Pumpkin in the appropriate circular cutout 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:

Circumference (cm)	50	55	54	52	37	52	53	47
Weight (gram)00	12	20	15	17	50	10	15	14

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

ii. Calculate correlation coefficient between circumference and weight of the pumpkin and interpret it.

b) It is known that 5% of the screws manufactured by an automatic machine are defective. If a sample of 20 screw is selected at random, find the probability that the sample contains: 5

i. exactly two defective screws

ii. at least two defective screws.

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

a) Characteristics of good estimator

b) Error in hypothesis testing

c) Application of statistics in engineering.

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2016
Programme: BE Full Marks: 100
Course: Probability and Statistics Pass Marks: 45
Time : 3hrs.

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) For a computer controlled lathe whose performance was below par, workers record the following causes and their frequencies: 7

Power fluctuation	6
Controller not stable	22
Operator error	13
Worn tool not replaced	2
Other	5

Construct Pareto chart.

i. What percentage of the cases are due to an unstable controller?

ii. What percentage of the cause is due to either unstable controller or operator error?

b) A random sample was taken of the thickness of insulation in transformer windings, and the following thicknesses (in millimeters) 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 for these data.

ii. Prepare a box plot for these data.

2. a) An oil exploration company currently has two active projects, one in Asia and the other in Europe. Let A be the event that the Asian project is successful and B be the event that the European project is successful. Suppose that A and B are independent events with $P(A) = 0.4$ and $P(B) = 0.7$. 7

i. If the Asian project is not successful, what is the probability that the European project is also not successful? Explain your reasoning.

ii. What is the probability that at least one of the two projects will be successful?

iii. Given that at least one of the two projects is successful, what is the probability that only the Asian project is successful?

b) Three road construction firms, X, Y and Z, bid for a certain contract. From past experience, it is estimated that the probability that X will be awarded the contract is 0.40, while for Y and Z the probabilities are 0.35 and 0.25. If X does receive the contract, the probability that the work will be satisfactorily completed on time is 0.75. For Y and Z these probabilities are 0.80 and 0.70. 8

i. What is the probability that the work will be completed satisfactorily?

ii. It turns out that the work was done satisfactorily. What is the probability that Y was awarded the contract?

3. a) Suppose that X is a random variable, whose probability density function is given by, 7

$f(x) = C(4x-2x^2)$, $0<x<2$

$= 0$, otherwise

i. Determine the value of C.

ii. Determine the cumulative distribution function of X.

iii. Find $P(X>1)$.

b) In an examination 15% of the candidates got first class (60% marks or above), while 40% failed (securing below 40% marks). Assuming the marks to be normally distributed, estimate the mean and standard deviation. 8

4. a) Six dice are thrown 729 times. How many times do you expected at least three dice to shown a five or six? 5

b) The magnitude of earthquakes recorded in *Sindhupalchowk* of Nepal during the year 2072 can be modeled as having an exponential distribution with mean 4.5, as measured on the Richter scale. Suppose that the magnitude of earthquakes striking the region has a gamma distribution with $\alpha = 1.5$ and $\beta = 3$ 5

i. What is the mean magnitude of earthquakes striking the

region?

ii. What is the probability that the magnitude an earthquake striking the region will exceed 5.0 on the Richter scale?

iii. What is the probability that an earthquake striking the regions will fall between 5.0 and 6.0 on the Richter scale?

c) The life time of semiconductor laser has a log-normal distribution with $\mu = 10$ hrs and $\sigma = 1.5$ hrs.

i. What is the probability that the life time exceeds 10,000 hrs?

ii. What life time is exceeded by 99% of laser?

5. a) In a certain factory there are two independent processes manufacturing the same item. The average weight in a sample of 250 items produced from one process is found to be 120grams with standard deviation of 12 grams, while the corresponding figures in a sample of 400 items from the other process are 124 and 14. Test whether two mean weights differ significantly or not at 10% level of significance.

b) From a population of 540, a sample of 60 individuals is taken. From this sample, the mean is found to be 6.2 and standard deviation 1.368.

i. Find the estimated standard error of the mean.

ii. Construct 96% confidence interval for mean.

c) ABC Physical Fitness claims that completion of their weight loss programme will result in a weight loss. to test this claim, 6 persons were selected of random and they were put through the weight loss programme and weights before and after the programme recorded. Test the claim of fitness centre at 0.05 level of significance. The weights in pounds in six persons recorded before and after the programme are as follows.

Persons	1	2	3	4	5	6
Weight (before)	145	200	160	185	164	175
Weight (after)	143	190	165	183	160	176

6. a) 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 places the