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RLS–103

Ph. D. IN LIFE SCIENCES (PHDLS)

Term-End Examination

December, 2024

RLS–103 : BIOSTATISTICS AND COMPUTER APPLICATIONS IN BIOLOGICAL RESEARCH

Time : 3 Hours *Maximum Marks : 100*

Note : *(i) Attempt any **five** questions. All questions carry equal marks.*

(ii) Simple calculator is allowed.

(iii) Statistical tables will be provided on demand.

(iv) Symbols have their usual meanings.

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1. (a) Value of three haematological parameters : RBCs count, Hb% and PCV % of a species of fish was studied for 3 months. Data obtained are given ahead :

Month	January	February	March
RBCs (Lac/mm^3)	2.5	2.0	2.5
Hb% (mg/100 ml)	8.5	8.0	10.0
PCV %	14.0	14.5	15.0

Draw a multiple bar diagram for the data. 6

(b) A Ph. D. scholar in Life Science collected the following data about different patients from a hospital :

(i) Gender of the patient

(ii) Age of patient

(iii) Blood group of the patient

(iv) Illness (cancer, malaria, TB, etc.)

(v) Whether he/she has medical policy

(vi) Name of the city of the patient.

Determine whether the obtained data come under nominal, ordinal, interval or ratio scale. 6

(c) Calculate mean and median for the distribution of the weights of 160 sheep from the following data : 8

Weight (in kg)	No. of Sheep
10—20	25
20—30	32
30—40	41
40—50	26
50—60	22
60—70	14

2. (a) Define correlation and describe various types of correlation with examples. 5

(b) The body weight (in gram) and intake of oxygen (VO_2cc/kg/h) of species of 8 fish (taken randomly from a pond) were measured and the following results were obtained :

Body Weight (in gms)	Oxygen Consumption (cc/kg/h)
28	66
29	84
30	84
32	99
32	100
27	70
31	90
30	90

(i) Draw scatter diagram.

(ii) Find the correlation coefficient between them and write your conclusion. 5+10

3. In a practical for a Botany class, seventeen sunflower seeds were randomly grouped and planted in pots whose soil had been subjected to either of three fertilizers. The seeds were germinated and height of each plant (in cm) after two weeks of germination was measured which is shown in the table given below :

Height of Plants (in cm) Under		
Treatment 1	**Treatment 2**	**Treatment 3**
23	26	25
27	28	26
32	28	22
34	35	21
25	30	25
	32	26

Are there significant differences in average heights among the three groups and different treatments at 5% level of significance ? 20

(Given that : $F_{(2,114),0.05} = 3.74$)

4. (a) The number of grams of carbohydrates contained in 1-ounce servings of randomly selected chocolate and non-chocolate candy is listed below :

Carbohydrates (gms)

Chocolate	29	25	17	36	41	25
Non-Chocolate	41	41	37	29	30	38
Chocolate	32	29	38	34	24	27
Non-Chocolate	39	29	28			

Is there sufficient evidence to conclude that the variance in carbohydrate content in chocolate candy is greater than non-chocolate candy at $\alpha = 0.05$? 12

(Given that : $F_{(11,8),0.05} = 3.31$)

(b) Describe any *one* method of collection of primary data. 8

5. (a) A researcher wishes to determine whether the salaries of professional nurses employed by private hospitals are higher than those of nurses employed by government-owned hospitals. She selects a

sample of nurses from each type of hospital and calculates the mean and standard deviation of their salaries, which are given below :

	Mean	**S.D.**	**Size**
Private	26,800	600	10
Government	25,400	450	8

If the variances of populations are unknown and equal, can she conclude that the private hospitals pay more than the government hospital at 1% level of significance ? 10

(Given that : $t_{(16),0.01} = 2.58$)

(b) In a sample of 200 teenagers 50 believe that war is inevitable, and in a sample of 300 people of age above 60, 93 believe that war is inevitable. Is the proportion of teenagers different from the proportion of people of age above 60 at $\alpha = 0.01$? 10

(Give that : $Z_{0.01/2} = \pm 2.58$)

6. The following contingency table presents the analysis of 300 persons according to hair colour and eye colour :

Hair Colour	**Eye Colour**		
	Blue	Gray	Brown
Fair	30	10	40
Brown	40	20	40
Black	50	30	40

To test the hypothesis that there is an association between hair colour and eye colour :

(i) State the null and alternative hypotheses.

(ii) Determine the expected cell frequencies.

(iii) Is there an association between hair colour and eye colour at 5% level of significance ? (Given that : $\chi^2_{(4),0.05} = 9.49$) 3+7+10

7. (a) Describe the method of collecting a systematic sample with example. 12

(b) Differentiate between stratified random sampling and simple random sampling. 8

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