Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-VIII Examination May 2012

Subject code: 180403

Subject Name: Biostatistics

Date:14/05/2012 **Time: 10.30 am – 01.00 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Assume table value as 1.96 for 5% level of significance.**
5. **Standard Statistical charts are allowed to be used.**

Q.1 The following is a Latin square design of five treatments of different wheat varieties being experimented on for yield study: **14**

A13	B9	C21	D7	E6
D9	E8	A15	B7	C16
B11	C17	D8	E10	A17
E8	A15	B7	C10	D7
C11	D9	E8	A11	B15

Analyze the data and interpret the results.

Q.2 **(a)** Give the applications of Biostatistics in modern research. **07**

(b) In a health Survey of employees of university, it is found that the mean hemoglobin level of 55 men is 10.2 per 100 ml with a standard deviation of 2.1 . Can we consider this group as taken from a population with a mean of 11.0 g/100ml? **07**

OR

(b) In an ontological examination of childrens, out of 146 children examined 21 were found to have some type of ontological abnormalities. Does it conform to the statement that 20% of the children have ontological abnormalities? **07**

Q.3 **(a)** Growth of bacteria (N) in **a** culture after **t** hrs. is given by the following table : **07**

t :	0	1	2	3	4	5	6
N :	32	47	65	92	132	192	275

Fit a curve of the form $N=ab^t$ and estimate N when t=7 .

(b) Define: Range, Unit, Population, Sample, Biostatistics, Kurtosis and Quartile Deviation **07**

OR

Q.3 **(a)** Using method of least squares, fit a relation of the form $y=ab^x$ to the following data: **07**

X:	2	3	4	5	6
Y:	144	172.8	207.4	248.8	298.5

(b) Table shows the numbers of colonies of a known microorganisms grown on ten agar plates. Calculate the arithmetic mean by using short cut method. **07**

Plate No	1	2	3	4	5	6	7	8	9	10
No of colonies.0	75	95	60	80	95	110	115	130	140	160

Q.4 (a) In a sample survey of public opinion, two questions were asked: **07**

1: Do you drink?

2: Are you in favor of local option on sale of liquor.

The answers are given in the following table:

	Yes	No	Row Total
Yes	56	31	87
No	18	6	24
Column Total	74	37	111

Is local opinion on the sale of liquor is dependent on the individual habit of drinking?

(b) Give the relation between Mean, Median and mode. Enlist the merits and demerits of Mode and Median. **07**

OR

Q.4 (a) In a clinical treatment, the patients were tested to see the effect of a potential hypertensive drug. The 50 patients were assigned to receive drug and other 50 as placebo at random. Their response to treatment was categorized as favorable or unfavorable. The data is given in the table below: **07**

Treatment	Response		Total
	Un favorable	Favorable	
Placebo	41	9	50
Drug	16	34	50
	57	34	100

Test the hypothesis that drug has significant effect. Assume table value as 1.96.

(b) A population of guinea pigs is known to have 159 heart beats per minute. When 13 guinea pigs were each fed on a fixed quantity of a drug and data taken on their beats, the mean X =147 with S=27.5. Find if there is a change in heart beat due to drug. **07**

Q.5 (a) Calculate Mean Deviation : **07**

Class interval	0 -4	4 -8	8-12	12 -16	16 -20
Frequency	4	6	8	5	2

(b) What are the Type-I and Type II errors? Explain. **07**

OR

Q.5 (a) Discuss the Chi-Square test as a “goodness of fit”. And give its characteristics. **07**

(b) Describe the limitations of the Biostatistics. **07**

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Table (a) Values of F at the 5% Significance Level

n_2 (df of the denominator)	n_1 (df of the numerator)								
	1	2	3	4	5	6	7	8	9
1	161	200	216	225	230	234	237	239	241
2	18.5	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4
3	10.1	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04

Table (b) Values of F at the 1% Significance Level

n_2 (df of the denominator)	n_1 (df of the numerator)								
	1	2	3	4	5	6	7	8	9
1	4052	5000	5403	5625	5764	5859	5928	5982	6022
2	98.5	99.0	99.2	99.2	99.3	99.3	99.4	99.4	99.4
3	34.1	30.8	29.5	28.7	28.2	27.9	27.7	27.5	27.3
4	21.2	18.0	16.7	16.0	15.5	15.2	15.0	14.8	14.7
6	13.7	10.9	9.78	9.15	8.75	8.47	8.26	8.10	7.98
8	11.3	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
10	10.0	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39
14	8.86	6.51	5.56	5.04	4.70	4.46	4.28	4.14	4.03
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72

2 Distribution of χ^2 corresponding to different levels of significance

Degree of freedom (df)	Probability (P)		
	0.05	0.01	0.001
1	3.84	6.64	10.83
2	5.99	9.21	13.82
3	7.82	11.35	16.27
4	9.49	13.29	18.47
5	11.07	15.09	20.52
6	12.59	16.81	22.46
7	14.07	18.48	24.32
8	15.51	20.09	26.13
9	16.92	21.67	27.88
10	18.31	23.21	29.59
11	19.68	24.73	31.26
12	21.03	26.22	32.91
13	22.36	27.69	34.53
14	23.69	29.14	36.12
15	25.00	30.58	37.70
16	26.30	32.00	39.25
17	27.59	33.41	40.79
18	28.87	34.81	42.31
1.9	30.14	36.19	43.82
20	31.41	37.57	45.32
21	32.67	38.93	46.80
22	33.92	40.29	48.27
23	35.17	41.64	49.73
24	36.42	42.98	51.18
25	37.65	44.31	52.62
26	38.89	45.64	54.05
27	40.11	46.96	55.48
28	41.34	48.28	56.89
29	42.56	49.59	58.30
30	43.77	50.89	59.70

Table value of *t* at different degrees of freedom on P = 0.05 and .01 level.

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(For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$)

DEGREE OF FREEDOM	P .05	.01
1	6.314	31.821
2	2.920	6.965
3	2.353	4.541
4	2.132	3.747
5	2.015	3.365
6	1.943	3.143
7	1.895	2.998
8	1.860	2.896
9	1.833	2.821
10	1.812	2.764
11	1.796	2.718
12	1.782	2.681
13	1.771	2.650
14	1.761	2.624
15	1.753	2.602
16	1.746	2.583
17	1.740	2.567
18	1.734	2.552
19	1.729	2.541
20	1.725	2.528
21	1.721	2.518
22	1.717	2.508
23	1.714	2.500
24	1.711	2.492
25	1.708	2.485
26	1.706	2.479
27	1.703	2.463
28	1.701	2.467
29	1.699	2.462
30	1.697	2.457
40	1.684	2.423
60	1.671	2.390
120	1.658	2.338