Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

B.Ph SEM-II Examination- Dec.-2011

Subject code: 220001 **Date: 13/12/2011**

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) Define sampling. What are the advantages of sampling method? Discuss about sample variability and bias. **06**

(b) Define the terminology population and sample. Discuss about cluster sampling method. **05**

(c) The erythrocyte sedimentation rate (mm/hr) of 10 male and 15 female TB patients before start of the treatment is given. Examine the significance of the difference in the means. [table t value at 23 d.f = 0.4] [M: Male, F: Female] **05**

M	65	60	115	82	43	103	125	118	83	75
F	63	85	90	100	90	105	98	93	100	125
	90	95	128	65	84					

Q.2 (a) What is meant by correlation? Discuss about the types of correlation. Predict and suggest the type of correlation occur in following data sets: **06**

Data set I		Data set II	
X	Y	X	Y
55	21	60	45
62	27	55	50
67	30	51	52
72	35	45	57
77	42	40	62

(b) How the correlation be established between two variable? What are the demerits of scatter diagramme? What do you understand by degree of correlation? **05**

(c) The following data were recorded on the number of diabetic cases and the number of persons per hospitals in a metropoliton city. Calculate the regression coefficient and find out its significance. Table t value=2.31 for 8 d.f .at 5% level of significance. **05**

No. of cases	22	24	25	11	12	9	13	14	15	16
No. of persons	40	42	45	66	55	60	70	75	62	70

Q.3 (a) Find the regression of x on y from the following data: **06**
$\sum x = 24$, $\sum y = 44$, $\sum xy = 306$, $\sum x^2 = 164$, $\sum y^2 = 574$, $N = 4$.
Find the value of x, when y = 6.

(b) Attack rates among the vaccinated and unvaccinated against measles are presented here. Prove the protective value of vaccination by Chi-square test. [table χ^2 value = 6.64 at 1% level] **05**

Group	Attacked	Non-attacked
Vaccinated (o)	10	90
Vaccinated (E)	18	82
Unvaccinated (o)	26	74
Unvaccinated (E)	18	82

(c) Discuss about application of chi-square and restriction of chi-square test. **05**

Q.4 (a) A Physician wants to compare antidiabetic drug of two manufacturing unit. What are the possible sources of bias in the clinical trial? Suggest him the methods to eliminate the bias. **06**

(b) Differentiate between cross over and parallel design. What do you mean by carry over effect in a bioequivalence study? **05**

(c) Define wash out, period and sequence in a bioequivalence study. Enlist various designs used in clinical trials. Discuss about general principles to conduct clinical trials. **05**

Q.5 (a) What is the significance of ANOVA application in pharmacy? Give in brief the summary for procedure for one way ANOVA. **06**

(b) How two way ANOVA is differing from one way ANOVA? **05**

(c) Systolic blood pressure values of four occupations are given. Determine if there is significant difference in mean blood pressure of four groups in order to assess the role of occupation in causation of BP. [table $F_{3,36} = 2.86$ at 5% level of significance.] [A: Officers, B: Clerks, C : Lab. tech., D: Attendant] **05**

A	125	130	135	120	115	120	130	135	140	135
B	120	122	115	110	125	122	120	120	126	120
C	120	115	115	130	120	125	122	115	126	118
D	118	120	118	120	120	115	125	125	120	115

Q.6 (a) What you understand by following terminologies in context to hypothetical testing? Explain it: **06**

(a) Null hypothesis
(b) Alternate hypothesis
(c) Type-I error and Type-II error

(b) The weight of 10 tuberculosis patients on admission and at the end of 12 months of treatment with PAS plus isoniazide daily, are given. The data was sampled from a clinical trial. Examine whether the gain in weight is statistically significant.[t table value =2.26 at 5% level of significance] **05**

Patient no	1	2	3	4	5	6	7	8	9	10
On admission	49	41	37	41	42	37	39	38	41	35
At 12 months	52	43	46	52	46	38	42	41	42	38

(c) The heights of ten children selected at random from a given locality had a mean 63.2 cms and variance 6.25 cms. Test at 5% level of significance the hypothesis that the children of the given locality are on the average less than 65 cms in all. **05**
[table t value for 9 d.f = 1.83]

Q.7 (a) Discuss about the circumstances in which nonparametric tests are applicable. Give advantages and disadvantages of non parametric test. **06**

(b) Dissolution is compared for three experimental batches with the following results (each point is the time in minutes to 50% dissolution for a single tablet). **05**

Batch 1	15	18	19	21	23	26
Batch 2	17	18	24	20		
Batch 3	13	10	16	11	9	

Is there a significant difference among batches? Use the Krushal-Wallis test. [table value $\chi^2_{0.05}$ at two d.f =4.605]

(c) Use wilcoxon signed rank test on the data of duration of endurance of pain by eleven mice before and after administration of drug (adrenaline 0.04 mg/20gm body weight) given. Is there sufficient evidence in the data to say that the drug increases the duration of endurance of pain? [table value for pair at 0.05 is 11] **05**
[B: Before drug, A: After drug]

B	15.5	12.7	14.8	16.7	20.1	22.0	20.2	18.1	17.6	17.4	19.1
A	21.2	20.1	17.2	22.7	20.0	19.8	19.8	18.8	17.9	24.3	18.6

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