Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BPHARM – SEMESTER II • EXAMINATION – WINTER • 2016

Subject code: 220001 **Date: 30-12-2016**

Subject Name: Applied Mathematics (Biostatistics)

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)** Explain the different sampling methods used in biostatistics. **06**

(b) Explain the following terms **05**

1) Sample 2) Sampling distribution 3) Sampling with replacement 4) Sampling without replacement.

(c) A population is divided in to three strata having stratum sizes N_1, N_2, N_3. From each stratum a simple random sample is drawn. The observations on certain characteristics X on the units in the samples are shown below: Estimate total of the population and mean of the population. **05**

Stratum	Stratum size N_i	Sample size n_i	Values of X
1	30	4	7,6,3,8
2	40	3	12,15,16
3	60	6	3,4,8,2,16,13

Q.2 **(a)** Define following terms related to testing of hypothesis (any three) **06**

1) Null hypothesis 2) Level of significance 3) Degrees of freedom 4) Type I error 5) Type II error.

(b) Two types of drug were used on 5 and 7 patients for reducing their weight. Drug A is imported and drug B indigenous. The decrease in weight after using the drugs for six months was recorded as given below. Is there significant difference in efficacy of two drugs? If not which drug should be used? ($t_{10,0.05} = 2.225$) **05**

Imported A	11	13	12	14	10		
Indigenous B	12	9	8	15	14	9	10

(c) The results of bioavailability study in animals comparing a new formulation 'A' to a market formulation 'B' with regard to Area under curve are shown below: **05**

Animal	1	2	3	4	5	6
A	136	168	160	94	200	174
B	106	184	193	105	193	197

For a two sided test at 5%level, at t value of 2.57 is needed for significance testing with d.f. of 5. Carry out paired t test and conclude whether the difference is significant or not.

Q.3 **(a)** The following table represents the acceptance yield of six lots of 100 samples received from two different suppliers. State whether the product variance caused by the supplier is 'significant' or 'not significant' (the tabulated value of $F_{5,5,0.05} = 5.05$) **06**

Supplier A_1	98	94	97	98	97	100
Supplier A_2	89	99	94	99	92	96

(b) A random sample of 27 pairs of observation from a bivariate normal population gave a correlation coefficient of 0.23.Is it likely that the variables in the population are uncorrelated($t_{25,0.05}$=2.06) **05**

(c) In an experiment to study the dependence of hypertension on smoking habit, the following data were obtained on 180 individuals. **05**

	Non smokers	Moderate smokers	Heavy smokers
Hypertension	21	36	30
No hypertension	48	26	19

Test the hypothesis that the presence or absence of hypertension is independent of smoking habit. (From Critical value of Chi square Table $\chi^2_{2,\,0.05} = 5.991$)

Q.4 **(a)** What is correlation? Discuss the types of correlation. Explain coefficient of correlation. **06**

(b) Explain scatter diagram and spearman's rank correlation method. **05**

(c) Explain: 1) Regression 2) Lines of regression. State the properties of regression coefficient. **05**

Q.5 **(a)** Define ANOVA. What are the assumptions of ANOVA? How One way ANOVA differs from two way ANOVA? **06**

(b) Write a note on procedure for analysis of variance for one way classification **05**

(c) Samples of paracetamol tablets produced by three different manufacturers were tested for their paracetamol content (mg) 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. 6 **(a)** What are non-parametric tests? What are the merits and demerits Of non-parametric tests. **06**

(b) Write a note on Kruskal- wallis test. **05**

(c) In order to compare the effectiveness of two sunburn protecting lotions, a random sample of seven subjects selected. **05**
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 2 hour cricket match, the degree of sunburn is measured on a scale.

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. (The table value for n=7 at 5% level of significance is 2)

Q.7 **(a)** Define: 1) Experimental design 2) Wash out period 3) carry over effect. **06**

(b) Which are the different types of Experimental designs used in clinical trials and explain any one in detail? **05**

(c) Differentiate parallel and cross over design. What are the merits and demerits of cross-over design? **05**

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