II Year B.Tech, Semester-I   **PROBABILITY & STATISTICS**
Code: 8HC16

UNIT-II: Sampling Distributions and Estimation:
Sampling distribution of   the Mean (σ - known and Unknown), Sums and Differences, Central limit theorem. Estimation: Point Estimation and Interval Estimation concerning Means for Large Samples.

ASSIGNMENT QUESTIONS

1. A population consists of five members 2,3,6,8 and 11. Consider all possible samples of size 2 that can be drawn with replacement from this population Find
    a.   The mean of the population
    b.   The standard deviation of the population
    c.   The mean of the sampling distribution of means and
    d.   The standard deviation of the sampling distribution of means.

2. Samples of size 2 are taken from the population 4, 8, 12, 16, 20, 24 without re-placement. Find
    i.   mean of the population
    ii.   standard deviation of population
    iii.   the mean of sampling distribution of means

3. Standard deviation of sampling distribution of means. Calculate the mean and s.d. of the sampling distribution of means of 80 samples each of size 25 by sampling (a) with replacement (b) without replacement from a normal population of 3000 with mean 68 and s.d. 3.

4. Determine the probability that the sample mean area covered by sample of 40 of 1 litre paint boxes will be between 510 to 520 square feet given that a 1 litre of such paint box covers on the average 513.3 square feet with s.d. of 31.5 s.ft.

5. A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative.

6. Given $U_1 = \{2,7,9\}$, $U_2 = \{3,8\}$

    Then find (a) Mean of U_1 (b) Mean of U_2 (c) Mean of $U_1 + U_2$ (d) Variance of U_1 (e)

    Variance U_2

7. The pulse rate of 50 yoga practitioners decreased on the average by 20.2 beats/minute with S.D. of 3.5. If mean of sample 20.2 is used as a point estimate of the true average decrease in pulse rate. What can we assert with 95% confidence about the maximum error E.

8. Construct 99% confidence intervals for the true average decrease in pulse rate. The diameter of motor shafts in a lot has a mena of 0.249 inch and a standard deviation of 0.003 inch. The inner diameter of bearings is another lot have a mean of 0.255 inch and a S.D. of 0.002 inch.
    i.   What are the mean and the S.D. of the clearances between shafts and bearings selected from those lots?
    ii.   If a shaft and a bearing are selected at random, what is the probability that the shaft will not fit inside the bearing? Assume that both dimensions are normally distributed.

9. The mean life time of light bulbs produced by company is 1500 hrs and S.D. of 150 hrs. Find the probability that lighting will take place for
    (i) Atleast 5000 hrs   (ii) Atmost 4200 hrs
    If three bulbs are connected such that when one bulb burns out, another bulb will go on. Assume that life times are normally distributed.

10. A random sample of size 64 is taken from a normal population with $\mu = 51.4$ and $\sigma = 68$. What is the probability that the mean of the sample will (a) exceed 52.9 (b) fall between 50.5 and 52.3 (c) be less than 50.6.

TUTORIAL -I

11. A population consists of four numbers 2,3,4,5. Consider all possible distinct samples of size two with replacement. Find (i) the population mean (ii) the population standard deviation (s.d) (iii) the sampling distribution of means (iv) the mean of the Standard deviation of means (iv) standard deviation of S.D. of means. Verify the results.

12. Samples of size 2 are taken from the population 3, 8, 10, 12, 16, 20 without re-placement. Find
    i. mean of the population
    ii. standard deviation of population

13. The mean of sampling distribution of means Calculate the probability that a random sample of 16 computers will have an average life of less than 775 hours assuming that length of life of computers is approximately normally distributed with mean 800 hours and s.d. 40 hours.

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15. Given $A = \{2,7,9,11\}$, $U_2 = \{3,5,6\}$

    Then find (a) Mean of A   (b) Mean of B (c) Mean of A + B (d) Variance of A (e) Variance B (f) Variance of A+B

TUTORIAL -II

16. The mean and Standard deviation of a Sample are 11795 and 14054 resp. If 50; find the 95% Confidence interval for the Population mean.

17. A random Sample of 300 items is taken from a Population whose Standard deviation is 18.The mean of the Sample is 82 Construct 95% Confidence interval for the mean

18. A random sample of heights of 81 students from a large population of students in a University having a S.D of 0.72 ft. has an average height of 5.5 ft. Find 95%, 99% confidence limits for the average height of all students of University.

19. A random sample of size 100 taken from a population of size 1000, the mean and S.D. of sample characteristic are found to be 4.8 and 1.1 respectively. Find 95% confidence interval for the population mean.

20. A random sample of 50 Mathematics grades out of total of 200 showed a mean of 75 and SD of 10. Find 95% confidence level for estimates of the mean of 200 grades ?