04/12/12 BIOSTATICS

VI

Biomed = 35 04/12/12

1 : 2nd half.12-AM(i)

Con. 8200-12. **KR-8972**

(3 Hours) [**Total Marks : 100**

N.B. : (1) Attempt any **five** questions.
(2) **Each** question is of **20 marks**.
(3) Question No. **1** is **compulsory**.
(4) **Scientific calculator** can be **used**.
(5) Appropriate **statistical Tables** can be **used**.

1. (a) Compute :— **5**
   (i) the mean
   (ii) the median
   (iii) the mode
   (iv) the variance
   (v) the coefficient of variance for the following data.

   5, 8, 9, 10, 13, 14, 13, 4

   (b) One hundred people were asked to specify which mode of transport they preferred. The following table shows the responses cross – classified by educational level of the respondent. **5**

Mode of Education Level

Transport	High School (A)	College (B)	Graduate School (C)
Train (T)	15	8	7
Bus (Bu)	3	7	20
Own vehicle (V)	5	5	15
Others (O)	10	3	2

Find the following probabilities :—
   (i) P(T)
   (ii) P(A/O)
   (iii) $P(V \cap C)$
   (iv) $P(\overline{B})$

   (c) The ages of a simple random sample of 10 individuals is known. The mean $\overline{x} = 27$ and $\sigma^2 = 20$. Can we conclude that the mean age of this population is different from 30 years ? (use Normal distribution) Let $\alpha = \cdot 05$. **5**

   (d) Fit the curve $y = ax^b$ to the following data by least square method. **5**

x	1	2	3	4	5	6
y	2·98	4·26	5·21	6·1	6·8	7·5

[**TURN OVER**

2. (a) A random sample of 15 student nurses were given a test to measure their level of authoritarianism with the following results : 6
Authoritarianism score :

75, 90, 85, 110, 115, 95, 132, 74, 82, 104, 88, 124, 110, 76, 98

Test at the 0·05 level of significance, the null hypothesis that the median score for the population sampled is 100.

(b) A completely randomized design experiment with 10 plots and 3 treatments gave the following results : 6

Plot No.	1	2	3	4	5	6	7	8	9	10
Treatment	A	B	C	A	C	C	A	B	A	B
Yield	5	4	3	7	5	1	3	4	1	7

Analyze the results for treatment effect using one way ANOVA table.
(Given : $F_{0.05}$ (2, 7) = 4·74)

(c) Measurements of gastric secretion of hydrochloric acid (milliequivalents per hour) in 16 normal subjects and 10 subjects with duodenal ulcer yielded the following results : 8

Normal Subjects	Ulcer Subjects
6·3	13·7
2·0	20·6
2·3	15·9
0·5	28·4
1·9	29·4
3·2	18·4
4·1	21·1
4·0	3·0
6·2	26·2
6·1	13·0
3·5	
1·3	
1·7	
4·5	
6·3	
6·2	

construct a 95 percent confidence interval for the ratio of the two population variances.

3. (a) In a study of childhood abuse in psychiatric patients, it was found that 166 out of 947 patients reported histories of abuse. Construct 90%, 95% and 99% confidence interval for the population proportion. 6

(b) Concern about acquired immunodeficiency syndrome (AIDS) was the motivation for a survey conducted by Professor Patty J. Hale. Among the information she collected were size of business and whether or not the employer had provided AIDS education for employees. The following results were reported. 6

No. of employees	AIDS education provided	
	Yes	No
0 – 50	2	20
50 – 500	5	11
more than 500	11	5

May we conclude on the basis of these data that whether or not a business provides AIDS education is independent of the size of the business ? Let $\alpha = 0{\cdot}05$.

(c) Sixteen laboratory animals were fed a special diet from birth through age 12 weeks. Their weight gains (in grams) were as follows : 8

63	68	79	65	64	63	65	64
76	74	66	66	67	73	69	76

can we conclude from these data that the diet results in a mean weight gain of less than 70 grams ? Let $\alpha = 0{\cdot}05$. (Given : $T_{16}(0{\cdot}05) = 35$).

4. (a) A company wishes to purchase one of five different machines A, B, C, D, E. In an experiment designed to decide whether there is a difference in performance of the machines, five experienced operators each work on the machines for equal times. The following table shows the number of units produced : 6

A	68	72	75	42	53
B	72	52	63	55	48
C	60	82	65	77	75
D	48	61	57	64	50
E	64	65	70	68	53

Test the hypothesis that there is no difference among the machines at the 0·01 level of significance.
(Given : $F_{0{\cdot}01}(4, 20) = 4{\cdot}43$)
(Subtract a suitable number say 60 from all the data).

(b) A sample of 150 chronic carriers of a certain antigen and a sample of 500 non-carriers revealed the following blood group distributions : 6

Blood Group	Carriers	Non-carriers
O	72	230
A	54	192
B	16	63
AB	8	15

can one conclude from these data that the two populations from which the samples were drawn differ with respect to blood group distribution ? Let $\alpha = 0{\cdot}05$.

(c) Define the following terms :— . 8

(i) null and alternative hypothesis
(ii) median
(iii) measurement scales
(iv) axiomatic definition of probability

5. (a) The following is the frequency distribution of the ages of blood relatives of those with Wolfram syndrome. 6

Age	Frequency
20 – 29	55
30 – 39	93
40 – 49	113
50 – 59	90
60 – 69	85
70 – 79	73
80 – 89	29
90 – 99	5

construct a cumulative frequency distribution, a relative frequency distribution, a cumulative relative frequency distribution, a histogram and a frequency polygon for there data.

(b) In a study, the investigators reported the following information on a measure of overall muscle condition scores made by the subjects : 6

Sample	n	Mean	S. D.
Exercise group	13	4·5	0·3
Sedentary group	17	3·7	1·0

We assume that the two populations of ovarall muscle condition scores are approximately normally distributed. Construct a 95% confidence interval for the difference between the mean of the 2 populations.

(c) The following are the numbers of a particular organism found in 100 samples of water from a pond. Test the null hypothesis that the data were drawn from a Poisson distribution if $\alpha = 0{\cdot}1$. 8

No. of organism per sample	Frequency
0	15
1	30
2	25
3	20
4	5
5	4
6	1
7	0

6. (a) An analysis reports that 25·7 percent (ie) 26% of U. S. adults are overweight. If we select a simple random sample of 5 U. S. adults, find the probability that the number of overweight people in the sample will be 6
   (i) zero
   (ii) more than one
   (iii) five
   (iv) two or fewer
   (v) between one and three, inclusive

   (b) Research has suggested a high rate of alcoholism among patients with primary unipolar depression (PUD). In 210 families with PUD, they found that alcoholism was present in 89· of 299 control families, alcoholism was present in 94. Do these data provide sufficient evidence for us to conclude that alcoholism is more likely to be present in families of subjects with PUD ? Let $\alpha = 0{\cdot}05$. 6

   (c) The table shows the yield per acre of four different plant crops grown on lots treated with three different types of fertilizer. Test at 0·01 level of significance whether there is a significant difference in yield per acre due to crops. 8

	Crop 1	Crop 2	Crop 3	Crop 4
Fertilizer A	4·5	6·4	7·2	6·7
Fertilizer B	8·8	7·8	9·6	7
Fertilizer C	5·9	6·8	5·7	5·2

Use two way ANOVA to determine whether treatment effects are equal or not. (Given : $F_{0\cdot01}$ (3, 6) = 9·78).

7. (a) John M. Morgan examined gallbladder function before and after fundoplication. The author measured the gallbladder ejection fraction (GBEF) before and after fundoplication. The goal of fundoplication is to increase GBEF. The data are shown below. We wish to know if these data provide sufficient widence to allow us to conclude that fundoplication increases GBEF functioning. **10**

Pre operation (%)	Post operation (%)
22	63·5
63·3	91·5
96	59
9·2	37·8
3·1	10·1
50	19·6
33	41
69	87·8
64	86
18·8	55
0	88
34	40

(b) The table shows the corresponding values of three variables x, y and z. **10**

(i) Find the linear least - squares regression equation of z on x and y.

(ii) Estimate z when x = 10 and y = 6.

(iii) Find r_{12}, r_{13}, r_{23}.

x	3	5	6	8	12	14
y	16	10	7	4	3	2
z	90	72	54	42	30	12