

B.Sc. (P) Life-Science / Applied Life- Science
Part-III
Paper No- 310(VIII)
Mathematics Methods in life-science

Time: 3hs

Max Marks: 50

Each question is of equal marks:

Scientific Calculator is allowed.

- 1 As a part of an investigation into the effects of different dietary fats on iron utilisation, a controlled experiment was conducted in which 11 rats were fed with safflower oil and 12 rats were fed with beef tallow. The mean and the variance of liver iron content was measured and recorded in the table below:

| Liver iron content (ug/g) | | |
|---------------------------|--------|----------|
| Dietary Fats | mean | Variance |
| Beef tallow | 105.47 | 261.7 |
| Safflower oil | 78.41 | 473.1 |

The researcher wished to test whether rats fed beef tallow have significantly different liver iron content from rats fed safflower oil. Do you agree? ($t_{crit} = 2.080$)

OR

An investigation into the effect of caffeine on reaction time involved measuring the reaction times of 60 people presented with a light stimulus, both before and after ingesting 80mg of caffeine. The difference, d , in reaction time before and after ingestion of caffeine was calculated for each person; the mean difference, $\bar{d} = 18.2$ ms, and the standard deviation of the differences, $s = 25.6$ ms. May we conclude that caffeine affected reaction time? ($z_{crit} = 1.96$)

- 2 As part of a survey of general health of people in UK the following figures were obtained the frequency of persistent cough amongst 240 smokers and non-smokers. The data obtained is shown below:

| | Amount of smoking | | | |
|---------------------|-------------------|--------------------------------|--------------------------------------|-------------|
| | Non-Smokers | 1-14 cigarettes smoked per day | 15 or more cigarettes smoked per day | Ex- smokers |
| Persistent cough | 16 | 6 | 14 | 5 |
| No Persistent Cough | 144 | 24 | 16 | 15 |

Is smoking related the presence of a persistent cough? ($\chi^2_{crit} = 7.81$)

OR

Obtain the multiple regression equation of the following data of 7 surgery patients:

| Postoperative length of stay in days (Y) | Number of current medical Problems (X ₁) | Preoperative length of stay in days (X ₂) |
|--|--|---|
| 6 | 1 | 1 |
| 6 | 2 | 1 |
| 11 | 2 | 2 |
| 9 | 1 | 3 |
| 16 | 3 | 3 |
| 16 | 1 | 5 |
| 4 | 1 | 1 |

- 3 The trained observers recorded the activity of 10 caged rats which had been handled regularly during the first 25 days of infancy and 8 rats which had not been handled regularly:

| | Activity Score |
|----------------|---|
| Handled rats | 215 220 249 254 260 265 290 300 306 320 |
| Unhandled rats | 140 170 192 205 215 240 245 305 |

Do you think that the handled rats would be more active than unhandled rats? ($U_{crit} = 17$)

OR

Cardiac output (litres/minute) was measured by thermodilution in a simple random sample of 15 postcardiac surgical patients in the left lateral position. The results were as follows:

4.91 4.10 6.74 7.27 7.42 7.50 6.56 4.64

5.98 3.14 3.23 5.80 6.17 5.39 5.77

We wish to know if we can conclude on the basis of these data that the population mean is different from 5.05. ($T_{crit} = 25$).

- 4 Complete the following ANOVA table and state which design was used.

| Source | SS | d.f. | MS | V.R. | P |
|------------|-------|------|----|------|---|
| Treatments | | 3 | | | |
| Blocks | 183.5 | 3 | | | |
| Error | 26.0 | | | | |
| Total | 709.0 | 15 | | | |

OR

Complete the following ANOVA table .

| Source | SS | d.f. | MS | V.R. |
|------------|----------|------|----------|-------|
| Treatments | 231.5054 | 2 | 115.7527 | 2.824 |
| Blocks | 98.5 | 7 | 14.0714 | |
| Error | 573.75 | 14 | 40.9821 | |

- What design was employed?
- How many treatments were compared?
- How many observations were analyzed?
- At the 0.05 level of significance, can we conclude that the treatments have different effects? Why? ($F_{crit} = 7.91$)