Ph.D. IN LIFE SCIENCES (PHDLS)
Term-End Examination
December, 2018

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RLS-103 : BIOSTATISTICS AND COMPUTER APPLICATIONS IN BIOLOGICAL RESEARCH

Time : 3 hours *Maximum Marks : 100*

*Note : Attempt any **five** questions. All questions carry equal marks. Simple calculator is allowed. Statistical tables will be provided on demand. Symbols have their usual meanings.*

1. (a) Oral surgery unit of a dental college performed the following number of operations each month :

   15, 18, 25, 40, 25, 18, 25, 21, 30, 33, 25, 20, 10, 28, 36, 15, 26, 35, 20, 21, 32, 40, 32, 16, 12, 14, 22, 26, 37, 16.

   (i) Construct a continuous frequency distribution of the above data by taking suitable class width.

   (ii) Draw the histogram of constructed continuous frequency distribution in part (i). *5+5*

(b) A pharmacologist measured the amount of dopamine (no. of moles/gm) in the brains of each of 10 rats. The observed data is given below :

6·8, 7·0, 5·3, 6·0, 5·9, 5·6, 6·8, 7·4, 6·2, 7·0

Calculate :

(i) The mean and standard deviation.

(ii) Coefficient of variation.   6+4

2. (a) Define correlation and explain different types of correlation.   5

(b) A gynecologist recorded the Blood Pressure (BP) of her patients and collected the following data :

Age (in years)	BP (in mmHg)
23	65
24	60
25	62
26	70
28	70
29	73
31	75
35	83
40	90

Find the regression line by taking BP as dependent variable. Also estimate the BP if the age of the patient is 38 years.   12+3

3. A researcher wishes to see whether a person's cholesterol level will change if the diet is changed. She takes a sample of 15 persons and divides them into 3 diet groups randomly. The data of cholesterol levels (in mg/deciliter) for the three groups are collected after 6 months, which are given below:

Cholesterol Levels		
Diet 1	Diet 2	Diet 3
190	210	170
170	200	200
210	230	210
180	210	200
200	190	205

Test whether the average effect of different diets on the cholesterol level differs significantly at 5% level of significance.   *20*

[Given that $F_{(2, 12)} \, 0 \cdot 05 = 3 \cdot 885$]

4. **(a)** The incidence of occupational disease in an industry is such that the workers have a 20% chance of suffering from it. What is the probability that out of six workers

   (i) Four or more will contact disease ?

   (ii) Three will contact disease ?   *10*

(b) Suppose the probability of an individual being left-handed is 0·10. What is the probability that three independently selected individuals are left-handed ? 5

(c) In a certain population of women, 5% have breast cancer, 15% are smokers and 3% are smokers as well as have breast cancer. A woman is selected at random from the population. What is the probability that she has breast cancer or she is a smoker ? 5

5. (a) A total of 200 patients suffering from toothache were divided into two groups of 120 and 80. The first group received drug A and the second group received drug B. The efficacy was measured by reduction in pain after the drug intake. Drug A showed effect in 80 cases and drug B in 40 cases. Is there good evidence that drug A is more effective than drug B at $\alpha = 0·05$?
[Given $Z_{tab} = 1·645$] 10

(b) A shopkeeper claims that the average life of aquarium fish is 1600 hours. To check this claim, a researcher takes a sample of 100 aquarium fish randomly and finds mean life time of 1570 hours with a SD of 120 hours. Is the claim acceptable at 5% level of significance ?
[Given that $Z = \pm 1·96$] 10

6. **(a)** What do you mean by simple random sampling ? Describe different types of simple random sampling. Also describe the lottery method of drawing a simple random sample with an example. **2+4+4**

(b) What is purposive sampling ? Write its merits and demerits. **5+5**

7. **(a)** To test the efficiency of a new drug a controlled experiment was conducted wherein 300 patients were administered the new drug and 200 other patients were not given the drug. The patients were monitored and the results in terms of conditions of patients were obtained as follows :

	Cured	Condition Worsened	No Effect	Total
Drug	200	40	60	300
No Drug	120	30	50	200
Total	320	70	110	500

Use Chi-square test to determine that the conditions of patients is independent of the drug at 5% level of significance. **12**

[Given $\chi^2_{(2)}$ $0.05 = 5.99$]

(b) The pulse rate of 6 people was recorded before and after taking a new drug, which are given below :

Pulse Rate						
Before Drug	68	71	84	93	67	74
After Drug	71	70	82	97	73	80

On the basis of the above information, can you conclude that there is a significant effect of the new drug to increase the pulse rate at $\alpha = 1\%$?   8

[Given that $|t_{(5)} 0.01| = 4.032$]