

GUJARAT TECHNOLOGICAL UNIVERSITY

B. Pharm. - SEMESTER-II • EXAMINATION – SUMMER-2016

Subject Code: 220001

Date: 02/06/2016

Subject Name: Applied Mathematics (Biostatistics)

Time: 10:30 am – 01:30 pm

Total Marks: 80

Instructions:

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Enumerate and explain different sampling methods with examples. **06**

(b) A population consists of 5 units with values, 1, 2, 3, 5, and 7. Draw all possible samples of size 2 without replacement and find sample mean of each sample. **05**

(c) Calculate the correlation coefficient for the following data showing heights (in inches) of mothers (X) and heights of their daughters (Y) **05**

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

Q.2 (a) What do you mean by correlation? Classified correlation with examples. **06**

(b) Nine students secured the following % of marks in Mathematics and Bio-Statistics. **05**

Roll No.	1	2	3	4	5	6	7	8	9
Marks in Math's	78	38	99	24	74	82	90	61	66
Marks in Bio-stats	84	53	92	59	67	62	86	57	54

Find the rank correlation coefficient and comment on its result.

(c) The following are the results of five assays of different but known potency. **05**

Drug potency (X)	65	80	90	100	125
Assay (Y)	66	79	91	102	124

Find the equation of the line of regression of Y on X and estimate Y when X = 95.

Q.3 (a) Define the term biostatistics? What is its importance in Pharmacy? **06**

(b) What is Analysis of variance? Write procedure for analysis of variance for one way classification. **05**

(c) Samples of peanut butter produced by three different manufacturers were tested for their ototoxic content (p.p.h) and following results were recorded. **05**

Brand A:	0.4	4.3	0.5	1.1	2.7	5.4
Brand B:	1.7	0.8	2.6	3.5	5.0	1.3
Brand C:	1.5	1.2	3.2	0.5	4.7	2.2

Carry out the analysis of variance to test the hypothesis that there are no significant differences among the three brands.[Table F_{2,15} = 3.68 at 5% level of Significance]

Q.4 (a) Define and explain the following terms related to testing of hypothesis: **06**

Null Hypothesis, Alternative Hypothesis and, Level of Significance.

- (b)** A control experiment was conducted to test the effectiveness of a new drug. Under this experiment 300 patients were treated with new drug and 200 were not treated with the drug. The results of the experiment are given below : **05**

Details	Cured	Condition worsened	No effect
Treated with the drug	200	40	60
Not treated with the drug	120	30	50

Use χ^2 test and comment on the effectiveness of the drug. [From Table $\chi^2_{2, 0.05} = 5.991$].

- (c)** A random sample of size 25 from a population gives the sample standard deviation to be 8.5. Test the hypothesis H_0 that the population standard deviation is 10. [From Critical value of Chi square Table $\chi^2_{24, 0.05} = 36.415$] **05**

Q.5 (a) Discuss about F-Test with its application in bio-stats. **06**

- (b)** Two samples are drawn from two normal populations. From the following data test whether the two samples have the same variance at 5% level : [From Table $F_{\text{tab}} = 3.68$] **05**

Sample 1:	60	65	71	74	76	82	85	87	---	---
Sample 2:	61	66	67	85	78	63	85	86	88	91

- (c)** Explain briefly Latin Squares Design (LSD). **05**

Q. 6 (a) Write a note on t-test for testing the significance of 1) a single mean and 2) between two mean. **06**

- (b)** A group of seven week old chickens reared on a high protein diet weighed 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 weighed 8, 10, 14, 10, and 13 ounces. Test whether there is sufficient evidence that additional protein has increased the weight of the chickens. [At 5% level of significance, the table value of t for 10 d.f is 2.23] **05**

- (c)** A group of 10 students is given a task to perform while sober. Each student is then given three beers over a one-hour period and asked to repeat the task. The task performance time (in minutes) for 10 students was recorded as under. **05**

Subject	1	2	3	4	5	6	7	8	9	10
When Sober	5.0	3.5	6.5	8.5	4.5	5.0	2.5	3.0	4.5	3.5
After Drinkin g	8.5	4.0	6.0	8.0	6.0	5.0	4.0	5.5	4.0	6.0

Using Wilcoxon signed rank test examine if there is evidence that alcohol dulls mental ability. [from table value for sample size 9 at 5% level is 5]

Q.7 (a) What are non-parametric tests? Point out its advantages and limitation. **06**

- (b)** Two types of chemical solutions A and B were tested for their pH (degree of acidity of the solution). Analysis of 7 samples of A showed a mean pH of 7.35 with a standard deviation of 0.025. Analysis of 6 samples of B showed a mean pH 7.32 with a standard **05**

deviation of 0.033. Using a 0.05 significance level, determine whether the two types of solutions have different pH values.[From t table $t_{11, 0.05} = 2.20$].

(c) The following table shows in ages (X) and blood pressure (Y) of 8 persons. **05**

X	52	63	45	66	72	65	47	25
Y	82	83	81	85	79	100	90	83

Obtain the regression equation of Y on X and find the expected B.P of a person who is 50 years old.
