## ISLAMIAH COLLEGE(AUTONOMOUS)



## LAB MANUAL

## ALLIED MATHEMATICAL STATISTICS PRACTICAL - II

## U8MSAP41

For the Candidates admitted from the academic year 2018-2019

## By

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# U8MSAP41ALLIED MATHEMATICAL STATISTICS PRACTICAL - II 

2 Hours / Week

## List of Exercises

1. Large sample tests with regard to population mean, proportion, standard deviation
2. Exact test with respect to Mean, Variance and Coefficient of correlation
3. Test for independence of Attributes Based on $\chi^{2}$-Distribution
4. Confidence interval based on Normal, $t, \chi^{2}-$ and $F$ distributions
5. ANOVA : One way and Two way classifications, RBD, LSD
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Ex. No. 1 Large sample tests with regard to population mean, proportion, standard deviation

## Date:

1. A die is thrown 9000 times and a throw of 3 or 4 is observed 3, 240 times. Show that the die cannot be regarded as an unbiased one and find the limits between which the probability of a throw of 3 or 4 lies. [ $\left.Z_{0.05}=1.96\right]$

Aim:

Procedure:

Result:
2. A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Show that the standard error of proportion of bad ones for the sample of this size is 0.015 and deduce that the percentage of bad pineapple is the consignment almost certainly lies between 8.5 and 17.5.

Aim:

Procedure:

Result:
3. A sample of 900 members has mean 3.4 cms . and S.D 2.61 cms. Is the sample from a large population of mean 3.25 cms . [ $\left.Z_{0.05}=1.96\right]$

Aim:

Procedure:

Result:
4. In a sample of 600 parts manufactured by a factory, the number of defective parts was found to be 45 . The company however claimed that only $5 \%$ of their product is defective. Is the claim tenable?

Aim:

Procedure:

Result:
5. In a random sample of 800 adults from the population of a certain large city, 600 are found to have dark hair. In a random sample of 1000 adults from the habitants of another large city, 700 are dark haired. Show that the difference of the proportion of dark haired people is nearly 2.4 times of the standard error of the difference for sample of above sizes.

Aim:

Procedure:

Result:
6. The means of two single large samples of 1000 and 2000 members are 67.5 inches and 68 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches.

Aim:

## Procedure:

7. The average hourly wage of a sample of 150 workers in a plant 'A' was Rs. 2.56 with a S.D of Rs 1.08 . The average hourly wage of a sample of 200 workers in a plant 'B' was Rs. 2.87 with a S.D of Rs. 1.28. Can an applicant safely assume that the hourly wages paid by plant ' $B$ ' are higher than those paid by plant 'A'?.

Aim:

Procedure:
8. A random sample of 10 boys has the following IQ's: $70,120,110,101,88,83,95,98,107,100$. Do the data support this assumption of a population mean IQ of $100 ?\left[\mathrm{t}_{0.05}=2.262\right.$ at 9 d.f]

Aim:

Procedure:

Result:
9. In a sample of size 10 , the sample mean was observed as 0.742 and the sample S.D as 0.04 . Can we accept that the hypothesis $\mathrm{H}_{0}: \mu=0.7$ on the basis of this sample?

Aim:

Procedure:

Result:
10. Below are given the gained weights(in kg ) of pigs fed on two diets ' $A$ ' and ' $B$ '
Diet 'A': 25, 32, 30, 34, 24, 14, 32, 24, 30, 31, 35, 25.
Diet 'B': 44, 34, 32, 10, 47, 31, 40, 30, 32, 35, 18, 21, 35, 29, 22.

Test if the two diets differ significantly as regards to their effect on increase in weights. [ $\mathrm{t}_{0.05}$ for $\mathrm{n}_{1}+\mathrm{n}_{2}-2=12+15-2=25$ d.f is 2.06].

Aim:

Procedure:

Result:
11. Samples of two types of electric light bulb were tested for length of life and the following data were obtained.

|  | Type - I | Type - II |
| :--- | :--- | :--- |
| Sample No | $\mathrm{n}_{1}=8$ | $\mathrm{n}_{2}=7$ |
| Sample means | $\mathrm{x}_{1}=1234 \mathrm{hrs}$ | $\mathrm{x}_{2}=1036 \mathrm{hrs}$ |
|  | $\mathrm{s}_{1}=36 \mathrm{hrs}$ | $\mathrm{s}_{2}=40 \mathrm{hrs}$ |
| Sample SDs |  |  |

Is the difference in the means sufficient to warrant that type I is superior to type II regarding length of the life?.[ $\mathrm{t}_{0.05}=1.77$ with $\left.\mathrm{n}_{1}+\mathrm{n}_{2}-2=8+7-2=13 \mathrm{~d} . \mathrm{f}\right]$.

