Tutorial No. 5

Class: SE SEM IV **Subject: EM IV**

1. A manufacturer of paper pins knows that 5% of his product is defective. If he sells paper pins in boxes of 100 and guarantees that not more than 10 pins will be defective, what is the approximate probability that a box will fail to meet the guaranteed quality?
2. If the probability that an individual suffers a bad reaction from a certain injection is 0.001. Determine the probability that out of 2000 individuals i) exactly 3 ii) more than 2 will suffer a bad reaction.
3. If X is a Poisson variates with $P\{X=1\}=P\{X=2\}$, find $E\left(X^2\right)$.
4. Fit a Poisson distribution to the following data.

x :	0	1	2	3	4	5	6	7	8
f :	56	156	132	92	37	22	4	0	1

5. If 2% bulbs are known to be defective bulbs, find the probability that in a lot of 300 bulbs, there will be 2 or 3 defective bulbs using i) Binomial distribution ii) Poisson distribution.
6. Let X is normally distributed with mean 12 and s.d. 4. Find i) $P\{X\le 20\}$ ii) $P\{3\le X\le 12\}$
7. A manufacturer wishes to give a safe guarantee for his product against manufacturing defects. He proposes to replace a product if it fails to work any time within the period of guarantee. He considered that a guarantee is safe he is required to replace not more than 6% of his product. If the life time of his product is normally distributed with mean life 2 years and s.d. 4 months, then what should be the maximum period of guarantee in terms of whole month, so that the guarantee is safe for him ?
8. In a distribution exactly normal, 7% of the item are under 35 and 89% are under 63. What are mean and s.d. of the distribution.
9. If the heights of 500 students is normally distributed with mean 68 inches and standard deviation 4 inches, estimate the number of students having heights i) greater than 72 inches ii) between 65 and 71 inches.
10. The marks of 1000 students of an Engineering college are distributed normally with mean 70 and standard deviation 5 . Estimate the number of students whose marks will be i) between 60 and 75 ii) more than 75 iii) less than 68 .
11. If $X_1, X_2, ..., X_n$ are Poisson variates with the parameter $\lambda = 2$, use the central limit theorem to estimate $P(120 < S_n < 160)$ where $S_n = X_1 + X_2 + ... + X_n$ and $n = 75$.
12. A fertliser mixing machine is set to give 12 kg of nitrate for every quintal bags of fertilizer. Ten 100 kg bags are examined. The percentages of nitrate are as follows: 11, 14, 13, 12, 13, 12, 13, 14, 11, 12 . Is there reason to believe that the machine is defective?
12. The growth (in mm) in 15 days of the tumour induced in a mouse is expected to be 4.0 mm. in order to test this contention a sample of nine mice with induced tumour was observed for 15 days. The mean growth in the sample was obtained to be 4.3 and standard deviation to be 1.2 mm. Test at 1% significance level whether the contention is correct.
13. A machinist is making engine parts with axle diameters of 0.7 inch. A random sample of 10 parts shows a mean diameter 0.742 inch with a standard deviation of 0.04 inch. Test whether the work is meeting the specification.
14. Samples of two types of electric light bulbs were tested for length of life and following data were obtained. Type I: $n_1 = 8$, $\bar{x}_1 = 1234$ hrs, $s_2 = 36$ hrs
and Type II: $n_2 = 7$, $\bar{x}_2 = 1036$ hrs, $s_2 = 40$ hrs
Is the difference in the means sufficient to conclude that type I is superior to type II.

15. A certain injection administered to 12 patients resulted in the following changes of blood pressure: 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4
Can it be concluded that the injection will be in general accompanied by an increase in blood pressure?

16. The means of two random samples of sizes 9 and 7 are 196.42 and 198.82 respectively. The sum of the squares of the deviation from the means are 26.94 and 18.73 respectively. Can the samples be considered to have been drawn from the same population?

17. The following table gives the number of air craft accidents that occurred during the various days of a week. Test whether the accidents are uniformly distributed over the week.

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
No. of accidents	15	19	13	12	16	15	10

18. Justify if there is any relationship between sex and color for the following data.

	Male	Female
Red	10	20
White	32	8
Green	4	26

19. Two batches of 12 animals each are taken for test of inoculation. One batch was inoculated and the other was not inoculated. The number of dead and surviving animals are given in the following table for both cases. Can the inoculation be regarded as effective against the disease?

	Dead	Suviving
Inoculated	2	10
Not Inoculated	8	4

20. A die was thrown 132 times and the following frequencies ere noted

Outcome on the die	1	2	3	4	5	6
Frequency	15	20	25	15	29	28

Test the hypothesis that the die is unbiased.