

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY

B. Pharmacy Sem-II Examination June 2010

**Subject code: 220001**

**Subject Name: Applied Mathematics (Biostatistics)**

**Date: 22/ 06 /2010**

**Time: 02/30 pm – 05.30 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** Enlist various sampling techniques. What are the advantages of sampling? Discuss in detail about stratified sampling. **08**
- B** A random sample of 20 tablets from a batch gives a mean ingredient content 42 mg. and standard deviation of 6 mg. Test the hypothesis that the population mean is 44 mg. **04**
- C** Two samples of size 8 and 7 give the sum of squares of deviations from their respective means equal to 34 and 24 respectively. Test the hypothesis that the populations have the same variance given that  $F_{0.05}=4.3$  for (7,6) d.f. **04**

- Q:2**
- A** Explain the following concepts **06**  
 [1] Confidence interval [2]Level of significance [3] Scatter diagram
- B** Two types of chemical solutions A and B were tested for their pH. Analysis of 6 samples of A showed a mean pH of 7.52 with a standard deviation of 0.024 Analysis of 5 samples of B showed a mean pH of 7.49 with a standard deviation of 0.032 using a significance level. Determine whether the two types of solutions have different pH values. **05**
- C** Five tablets of paracetamol and omeprazole were analysed for drug content. The following results were obtained. Compare the two drugs using student's t-test. [  $t_{8,0.005}=2.306$  ] **05**

No	Paracetamol	Omeprazole
1	99.47	100.86
2	99.88	110.53
3	101.42	99.57
4	100.99	99.59
5	100.54	100.66

- Q:3**
- A** Define correlation. Which are the types of correlation? Explain the methods of studying correlation. **04**
- B** Explain the term regression and state the difference between regression and correlation. **04**
- C** Compute correlation coefficient for the following data and interpret it **05**
- |   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| X | 4  | 5  | 9  | 14 | 18 | 22 | 24 |
| Y | 16 | 22 | 11 | 16 | 7  | 3  | 17 |
- D** Find the lines of regression of Y on X if  $n=9$ .  $\sum x = 30.3$ ,  $\sum y = 91.1$ ,  $\sum xy = 345.09$  and  $\sum x^2 = 115.11$ . Also find the values of variable Y when  $X=1.5$  and  $X=5.0$  **03**

- Q:4**
- A** Explain the following terms related to testing of hypothesis: **08**  
 [1] Type I and II error [2] Null hypothesis [3] standard error [4] Critical region

- B** Explain ANOVA and state some application of analysis of variance. **03**  
**C** Suppose that 15 tablets are available for the comparison of three assay methods. Five tablets for each assay. Five replicate tablets are analyzed in each of the three assay method groups, one assay per tablet as shown in table **05**

Method A	Method B	Method C
102	99	103
101	100	100
101	99	99
100	101	104
102	98	102
Mean=101.2	99.4	101.6
s.d= 0.84	1.14	2.07

By applying one way ANOVA test whether the mean assay is the same for the three different groups. [ At 5% level of significance for (2,12) d.f =3.88]

- Q:5** **A** Enumerate various types of non-parametric test. Discuss about merits and limitations of non-parametric methods. **05**  
**B** In order to compare the effectiveness of two sunburn lotions, a random sample of seven subjects is selected. Lotion A is applied to the left side of their faces and Lotion B to the right side. After the subjects have sat in the sun watching a three-hour tennis match, the degree of sunburn is measured on a scale. **06**

Subject	1	2	3	4	5	6	7
Lotion A	48	62	42	69	74	35	84
Lotion B	46	49	48	63	43	32	53

Applying wilcoxon signed rank test, determine whether the data support the claim that the two lotions are equally effective. [ table value for n=7 at 5% level of significance is 2]

- C** The following table shows the result of an experiment to investigate the effect of vaccination induced on the animals against a particular disease. Use the chi-square test to test the hypothesis that there is no difference between the vaccinated and unvaccinated groups. [ Value of  $\chi^2$  for 1 d.f at 5 % level = 3.84] **05**

	Got disease	Did not get disease
Vaccinated	9	42
Not vaccinated	17	28

- Q:6** **A** Describe cross over designs. What are the merits and demerits of cross over design. Give comparison with parallel design. **06**  
**B** Discuss carryover or residual effect in a bioequivalence study. **03**  
**C** Explain the technique of analysis of variance for a two-way classification data. **03**  
**D** A standard curve passing through the origin was prepared for colorimetric estimation of sulphadiazine. The concentration and absorbance are given below. Find the equation of line. **04**

Concentration	5	10	15	20	30	40
Absorbance	0.120	0.231	0.362	0.458	0.698	0.888

- Q:7 A** Differentiate between **06**  
 [a] Sample and Population  
 [b] Mann-Whitney U test and Kruskal-Wallis H- test.  
 [c] one tail and two tail test
- B** Join the particular test with the name of scientist: **02**

Test	Derived by scientist
T test	Karl Pearson
ANOVA	Sir Francis Galton
Chi-square test	W.S.Gossett
Regression	R.A.Fisher
	None

- C** A soap manufacturing company was distributing a particular brand of soap through a large number of retail soaps. Before a heavy advertisement campaign the mean sales per week per soap was 140 dozens. After the campaign, a sample of 26 soaps was taken and the mean sales were found to be 147 dozens with standard deviation 16. Can you consider the advertisement campaign effective? [ the tabulated value of t = 1.708.] **04**
- D** Two granulations were prepared by different procedure. Seven random samples of powdered mix of equal weight were collected from each batch and assayed for active material. Test is to be performed at 5% level.[ tabulated F value with 6 d.f= 5.8] **04**

Granulation A	Granulation B
20.6	20.2
20.9	21.5
20.6	18.9
20.7	19
19.8	21.8
20.4	20.4
Mean=20.57	Mean=21
S <sup>2</sup> = 0.156	S <sup>2</sup> = 1.297

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