Aim:

Procedure:

Result:
12. Random sample drawn from two countries gave the following data relating to the heights of a adult males:

|  | Country A | Country B |
| :--- | :--- | :--- |
| Mean height (in <br> inches ) | 67.42 | 67.25 |
| Standard deviation | 2.58 | 2.5 |
| Number in samples | 1000 | 1200 |

Is the difference between the means significant.?

Aim:

Procedure:

## Result:

13. A coefficient of correlation of 0.2 is derived from a random sample of 625 pairs of observations.

Is this value r significant?

Aim:

Procedure:

## Result:

14. A random sample of 27 pairs of observation from a normal population gave a correlation coefficient of 0.6 . Is the significance of correlation in the population? [ $\mathrm{t}_{0.05}$ for $(\mathrm{n}-2)=25$ d.f is 2.06].

Aim:

Procedure:

Result:
15. The following figures shows the distribution of digits in numbers chosen at random from the telephone directory:

| Digits | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | total |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Frequen <br> cy | 102 <br> 6 | 110 <br> 7 | 99 <br> 7 | 96 <br> 6 | 107 <br> 5 | 93 <br> 3 | 110 <br> 7 | 97 <br> 2 | 96 <br> 4 | 85 <br> 3 | 1000 <br> 0 |

Test whether the digits may be taken to occur equally frequently in directory. [ $\Psi^{2}{ }_{0.05}$ for $10-1=9$ d.f is 16.919].

Aim:

Procedure:

## Result:

16. A sample analysis of examination results of 200 MBA's was made. It was found that 46 students had failed, 68 secured a third division, 62 secured a second division and rest were placed in the first division. Are these figures must commensurate with the general examination result which is in the ration of 4:3:2:1 for various categories respectively? [ $\Psi^{2}{ }_{0.05}$ for 4-1 $=3$ d.f is 7.815 ].

Aim:

Procedure:

## Result:

17. Out of 8,000 graduates in town of 800 are females, out of 1600 graduates employees 120 are females. Use $\Psi^{2}$ to determine if any distinction made in appointment on the basis of sex. Value of $\Psi^{2}$ at $5 \%$ level for one degreeof freedom is 3.84 .

Aim:

Procedure:

Result:
18. Two random samples were drawn from the two normal populations and their values are:
A: 66, 67, 75, 76, 82, 84, 88, 90, 92
B: 64, 66, 74, 78, 82, 85, 87, 92, 93, 95, 97
Test whether the two populations have the same variance at $5 \%$ level of significance at $5 \%$ level for $\mathrm{v}_{1}=10$ and $\mathrm{v}_{2}=8 .\left[\mathrm{F}_{0.05}=\right.$ 3.36]

Aim:

Procedure:

Result:
19. Two random samples are drawn from the two normal population. From the following data test whether the two samples have the same variance at $5 \%$ level:
Sample 1: 60, 65, 71, 74, 76, 82, 85, 87
Sample 2: 61, 66, 67, 85,78, 63, 85, 86, 88, 91
Test whether the two populations have the same variance at $5 \%$ level of significance for $\mathrm{v}_{1}=9$ and $\mathrm{v}_{2}=7$. [ $\left.\mathrm{F}_{0.05}=3.68\right]$

Aim:

Procedure:

Result:
20. To assess the significance of possible variation in performance in a certain test between the convent schools of a city, a common test was given to a number of students taken at random from the senior fifth class of each of the four schools concerned. The results are given below. Make an analysis of variance of data.

| School A | School B | School C | School D |
| :---: | :---: | :---: | :---: |
| 8 | 12 | 18 | 13 |
| 10 | 11 | 12 | 9 |
| 12 | 9 | 16 | 12 |
| 8 | 14 | 6 | 16 |
| 7 | 4 | 8 | 15 |

$\left[f_{0.05}=3.2389\right.$ at $\mathrm{v}_{1}=3$ and $\left.\mathrm{v}_{2}=16\right]$

Aim:

Procedure:

Result:
21. The three samples below have been obtained from normal populations with equal variances. Test the hypothesis that the sample means are equal:

| 8 | 7 | 12 |
| :---: | :---: | :---: |
| 10 | 5 | 9 |
| 7 | 10 | 13 |
| 14 | 9 | 12 |
| 11 | 9 | 14 |

The table value of F at $5 \%$ level is 3.88 at $\mathrm{v}_{1}=2$ and $\mathrm{v}_{2}=12$.

