

**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<sub>2,15</sub> = 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  $\chi^2$  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  $F_{tab} = 3.68$  ] **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.

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