# POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2017
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) Following data represents the tensile strength of steel-rod manufactured by company A located at Biratnagar. 8

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 36 | 49 | 84 | 79 | 56 | 28 | 43 | 67 | 36 |
| 43 | 78 | 37 | 40 | 68 | 72 | 70 | 55 | 62 | 82 |
| 88 | 50 | 60 | 56 | 57 | 46 | 39 | 57 | 22 | 65 |
| 59 | 48 | 76 | 74 | 80 | 69 | 51 | 40 | 56 | 45 |
| 35 | 21 | 62 | 52 | 63 | 32 | 86 | 64 | 53 | 34 |

Construct a frequency distribution and represent the data by means of Cumulative frequency curve. Identify the median and first quartile from the curve. Also interpret the result of 1st quartile.

b) From the following distribution of mark of 500 students of a college, find the minimum pass marks, if only 20% of student had failed and also the minimum marks obtained by the top 25% of the students. 7

| marks | 0-20 | 20-40 | 40-50 | 50-60 | 60-80 | 80-100 |
|---|---|---|---|---|---|---|
| No. of students | 50 | 100 | 150 | 90 | 60 | 50 |

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

b) A coin is tossed until a head appears. What is expectation of number of tosses required? 7

3. a) A sample of 600 mobile of a certain Brand is tested to find the length of Battery. After each full charge, produced result of average 12 hours and standard deviation of 4.5 hours. Assuming the data to be Normally distributed, find the number of mobiles that are expected to have life after each full charge: 8

   i. More than 15 hours
   ii. Between10 and 14 hours
   iii. Top 10% performer (on the bases of battery life)

b) The quality control manager at a light bulb factory needs to estimate the mean life of a large shipment of life bulbs. The process standard deviation is known to be 100 hours. A random sample of 64 light bulbs indicated a sample mean life of 350 hours. 7

   i. Obtain the standard error of the mean and interpret its meaning
   ii. Set up 95% confidence interval of the true population mean life of bulbs in this shipment
   iii. Do you think that manufacturer has the right to state the light bulbs last an average of 390 hours?

4. a) The length of time (in minutes) that a certain lady speaks on the telephone is found to be random phenomenon, with a probability function specified by the probability density function f(x) as: 8

$f(x) = Ae^{x/5}$ for $x \geq 0$

$= 0$ otherwise

   i. Find the value of A
   ii. What is the probability that she will talk over the phone is:
      a. More than 10 minutes
      b. Less than 5 minutes
      c. Between 5 and 10 minutes

b) Joint probability distribution of random variables X and Y is given by 7

$f(x,y) = k(6-x-y), \quad 0 < x < 2, 2 < y < 4$

$=0$ otherwise

Find:

i. the constant k
ii. Marginal density function of X and Y
iii. E(X) and V(X)
iv. Are X and Y independent?

5. a) The National Bureau of standard has previously reported the value of Selenium (Se) in NBS orchard leaves to be 0.080. A random sample of size n=6 gives the following determinations: 7

| | | | | | |
|---|---|---|---|---|---|
| 0.072 | 0.073 | 0.080 | 0.078 | 0.088 | 0.080 |

Does the data contradict the previously reported value?

b) In a factory, 2% fans were found defective in a lot of 2000 fans and in another factory, 2.5% fans were found defective in a lot of 3000 fans. Do you find that the fans in the second factory are significantly inferior compared to the fans in the first factory (use a =5%). 8

6. a) Suppose that the service life of a semiconductor is a random variable having exponential distribution with $\lambda = \frac{1}{50}$hours. Find the probability that such a semiconductor will still be operating condition after 100 hours. 5

b) The following are the heights in centimeter and the weights in kilogram of 10 men: 10

| Height | 162 | 168 | 174 | 176 | 180 | 180 | 182 | 184 | 186 | 186 |
|---|---|---|---|---|---|---|---|---|---|---|
| Weight | 65 | 65 | 84 | 63 | 75 | 76 | 82 | 65 | 80 | 81 |

i. Develop the estimating regression equation of weight on height.
ii. Find the coefficient of determination and interpret it. Also find standard error of the estimate.

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

a) Coefficient of determination
b) Probability and non probability sampling
c) Errors in hypothesis testing