

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. Pharm. – SEMESTER II • EXAMINATION – WINTER 2015

Subject Code: 220001

Date: 5/12/2015

Subject Name: Applied Mathematics (Biostatistics)

Time: 2.30 pm to 5.30 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) Describe the different sampling methods used in biostatistics. **06**
- (b) The following data show the blood pressure reduction (in mmHg) caused in 10 animals by a new drug. **05**
 20, 18, 15, 12, 8, 16, 18, 17, 14, 21.
 Test the hypothesis that the blood pressure reduction for the population is 15 mmHg. Find 95% limits for the population mean. ($t_{9, 0.05} = 2.262$)
- (c) The laboratory A and B carry out independent estimates of disintegration times of omeprazole tablets. The disintegration time obtained by the laboratories are as follows. Is there any significant difference between the disintegration times obtained by the two laboratories? ($t_{9, 0.05} = 2.262$) **05**

Batch No.	Disintegration time in min.	
	Lab. A	Lab. B
A	7.8	9.1
B	8.2	8.6
C	7.1	8.5
D	3.5	4.2
E	8.3	7.8
F	6.5	7.3
G	9.2	9.7
H	4.4	6.5
I	7.6	6.3
J	8.9	6.5

- Q.2**
- (a) Discuss Null hypothesis, alternate hypothesis & their significance. **06**
- (b) In a laboratory experiment, two random samples gave the following results. **05**
 Test the equality of sample variances at 5% level. ($F_{9, 11, 0.05} = 2.90$)

Sample	Size	Sample mean	Sum of squares of deviations from the mean
1	10	15	90
2	12	14	108

- (c) The following table shows the results of an experiment to investigate the effect of vaccination induced in the animals against a particular disease. Use a Chi-square test to test the hypothesis that there is no difference between the **05**

vaccinated and non-vaccinated groups. Values of Chi square for 1 degree of freedom at 5% level is equal to 3.84.

	Got disease	Did not get disease
Vaccinated	9	42
Non-vaccinated	17	28

- Q.3 (a)** Explain the following terms. **06**
- 1) Critical region
 - 2) Confidence interval
 - 3) Degree of freedom

(b) What is correlation and discuss its type. **05**

(c) Calculate co-relation co-efficient from the following data. **05**

X	1	2	3	4	5	6	7	8	9	10
Y	10	12	16	28	35	36	41	49	40	50

Q.4 (a) Explain the term regression and state the difference between regression and correlation. **06**

(b) Nine students secured the following marks in Mathematics and chemistry. Find the rank co-relation co-efficient and comment on its values. **05**

Roll no.	1	2	3	4	5	6	7	8	9
Marks in Mathematics	78	36	98	25	75	82	90	62	65
Marks in chemistry	84	51	91	60	68	62	86	58	53

(c) For the following data find the two regression lines. **05**

X	1	2	3	4	5	6	7	8	9	10
Y	10	12	16	28	35	36	41	49	40	50

Q.5 (a) What is Analysis of variance and state some application of it. **06**

(b) A pharmaceutical company wishes to test whether its three salesman A, B and C tend to make sales of the same size or whether they differ in their selling ability. The following are their weekly sales records of these salesman. **05**

Determine whether the average sale of three salesman differ in size.

($F_t = 3.88$ at 5% level for (2, 12) degree of freedom)

A	B	C
20	50	60
30	20	20
20	20	30
40	30	50
30	40	40

(c) The following data represent the no. of units of production per day turned out by 5 different workers using four different types of machine. **05**

1) Test whether the mean productivity is the same for the four different types of machines

2) Test whether five worker differ with respect to mean productivity.

Worker	Machine type			
	A	B	C	D
1	40	34	43	42
2	42	36	48	39
3	30	32	40	28
4	39	34	42	49
5	34	38	45	35

[$F_t = 3.49$ at 5% level for (3, 12) degree of freedom; $F_t = 3.26$ at 5% level for (4, 12) degree of freedom]

- Q. 6** (a) Discuss types of distribution with example. **06**
 (b) Write a note on Wilcoxon signed rank test. **05**
 (c) The following are the average weekly losses of worker hours due to accident in 10 industrial plant before and after a certain safety program was put into operation. Use the sign test at the 0.05 level of significance to test whether the safety program is effective. **05**

Before	45	73	46	124	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

For $n=10$ and $p = 0.5$ the probability of $X = 0.0107$

- Q.7** (a) Differentiate between crossover and parallel design. What is carry over effect in bioequivalence study? **06**
 (b) What do you mean by biostatistics? Explain its importance in Pharmacy. **05**
 (c) Discuss various non- parametric tests. **05**
