

**GUJARAT TECHNOLOGICAL UNIVERSITY****BPHARM – SEMESTER I • EXAMINATION – SUMMER - 2013****Subject code: 220001****Date: 27-05-2013****Subject Name: Applied Mathematics (Biostatistics)****Time: 02:30 pm to 05:30 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain: Standard error, Degree of freedom, Fiducial limits for population mean. **06**  
 (b) Discuss merits and demerits of sampling. Discuss simple random sampling. **05**  
 (c) Using the following data, find the equation of the two lines of regression. **05**

| Variable | Mean | std Deviation | Coefficient of correlation |
|----------|------|---------------|----------------------------|
| X        | 40   | 5             | r=0.8                      |
| Y        | 30   | 4             |                            |

- Q.2** (a) Discuss Null hypothesis, alternate hypothesis with types of error in test of hypothesis. **06**  
 (b) A random sample of 20 famotidine injection from a batch gives a mean active ingredient content of 42 mg and the standard deviation of 5 mg. Test the hypothesis that the population mean is 40 mg. ( $t_{19,0.05} = 2.09$ ) **05**  
 (c) The table below gives the age of tablet machine of certain make and annual maintenance costs. Obtain the regression equation for costs related to age. **05**

| Machine age (years)            | 2  | 4  | 6  | 8  |
|--------------------------------|----|----|----|----|
| Maintenance cost (thousand Rs) | 10 | 20 | 25 | 30 |

- Q.3** (a) Write a note on procedure for ANOVA for two way classification. **06**  
 (b) What do you mean by biostatistics? Explain its importance in Pharmacy. **05**  
 (c) The following data shows diastolic blood pressure and cholesterol levels of randomly selected men. Find the coefficient of correlation between these two parameters. **05**

|                |     |     |     |     |     |     |     |     |     |     |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Diastolic B.P. | 80  | 75  | 90  | 74  | 75  | 110 | 70  | 85  | 88  | 78  |
| Cholesterol    | 307 | 259 | 341 | 317 | 274 | 416 | 267 | 320 | 274 | 336 |

- Q.4** (a) Explain i) Wash out period ii) Carry over effect iii) Replicate design. **06**  
 (b) In a study of dependence of oral cancer on smoking habit held at cancer hospital, following data were obtained on 180 individuals. **05**

|           | non smokers | moderate smokers | heavy smokers |
|-----------|-------------|------------------|---------------|
| Cancer    | 7           | 12               | 20            |
| No Cancer | 62          | 50               | 29            |

Test the hypothesis that the presence or absence of cancer is independent of smoking habit. (Chi square tab:  $_{2, 0.05} = 5.991$ )

- (c) An antibiotic producing company has called 15 persons for interview to fill 10 vacancies of salesman. The ranks are given by interview board consisting of sales manager and a psychologist. Find the Spearman's rank correlation coefficient and interpret your result. **05**

|                       |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
|-----------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| Rank by Sales Manager | 1 | 3 | 2 | 4 | 6 | 5 | 7 | 9 | 8 | 11 | 10 | 12 | 14 | 13 | 15 |
| Rank by Psychologist  | 2 | 3 | 1 | 5 | 4 | 6 | 8 | 7 | 9 | 10 | 12 | 11 | 13 | 14 | 15 |

- Q.5** (a) Thirty microgram of Methcobalamin was given intramuscularly every four week to six patients of pernicious anaemia. The results are given below. Do the data indicate improvement in haemoglobin level? ( $t_{5, 0.05} = 2.57$ ) **06**

| Patient | Haemoglobin gm % |                        |
|---------|------------------|------------------------|
|         | Before therapy   | After 3 months therapy |
| 1       | 10.3             | 13.0                   |
| 2       | 11.3             | 13.4                   |
| 3       | 14.7             | 16.0                   |
| 4       | 11.3             | 13.6                   |
| 5       | 11.7             | 14.0                   |
| 6       | 12.5             | 13.8                   |

- (b) The demand for a particular spare in a factory was found to vary from day to day. By using chi square test for goodness of fit, test the hypothesis that the number of parts demanded has no association with the days of the week. (Chi square tab<sub>5, 0.05</sub> = 11.07) **05**

| Day                   | Mon  | Tue  | Wed  | Thur | Fri  | Sat  |
|-----------------------|------|------|------|------|------|------|
| No. of parts demanded | 1124 | 1125 | 1110 | 1120 | 1126 | 1115 |

- (c) Write a note on “Regression coefficient and line of regression”. **05**

- Q. 6** (a) Write a note on “Chi-square test”. **06**

- (b) Blood glucose level (per100 ml) of human is compared with rabbits. Apply proper statistical test to know whether there is any significant difference between blood glucose levels of human and rabbits. ( $t_{18,0.05} = 2.101$ ) **05**

|         |     |     |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Human   | 100 | 112 | 90  | 125 | 115 | 137 | 145 | 140 | 152 | 143 |
| Rabbits | 145 | 135 | 125 | 151 | 140 | 159 | 178 | 200 | 184 | 172 |

- (c) Two granulations were prepared by different procedures. Seven random samples of powdered mixture were collected from each batch and assayed for active material. Test whether two samples comes from population having similar variance ( $F_{6, 6, 0.05} = 4.28$ ). **05**

|               |      |      |      |      |      |      |      |
|---------------|------|------|------|------|------|------|------|
| Granulation A | 20.4 | 20.6 | 20.6 | 20.7 | 21.0 | 20.9 | 19.8 |
| Granulation B | 20.2 | 21.0 | 20.4 | 19.0 | 21.5 | 18.9 | 21.8 |

- Q.7** (a) Discuss various non- parametric tests. **06**

- (b) The following data gives the yields of 12 plots under 4 varieties of herbal crop. Test using one way ANOVA whether there are significant differences among the four varieties. ( $F_{\text{tab}(3,8,0.05)} = 4.07$ ) **05**

| A   | B   | C   | D   |
|-----|-----|-----|-----|
| 200 | 230 | 250 | 300 |
| 190 | 270 | 300 | 270 |
| 240 | 150 | 145 | 180 |

- (c) What is a crossover design? Discuss merits and demerits of crossover design. **05**

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