

1.B.: 1) Attempt total five (05) questions.

2) All questions carry equal marks.

3) Question number 01 is compulsory.

4) Appropriate statistical tables can be used.

5) Non programmable Scientific Calculator can be used.

✓ 01. (a) Calculate the mean of the following distribution by a. Direct Method 20
b. Step Deviation Method

Marks: 0-10 10-20 20-30 30-40 40-50 50-60 60-70

No. of

Students: 6 5 8 15 7 6 3

(b) Suppose that it is known that 30% of certain populations are immune to a disease. If a random sample of size 10 is selected from this population, what is the probability that it will contain exactly four immune persons?

(c) Fit Second Degree Parabola for the following data:

x : 1 2 3 4 5 6

y : 6 17 34 57 86 121

(d) If the mean and SD of serum iron values for healthy men are 120 and 15 micrograms per 100 ml, respectively, what is the probability that a random sample of 50 normal men will yield a mean between 115 and 125 micrograms per 100ml?

✓ 02. (a) Motivated by an awareness of the existence of a body of 6
controversial literature suggesting that stress, anxiety and depression are harmful to the immune system, Gorman et al. conducted a study in which the subjects were homosexual men, some of them were HIV positive and some of whom was HIV negative. Data are collected on a wide variety of medical, immunological, psychiatrics and neurological measures, one of which was the number of CD4+ cells in the blood. The mean number of CD4+ cells for the 112 men with HIV infection was 401.8 with a SD of 226.4. For the 75 men without HIV infection the mean and SD were 828.2 and 274.0 respectively. Construct a 95%, 98%, 99% confidence interval for the difference between population means.

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- (b) A test to measure mother's attitudes toward their labor and delivery experiences was given to two groups of new mothers. Sample 01 had attended parental classes while sample 02 did not attend. The sample size and SD of the test scores are as follows:

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Sample	n	\bar{X}	S
01	15	4.75	1.0
02	22	3.00	1.5

Do these data provide sufficient evidence to indicate that the attendees on an average score higher than non attendees, by 5%LOS?

- (c) The following table shows the weights X_1 to the nearest pound (lb), the heights X_2 to the nearest inch (in), and the ages X_3 to the nearest years of 12 boys.

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Weight X_1	64	71	53	67	55	58	77	57	56	51	76	68
Height X_2	57	59	49	62	51	50	55	48	52	42	61	57
Age X_3	8	10	6	11	8	7	10	9	10	6	12	9

- (i) Find the least square regression equation of X_1 on X_2 & X_3 .

ii Find r_{12}, r_{13}, r_{23}

iii Find $R_{1.23}, R_{2.13}, R_{3.12}$

- 3 (a) Following table gives for a sample of married women, the level of education and the marriage adjustment score:

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Level of Education	Marriage Adjustments				Total
	Very Low	Low	High	Very High	
College	24	97	62	58	241
High School	22	28	30	41	121
Middle School	32	10	11	20	73
Total	78	135	103	119	435

Can you conclude that the higher the level of education the greater is the degree of adjustment in marriage?

(b) A random sample of 15 student nurses were given a test to measure their level of Authoritarianism with the following results:

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Student Number	Authoritarianism	Student Number	Authoritarianism
1	75	9	82
2	90	10	104
3	85	11	88
4	110	12	124
5	115	13	110
6	95	14	76
7	132	15	98
8	74		

Using Sign Test at 0.05 level of significance, test the Null hypothesis that the median score for the population sampled is 100.

(c)

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

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

Can we conclude from these data using Wilcoxon Signed Rank test that the diet results in a mean weight gain of less than 70 grams by

using 5% LOS? Given $T_{tab} = T_{16}(0.05) = 35$

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- 4 (a) To assess the significance of possible variations in performance in a certain test between the grammar schools of a city, a common test was given to a number of students taken at random from the senior fifth class of each of the four schools concerned, Do a one way ANOVA for the results given below:

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	SCHOOLS				
	A	B	C	D	
	8	12	18	13	
	10	11	12	9	
	12	9	16	12	
	8	14	6	16	
	7	4	8	15	
Total	45	50	60	65	Grand Total 220

Given that the tabulated value of the statistics at 0.05 LOS is equal to

$$F(3,16) = 3.24$$

- (b) The following serum albumin values were obtained from 17 normal and 13 hospitalized subjects

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Normal subjects:	2.4	3.5	3.1	4.0	4.2	3.0	3.2	3.5
	3.8	3.9	3.4	4.5	5.0	2.9	4.0	3.5
	3.6							
Hospitalized subjects:	1.5	2.0	3.4	1.7	2.0	3.1	1.3	1.5
	1.8	2.0	3.8	3.5	1.5			

Would you like to conclude at the 0.05 level of significance that the medians of the two populations are different use Yates Correction?

