

(4)

- (d) Chi-square test of independence after uploading the data present in a .csv file
- (e) Paired T-test, Independent-Samples T-test where y1 and y2 are numeric, Independent-Samples T-test with equal variances not assumed
- (f) Three different functions to merge and Joint Data in R

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Ex/SC/BT/PG/134T/2025

M. Sc. BIOTECHNOLOGY EXAMINATION, 2025

(1st Year, 1st Semester)

BIOTECHNOLOGY

PAPER : SC/BT/PG/134T

(Biostatistics and Computational Biology)

Time : 2 Hours

Full Marks : 40

GROUP—A

(CO2) : Answer *any three* questions : 10×3=30

1. A sample of 400 cells has a mean length of 67.47 μ m. Can it be reasonably regarded as a sample from a large population with mean height of 67.39 μ m and standard deviation of 1.30 μ m?

- (a) Test at a 5% level of significance ($Z_{0.05} = 1.96$).
- (b) Explain which would be the appropriate hypothesis test for this dataset.
- (c) Considering the hypothesis test results, decide which Type I or Type II errors are possible and describe this error.
- (d) Define five number summaries of any dataset.

4+1+2+3

(2)

2. (a) A group of seven-week-old chickens reared on a high protein diet weigh 12, 15, 11, 16, 14, 14 and 16 ounces; a second group of five chickens, similarly treated except that they received a low protein diet, weigh 8, 10, 14, 10 and 13 ounces. Test at 5 percent level whether there is significant evidence that additional protein has increased the weight of the chickens. Use assumed mean (or A1) = 10 for the sample of 7 and assumed mean (or A2) = 8 for the sample of 5 chickens in your calculation. ($t_{0.05} = 2.306$)
- (b) Explain which would be the appropriate hypothesis test for this dataset. 4+1+2+3
- (c) Considering the hypothesis test results, decide which Type I or Type II errors are possible, and describe this error.
- (d) Define dot plot and stem-and-leaf display for quantitative data with diagrams.
3. (a) The table given below shows the data obtained during the outbreak of small pox :

	Attacked	Not attacked
Vaccinated	31	469
Not vaccinated	185	1315

Test the effectiveness of vaccination in preventing the attack from small pox at 5 percent level of significance (χ^2 for 1 degree of freedom at 5 percent level of significance is 3.841).

- (b) Explain why this dataset is appropriate for χ^2 hypothesis test for this dataset.

(3)

- (c) Considering the hypothesis test results, decide which Type I or Type II errors are possible and describe this error. 6+2+2
4. The following is the per-acre production data for three wheat varieties grown on four plots. State whether the variety differences are significant.

Plot of land	Per acre production data			
	Variety of wheat			
	A	B	C	
1	6	5	5	
2	7	5	4	
3	3	3	3	
4	8	7	4	

Set up a table of analysis of variance and calculate F. State whether the difference between the yields of three varieties is significant, taking 4.26 as the table value of F at 5% ($F(2,9) = 4.26$) 10

GROUP—B (CO1 and CO3)

5. Write the correct syntax for the following (any five): 2×5=10
- (a) Construction of Correlation Matrix of many variables of R (including the name of the package)
- (b) To create Scatter and Bar Plot in R (including the name of the package)
- (c) One-way ANOVA and two-way ANOVA