 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION – **MEDICAL LAB TECHNOLOGY**

THIRD SEMESTER – **NOVEMBER 2012**

# ST 3901 - STATISTICAL APPLICATIONS IN BIOLOGICAL SCIENCES

Date : 08/11/2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**SECTION – A**

**Answer ALL questions:**  (10 x 2 = 20)

1. Define Correlation.
2. Give the various measures of dispersion.
3. What are the limitations of Statistics?
4. Explain type II error.
5. Write the test statistic for a chi-square test of independence of attributes.
6. Define ANOVA.
7. Find Range and coefficient of Range from the given data:

99, 77, 39, 89, 69, 79, 89, 99, 999, 899, 696, 969.

1. State any two uses of Regression.
2. Give the formula for Z-test for single proportion.
3. Give two way ANOVA table.

**SECTION – B**

**Answer any FIVE of the following:** (5 X 8 = 40)

1. Determine Karl Pearson coefficient of correlation for the following data

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Drug taken(In days)** | 1 | 2 | 1 | 3 | 5 | 8 | 10 | 7 |
| **% Reduction of tumor** | 46 | 63 | 56 | 40 | 66 | 76 | 83 | 70 |

1. Explain the procedure of One Way ANOVA.
2. Given:

30, 71, 90, 86, 113, 40, 70, 10, 33, 20, 55

     Calculate Mean, Median, Mode, and Quartile Deviation, Range from the above data.

1. Two diets are compared by conducting an experiment on two sets of 70 and 90 experimental animals. The average increase in weight due to the diet A and B are respectively 10 kg and 5 kg with standard deviation of 1 kg and 2 kg. Check the claim that diet B is superior over diet A at 5% level of significance.
2. Suppose we want to see the effect of a drug on blood pressure. Eight subjects are chosen and the blood pressure is measured for each subject before and after the administration of the drug. The result is shown below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **B.P before** | 119 | 114 | 129 | 125 | 137 | 131 | 141 | 131 |
| **B.P After** | 128 | 122 | 137 | 132 | 139 | 133 | 142 | 132 |

       Does the drug has significant effect on blood pressure?

1. Calculate first four moments and kurtosis form the given data:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **X** | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **F** | 2 | 5 | 12 | 20 | 25 | 20 | 8 |

1. The following table gives the number of accidents that occurred during the various days of the week.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Days** | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
| **No. Of accidents** | 14 | 16 | 8 | 20 | 11 | 9 | 14 |

Test whether the accidents are uniformly distributed over the week.

1. Eight Week wages (in thousands) for family A and B is given below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **FamilyA** | 6 | 3 | 4 | 7 | 5 | 8 | 9 | 6 |
| **Family B** | 9 | 10 | 1 | 3 | 7 | 14 | 2 | 8 |

Identify which family is more consistent.

**SECTION – C**

**Answer any TWO of the following:**  (2 X 20 = 40)

1. To study the performance of four detergents and three different water temperatures, the following

**‘**Whiteness’ readings were obtained with specially designed equipment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Water Temp.** | **Detergents**  **A B C D** | | | |
| **Cold water** | 55 | 60 | 65 | 50 |
| **Warm water** | 50 | 56 | 50 | 65 |
| **Hot water** | 53 | 49 | 57 | 63 |

Perform a Two-way ANOVA, using 5% level of significance. (20)

1. (i) Calculate Karl Pearson’s coefficient of Skewness from the given data : (10)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Age (X)** | 1 | 3 | 4 | 3 | 2 | 5 | 6 | 2 |
| **No. of childs (f)** | 7 | 9 | 11 | 14 | 6 | 4 | 12 | 10 |

(ii) Explain various types of diagrams for the present the data and also uses of statistics (10)

1. (i) Below are given the gain in weight in kgs of cows fed on two diets X and Y:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Diet X** | 35 | 42 | 40 | 42 | 34 | 24 | 42 |  |  |  |
| **Diet Y** | 34 | 44 | 32 | 40 | 52 | 41 | 50 | 40 | 42 | 45 |

Test at 5 % level whether the two diets differ as regards their effect on mean increase in weight by using t-test for difference means. (10)

(ii) A certain drug is claimed to be effective in curing cold. In an experiment on 170

     people with cold, half of them were given the drug and half of them given sugar pills.

     The patient’s reaction to the treatment is recorded in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Helped** | **Harmed** | **No effect** |
| **Drug** | 55 | 24 | 45 |
| **Sugar pills** | 43 | 15 | 35 |

    Test the hypothesis that the drug is no better than sugar pills for curing cold. (10)

1. (i) For the following data on RNA content of cells and rate of protein synthesis is given below:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **RNA content (Mg/100 ml) X** | 40 | 45 | 48 | 54 | 66 | 78 | 86 | 90 | 95 | 100 |
| **Protein synthesis rate(Mg/hr) Y** | 5 | 6 | 7 | 7 | 8 | 7 | 9 | 10 | 11 | 10 |

      Construct Regression Equation and also Estimate Protein synthesis rate when RNA content is       60 Mg/100 ml. (10)

(ii) Seven competitors in a beauty contest are ranked by three judges in the following orders:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1st Judge** | 2 | 3 | 1 | 6 | 5 | 7 | 4 |
| **2nd Judge** | 3 | 5 | 7 | 2 | 6 | 4 | 1 |
| **3rd Judge** | 6 | 4 | 5 | 1 | 3 | 7 | 2 |

Use the rank correlation coefficient to determine which pair of judges has the nearest approach    to common taste in beauty. (10)

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