- (c) Narcolepsy is a disease involving disturbances of the sleep wake cycle. Members of the German migraine headache Society studied the relationship between migraine headaches in 96 subjects diagnosed with narcolepsy and 96 healthy controls. The results are shown in the following table we wish to know if we may conclude, on the basis of these data, that the narcolepsy population and healthy populations represented by the samples are not homogeneous w.r.t. Migraine frequency by 5% LOS?

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Major	Reported Migraine Headaches		
	Yes	No	
	Total		
Narcoleptic S	21	75	96
Healthy C	19	77	96
Total	40	152	192

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5 (a) The weights of 9 obsessive women's before and after a 12 week VLCD treatment are shown as follows: 6

Before Treatment: 117.3 111.4 98.6 104.3 105.4 100.4 81.7 89.5 78.2

After Treatment: 83.3 85.9 75.8 82.9 82.3 77.7 62.7 69.0 63.9

Do these data indicate that the weight loss treatment VLCD is effective by 5% LOS?

(b) In a study of obesity the following results were obtained from 6 samples of males and females between the ages of 20 & 75:

Sex size of sample number of observations overweight

Males 150 21

Females 200 48

Can we conclude from these data that in the sampled populations there is a significant difference in the proportion who are overweight

(c) There are three main brands of a certain powder. A set of its 120 sales is examined and found to be allocated among four groups A, B, C, D and brands I, II, III as shown have under: 8

Brand	GROUPS			
	A	B	C	D
I	0	4	8	15
II	5	8	13	6
III	18	19	11	13

Is there any significant difference in brands preference? Answer at 5% LOS using one way ANOVA Table. (Take 10 as the code value to subtract from all given values in your working)

Given $F(3,8)_{0.05} = 8.85$

$$y = ax^2 + \frac{b}{x}$$

6(a) Fit a curve of the type $y = ax^2 + \frac{b}{x}$ to the following data: 6

x :	1	2	3	4
y :	-1.51	0.99	3.88	7.66

(b) Suppose that the ages at time of onset of a certain disease are approximately normally distributed with a mean of 11.5 years and a SD of 3 years. A child has just come down with the disease. Find the probability that the child is: 6

a) Between the ages of 8.5 to 14.5 years

b) Over 10 years of age

c) Under 12

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(c) Prepare a frequency table by taking a class interval of frequency 10 (exclusive type) 19, 70, 75, 15, 0, 23, 59, 56, 27, 89, 91, 22, 21, 22, 50, 89, 56, 73, 56, 89, 75, 65, 85, 22, 3, 12, 41, 87, 82, 72, 50, 22, 87, 50, 89, 28, 89, 50, 40, 36, 40, 30, 28, 87, 81, 90, 22, 15, 30, 35 Find Mean and draw Histogram & Frequency Polygon. 8

07 (a) A medical research team wished to evaluate a proposed screening test for a diseases. The test was given to a random sample of 450 patients with that diseases and an independent sample of 500 patients without the symptoms of that diseases. The two samples were drawn from populations of subjects who were 65 years of age or older. The results were as follows: 6

Alzheimer's Diagnosis			
Test Results	Yes (D)	No (\bar{D})	Total
Positive (T)	436	5	441
Negative (\bar{T})	14	495	509
Total	450	500	950

Find the following probabilities using the above table:

$$P(T), P(\bar{T}), P(T | D), P(\bar{T} | D), P(T | \bar{D})$$

(b) A physical therapist wished to compare three methods of teaching patients to use a certain prosthetic device. He felt that the rate of learning would be different for patients of different ages and wished to design an experiment in which the influence of age could be taken into account 6

TIME IN DAYS REQUIRED TO LEARN THE USE OF PROSTETIC DEVICE

AGE GROUP	TEACHING METHOD			TOTAL
	A	B	C	
Under 20	7	9	10	26
20 to 29	8	9	10	27
30 to 39	9	9	12	30
40 to 49	10	9	12	31
50 and Over	11	12	14	37
TOTAL	45	48	58	151

Using Two Way ANOVA Determine whether all treatment effects are equal or not?

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(c) Define the following terms in detail:

- 1) Type I and Type II errors
 - 2) Level of Significance & Critical Region
 - 3) Null and Alternate hypothesis
 - 4) Central Limit theorem.
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