of four persons are selected randomly. Find the probability that the subcommittee will consists of 7

   i. 3 Engineers and 1 Accountant

   ii. 1 Engineer, 1 Accountant and 2 Economists

   iii. 4 Economists

b) In a class of 75 students, 15 were considered to be very intelligent, 45 as medium and the rest below average. The probability that a very intelligent students fails in a viva – voce examination is 0.005; the medium student failing has a probability of 0.05; and the corresponding probability for a below average student is 0.15. If a student is known to have passed the viva – voce examination, what is the probability that he is below average? 8

3. a) The average number of network error experienced in a day on a local area network (LAN) is distributed with an average 2.4. What is the probability that in any given day; 7

i. Zero network error will occur?

ii. Exactly one network error will occur?

iii. At least one network error will occur?

b) Define standard normal variable. In a normal distribution, 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution? 8

4. a) A random variable X has following probability function. 7

X = x	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2K	0.3	K

Find

i. The value of K.

ii. Mean and variance of X

iii. $E(X+1)^2$

b) Define joint probability density function. If the joint probability density of two random variables is given by 8

$f(x, y) = 6\, e^{-2x-3y}$ for $x > 0, y > 0$.

$= 0$ elsewhere.

Find

i. Marginal density function of x and y.

ii. Are x and y independent?

5. a) A population consists of 4 units A, B, C, and D with values 8, 2, 6, and 4.

i. Construct a sampling distribution of sample mean by selecting samples of size 2 in random sampling without replacement. 7

ii. Find the mean and variance of the sampling distribution of the sample mean

iii. Also examine whether the sample mean is an unbiased estimator of population mean. 8

b) The heights of six randomly selected sailors are in inches: 63, 65, 68, 69, 71, and 72. Those of 10 randomly selected soldiers are 61, 62, 65, 66, 69, 69, 70, 71, 72, and 73. Test the hypothesis that the height of sailors is, on average, taller than soldiers. Use $\alpha = 0.05$.

6. a) 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 the 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 boots to decrease? 7

b) Given the following data of CPU time required (Y) and the number of disk I/O operations (X).

Time in sec. (Y)	24	38	42	50	60	30	20	25	40	39
Number (X)	398	390	410	502	590	305	210	252	398	392

8

i. Compute the coefficient of correlation between X and Y.

ii. Estimate the CPU time requirement for 550 disk I/O operations.

iii. Find coefficient of determination and interpret its result.

7. Write short notes on any **TWO**: $2 \times 5 = 10$

a) Primary data and Secondary data.

b) Random Variable

c) Null hypothesis and alternative hypothesis.

Best Wishes!!!