Aim:

Procedure:

Result:
22. A tea company appoints four sales men A, B, C and D and observes their sales in three seasons summer, winter and monsoon. The figures (in lakhs) are given in the following table:

| Seasons | Salesman |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D |
| Summer | 36 | 36 | 21 | 35 |
| Winter | 28 | 29 | 31 | 32 |
| Monsoon | 26 | 28 | 29 | 29 |

i. Do the salesmen significantly differ in performance?
ii. Is there significant difference between the seasons? [i. $f_{0.05}\left(\mathrm{v}_{1}=2, \mathrm{v}_{2}=12\right)=4.76$, ii. $\mathrm{f}_{0.05}\left(\mathrm{v}_{1}=2, \mathrm{v}_{2}=6\right)=$ 5.14].

Aim:

Procedure:

Result:
23. Perform a two-way ANOVA on the data given below

| Plots | Treatment |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D |
| Land I | 38 | 40 | 41 | 39 |
| Land II | 45 | 42 | 49 | 36 |
| Land III | 40 | 38 | 42 | 42 |

[For $(3,6)$ d.f $\mathrm{F}_{(0.05)}=4.76$ and for $(2,6)$ d.f $\left.\mathrm{F}_{(0.05)}=5.14\right]$

Aim:

Procedure:

Result:
24. Analyse the following results of an experimental design.

| Column | 1 | 2 | 3 | 4 |
| :---: | :---: | :---: | :---: | :---: |
| Row |  |  |  |  |
| 1 | $\mathrm{~A}(12)$ | $\mathrm{D}(20)$ | $\mathrm{C}(16)$ | $\mathrm{B}(10)$ |
| 2 | $\mathrm{D}(18)$ | $\mathrm{A}(14)$ | $\mathrm{B}(11)$ | $\mathrm{C}(14)$ |
| 3 | $\mathrm{~B}(12)$ | $\mathrm{C}(15)$ | $\mathrm{D}(19)$ | $\mathrm{A}(13)$ |
| 4 | $\mathrm{C}(16)$ | $\mathrm{B}(11)$ | $\mathrm{A}(15)$ | $\mathrm{D}(20)$ |

The letters A, B, C, D denotes the treatments and the figures in brackets denote the observations.
$\left[f_{0.05}\left(\mathrm{v}_{1}=3, \mathrm{v}_{2}=7\right)=27.91 ; \mathrm{f}_{0.05}\left(\mathrm{v}_{1}=3, \mathrm{v}_{2}=7\right)=27.91 ; \mathrm{f}_{0.05}\left(\mathrm{v}_{1}\right.\right.$
$\left.=3, \mathrm{v}_{2}=7\right)=27.91$ ]

Aim:

Procedure:

Result:
25. Three verities $\mathrm{A}, \mathrm{B}, \mathrm{C}$ of a crop are tested in a randomized block design with four replicants. The plot yields in pounds are as follows.

| $\mathrm{A}(6)$ | $\mathrm{C}(5)$ | $\mathrm{A}(8)$ | $\mathrm{B}(9)$ |
| :---: | :---: | :---: | :---: |
| $\mathrm{C}(8)$ | $\mathrm{A}(4)$ | $\mathrm{B}(6)$ | $\mathrm{C}(9)$ |
| $\mathrm{B}(7)$ | $\mathrm{B}(6)$ | $\mathrm{C}(10)$ | $\mathrm{A}(6)$ |

Analyse the experimental yield and state your conclusion. [ $\mathrm{f}_{0.05}=$ 5.14 at $\mathrm{v}_{1}=2$ and $\mathrm{v}_{2}=6$ and $\mathrm{sf}_{0.05}=4.76$ at $\mathrm{v}_{1}=3$ and $\mathrm{v}_{2}=6$ ]

Aim:

Procedure:

Result:

