POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Probability and Statistics (New)

Semester: Fall

Year : 2023
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Cell phones have made our lives easier, they also have negative effect on us. Daily use of cell phones for a long time may lead to phobia of phones may be cause of depression. The randomly selected some teenage boys and girls of certain college daily spends their time in hours in cell phone are given below. 8

Boys (in hrs):	3.0	4.0	2.5	5.0	4.5	1.5	2.0	3.5
Girls (in hrs):	4.5	1.5	5.5	3.0	2.5	4.0	5.0	4.5

   i. In boys and girls which one may lead near to phone phobia and why?
   ii. Which one has more uniform in phone using time?

   b) A Dell company has two plants to manufacture computer chips. Out of 100 chips, plant A produces 80% and plant B produces 20% of the chips. Whereas production from plan A and plant B chips rated 85% and 65% as standard quality, a chip is selected at random from the whole production of the two plants and found to be standard quality; i) what is the probability that it was produced by plant A? ii) What is the probability that the selected chips being non standard quality? 7

2. a) The number of hardware failure of a computer system in a week of operation has the following probability mass function 7

No. of failures:	0	1	2	3	4	5	6
Probability:	0.18	0.28	0.25	0.16	0.04	0.06	0.03

   Find the variance of the number of failures in a week.

   b) The phone lines to an airline reservation system are occupied 40% of the time. Assume that the events the lines are occupied on successive calls are independent. Assume that 10 calls are placed to the airline then what is the probability that; 8

   i. For exactly 3 calls the lines are occupied?
   ii. For at least one call the call lines are not occupied?

3. a) What is standard normal variate? From past experience it is known that time to downioad on certain university webpage is normally distributed with mean of 9 seconds with standard deviation of 2 seconds. What is the probability that the download will be completed i) under 3.5 seconds ii) more than 3 seconds? 8

b) The amount of time that a surveillance camera will run without having to be reset is a random variable having exponential distribution with parameter $\lambda = 1/50$ day. Find the probability that such camera will have to reset in less than 20 days. 7

OR

a) A set of final examination grades in an introductory statistics course was found to be normally distributed with mean of 73 and standard deviation of 8. i) What is the probability of getting a grade no higher than 91 on this exam? ii) Only 5% of the students taking the test scored than what grade? 8

b) Out of 3000 families 4 children each, assume boys and girls are equally probable. How many families would you expect to have i) at most 2 girls ii) at least one boy? 7

4. a) The joint probability distribution of X and Y are: 7

$$f(x,y) = 2 - x - y, \quad 0 < x < 1, \quad 0 < y < 1$$

$= 0$, otherwise

Find marginal probability density function of x and y, are X and Y independent?

b) A population consists of the values 7, 6, 8, 4 and 10. Prove that sample mean of size 3 is unbiased estimate of population mean. 8

5. a) The following are the Brinell hardness values obtained for eight samples of magnesium alloys: 8

Hardness of alloys: 107, 148, 123, 165, 102, 119, 115, 125

Find 95% confidence interval of the mean Brinell hardness of the magnesium alloys.

b) In random sample 1000 houses in a certain city it was found that 318 have internet facilities. In the neighboring city it was found that 450 houses out of 1200 houses have internet facility. Test whether there is significance difference between houses of two cities having internet facilities at 5% level of significance. 7

OR

a) A population consists of the value 7, 6, 8, 4, 10. Show that sample mean of size 3 is unbiased estimator of the population mean. 8

b) A quality control engineer at a light bulb factory needs to estimate the average life of a large shipment of light bulbs. The process standard deviation is known to be 100 hours. A random sample 64 light bulbs indicated a sample mean of 350 hours. Would you claim that the manufacture has the right to state that the light bulbs last an average of 400 hours at 5% level of significance? 7

6. a) The score of 8 candidates priori and after training are given below. 7

Priori:	82	48	36	54	72	84	90	65
After:	92	42	45	81	84	75	86	70

Was training effective at 5% level of significance?

b) The following data presents the marks obtained by students in mathematics and physics. 8

Marks in mathematics:	85	60	73	40	82	90
Marks in physics:	92	72	75	65	50	80

Fit the regression equation of marks of physics on marks of mathematics and predict the marks of mathematics whose marks of physics are 52.

7. Write short notes on: **(Any two)** 2×5

a) Poisson distribution

b) Interval estimation

c) Karl Pearson's correlation coefficient