CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Fifth Semester of B.Pharm. Examination
University Theory Examination Nov-Dec 2015
MA331 Bio-Statistics

Date: 10/12/2015 Thursday **Time: 10:00 a.m. to 01:00 p.m.** **Maximum Marks: 80**

Instructions:

(1) **Figures to right indicate marks.**
(2) **Section wise separate answer book to be used.**
(3) **Draw neat sketches wherever necessary.**
(4) **Use of scientific non-programable calculator is allowed.**

SECTION I

Q.1. Attempt any TWO of the following.

(a) Answer the following questions. **[10]**

1) Explain the difference between the term Population and Sample using suitable examples in Biostatistics. **(05)**

2) Write important properties of arithmetic mean. **(05)**

(b) Explain whether following statements are true or false. **[10]**

1) The absolute sum of deviations of values of variable from its mean is zero.

2) If the mean of 5 values of variable x is 8, and $\sum_{i=1}^{4} x_i = 20$, then $x_5 = 20$.

3) The mode of 5 3 2 4 5 is 5.

4) The geometric mean of 4 values of variable x is 5, if all values of variable are multiplied by 2, the new geometric mean of changed values of variable is 10.

5) If median of three values of variable x, is 6, and all values of x are multiplied by 3, then median of new values is 18.

(c) Answer the following questions. [10]

1) Explain the difference between Quantitative and Qualitative data using suitable examples in Bio-Statistics. (05)

2) Define the term Standard deviation of raw data.Write important properties of standard deviation. (05)

Q.2. Attempt any TWO of the following.

(a) Data on the percentage of paracetamol in batches of Sterwin 500 mg tablets are shown below (Table 1). The tablets were assayed by both the BP1993 UV method and by an alternative NIR reflectance spectrophotometric method. [10]

Use following class limits (Table 2) and construct

Table 1: Paracetamol content (%) in batches of tablets

Batch	UV	Batch	UV	Batch	UV	Batch	UV	Batch	UV
1	84.06	6	84.87	11	84.62	16	84.71	21	83.97
2	84.10	7	84.75	12	83.32	17	85.34	22	83.92
3	85.13	8	83.93	13	83.97	18	84.18	23	85.65
4	84.96	9	83.92	14	85.65	19	84.18	24	83.86
5	84.96	10	84.39	15	84.38	20	84.05	25	84.57

Table 2: Limits:Paracetamol content (%) in batches of tablets

Lower Limit	83.30	83.80	84.30	84.80	85.30
Upper Limit	83.79	84.29	84.79	85.29	85.79

1) Frequency distribution **(03)**

2) Relative frequency distribution and **(03)**

3) Histogram **(04)**

(b) Consider data on the percentage of paracetamol in first 10 batches of Sterwin 500 mg tablets (Table 1),and determine **[10]**

1) Arithmetic Mean and Standard deviation percentage of paracetamol respectively. **(05)**

2) Root Mean square deviation about mode percentage of paracetamol. **(05)**

(c) The data set below (Table 3) lists measurements of blood plasma nicotine levels (in nanogram per milliliter) for 10 smokers, in a study of cigarette smoking habits.Determine **[10]**

Table 3: blood plasma nicotine levels

123	311	242	474	375	449	419	185	33	564

1) All quartiles blood plasma nicotine level . **(05)**

2) Mean deviation about median blood plasma nicotine level. (05)

SECTION II

Q.3. Attempt any TWO of the following.

(a) State the area properties of normal distribution. Assume that hemoglobin level of a worker in a certain population is distributed according to Normal distribution with mean $\mu = 19.3$ and standard deviation $\sigma = 2.6$. Determine the percentage of workers whose hemoglobin level is [10]

1) less than 21.9 $P\{X < 21.9\}$

2) between 17.9 and 21.9 $P\{17.9 < X < 21.9\}$

You are given $P\{Z \leq 1\} = 0.8414$ and $P\{Z \leq -0.54\} = 0.2951$

(b) If a random variable X has Poisson distribution and $P(X = 0) = 0.4$ [10]

1) Determine mean of X.

2) Compute $P\{X = 1\}$

3) Compute $P\{X \leq 3\}$

(c) Define Binomial distribution. What are mean and standard deviation of distribution? The probability that an infection is cured by a particular antibiotic drug within a week is 0.85. Suppose four patients are treated by this antibiotic drug. Using Binomial distribution, find out the probability that [10]

1) No patient is cured.

2) Exactly one patient is cured.

3) Exactly two patients are cured

4) At least two patients are cured.

Q.4. Attempt any TWO of the following.

(a) The data come from a study that investigated optimal conditions for the extraction of tobacco alkaloids using ultrasonic and microwave extraction methods. The first row shows the extraction temperature ($°C$), while the second row gives the percentage nicotine extracted from tobacco. [10]

Table 4: The nicotine study data

Temperature °C	41	41	74	74	30	85	57.5	57.5
% Nicotine	3.279	3.401	3.973	4.319	3.145	4.595	3.945	4.243

1) Identify dependent and independent variables from the data (Table 4)

2) Construct the scatter diagram from the data and obtain regression line (Table 4)

3) Predict the % Nicotine at Temperature 50°C from regression line obtained in question (2)

(b) A 0.1 M solution of acid was used to titrate 10 ml of 0.1 M solution of alkali and the following volumes of acid were recorded,

Table 5: Volume in ml

9.88	10.18	10.23	10.39	10.21

If μ denotes the true mean volume of acid then determine 95% and 99% confidence interval for μ. You are given $t_{4,0.05/2} = 2.776445, t_{4,0.05} = 2.131847, t_{4,0.01/2} = 4.604095, t_{4,0.01} = 3.746947$ [10]

(c) Answer following questions. [10]

(i) Define simple correlation between two variables and write its important properties.

(ii) The data come from a study of the effect of a drug, captopril, on blood pressure in human patients who had moderate essential hypertension (moderately raised blood pressure). The pressure of the blood inside the body varies as the heart beats, and a blood pressure measurement generally produces two values: the systolic pressure, which is the maximum pressure as the heart contracts, and the diastolic pressure, which is the minimum pressure.The following values are obtained for $n = 15$ paired values,

$$\begin{aligned} \sum x^2 - \frac{(\sum x)^2}{n} &= 5920.9333 \\ \sum y^2 - \frac{(\sum y)^2}{n} &= 1535.3333 \\ \sum xy - \frac{\sum x \sum y}{n} &= 2004.3333 \end{aligned} \tag{1}$$

Determine correlation coefficient from the values given in (1)