POKHARA UNIVERSITY

Level: Bachelor | Semester: Spring | Year : 2021
Programme: BE | Full Marks: 100
Course: Probability and Statistics | 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) The following are the marks obtained by two students A and B in 10 tests 100 marks in each: 7

Test	1	2	3	4	5	6	7	8	9	10
Marks by A	44	80	76	77	65	72	68	56	90	80
Marks by B	48	75	54	60	63	69	72	51	57	66

Determine i) who is better student? ii) who is more consistent?

b) A random sample was taken of the thickness of insulation in transformer windings, and the following thickness in mm were recorded: 8

18	21	22	29	25	31	37	38	41	39
44	48	54	56	56	57	47	38	35	36
29	37	32	42	43	40	48	36	37	37

i) Prepare a stem and leaf display

ii) Prepare a box and whisker plot and interpret the shape of the distribution.

2. a) A bag contains 10 balls, 2 of which are red, 3 blue and five black. Three balls are drawn at random from the bag. What is the probability that? 8

i) The three balls are of different colours

ii) Only two balls are of the same colours

iii) The balls are all of same colour?

b) The chances of X, Y, Z becoming manager of a certain company are 4:2:3. The probabilities that bonus scheme will be introduced if X, Y, Z becomes manager are 0.3, 0.5 and 0.8 respectively. If the bonus scheme has been introduced, what is the probability that : 7

i) X is appointed as the manager?

ii) Y is appointed as the manager?

3. a) Let X be continuous random variable with probability density function. 7

$$f(x) = ax, \quad 0 \le x \le 2$$
$$= a \quad 2 \le x \le 4$$
$$= ax + 3a \quad 4 \le x \le 6$$
$$= 0, \text{ otherwise}$$

i) Find the value of 'a'.

ii) Find $P(X \le 1.5)$ and $P(1.5 \le X \le 2.5)$

b) Test for impurities commonly found drinking water from private wells showed that 30% of all wells in a particular have impurity A. if a random sample of 5 wells is selected from the large number of wells in the country, what is the probability that: 8

i. Exactly 3 wells have impurity A?

ii. At least 3 wells have impurity A?

iii. Fewer than 3 wells have impurity A?

4. a) As a result of tests on 20,000 electric bulbs manufactured by a company it was found that the life time of the bulb was normally distributed with an average of 2040 hours and the standard deviation of 60 hours. On the basis of the information: 8

i) Estimate the number of bulbs that are expected to burn for less than 1960 hours.

ii) Estimate the number of bulbs that are expected to burn in between 1860 hours to 2120 hours.

iii) Find the minimum lifetime of 2,000 bulbs which have greater lifetime

b) Suppose X and Y have the following joint probability mass function 7

Y \ X	2	3
1	0.1	0.15
2	0.2	0.3
3	0.1	0.15

Find

i) The marginal distribution of X and Y

ii) The conditional probability of Y given that X=3

iii) F(2,2) and F(3,2)

iv) Variance of X and variance of Y

5. a) A random sample of 100 articles selected from a hatch of 2000 article shows that the average diameter of the article is 0.354 with standard deviation 0.048. Find the 95% confidence interval for the average of batch of 2000 articles. 8

b) A manufacture of gun powder has developed a new powder which is designed to produce a muzzle velocity equal to 3000 ft/sec. seven shells are loaded with the charge and muzzle velocities measured. The resulting velocities are as follows: 3005,2935,2965,2905, 2995 and 3905.Does these data present sufficient evidence to indicate that the average velocity differs from 3,000 ft/sec? 7

6. a) For a random sample of 10 pigs fed on diet A the increase in weight (in lbs) in a certain period was 10, 17, 13, 12, 9, 8, 14, 15, 6, and 16. For another random sample of 12 pigs fed on diet B, the increase in weight in the same period were 14, 18, 8, 21, 23, 10, 17, 12, 22, 15, 7, 13. Test whether diets A and B differ significantly as regards their effect on an increase in weight. 7

b) In the United States, during the fall harvest season Pumpkin are sold in the large quantities at the farm stands. Often instead of weighing the Pumpkin prior to sale, the farm stand operators will just place the Pumpkin in the appropriate circular cut out on the counter. When asked why this was done one farmer replied, `` I can tell the weight of the pumpkin from its circumference``. To determine whether this was really true; a sample of 8 Pumpkin`s circumference and weights were measured: 8

Circumference in cm	50	55	54	52	37	52	53	47
Weight in grams (00)	12	20	15	17	9	14	16	14

i) Develop the estimating linear regression equation to predict the weight of the pumpkin that is 60 cm in circumference.

ii) Calculate the Standard error of the estimate and interpret the result.

iii) What percentage of the total variation in weight of the pumpkin is explained by the circumference of the pumpkin?

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

a) Error in hypothesis testing

b) Gamma and Beta distribution

c) Baye's Theorem