

[3 Hours]

[Total Marks : 80]

N.B:

1. Question No. 1 is compulsory.
2. Attempt any three questions from Q.2 to Q.6.
3. Use of Statistical tables is permitted.
4. Figures to the right indicate full marks.



1. (a) In the sample of 34 women with previous gestational diabetes, the mean non esterified fatty acids concentration (NEFA) level was 435 with a sample standard deviation of 215. Construct 90, 95, 99 percent confidence intervals for the mean fasting NEFA level for a population of women with gestational diabetes. (05)

- (b) The following table shows 1000 nursing school applicants classified according to scores made on a college entrance examination and the quality of high school from which they graduated as, rated by a group of educators.

Score	Quality of High School		
	Poor(P)	Average (A)	Superior (S)
Low(L)	105	60	55
Medium(M)	70	175	145
High(H)	25	65	300

Calculate

- (i) $P(A)$
- (ii) $P(H)$
- (iii) $P(A \cap H)$
- (iv) $P(M \cap P)$

- (c) The probability mass function of a random variable X is zero except at the points $X=0, 1, 2$. At these points it has the values (05)

$$P(0)=3c^2, P(1)=4c-10c^2, P(2)=5c-1$$

Determine c , $E(X)$ and variance.

- (d) In a retrospective study, the authors found 20 subjects who had the surgery between 1993 and 2000. For these subjects, the data below represent the duration in months of follow-up care after the operation. (05)

103 68 62 60 60 34 49 44 42 41 38 36 34 30 19 19 19 17 16

Calculate mean, median, mode, standard deviation and coefficient of variation

2. (a) The purpose of a study of by Wilkins was to measure the effectiveness of Recombinant human growth hormone (rhGH) on children with total body surface are a burns > 40 percent. In this study, 16 subjects received daily injections at home of rhGH. The sample variance of IGF- levels (inng/ml) was 670.81. We wish to know if we may conclude from these data that the population variance is not 600. (06)

- (b) Three factories A, B, C produce 30%, 50% and 20% of the total production of an item. Out of their production 80%, 50%, and 10% are defective respectively. An item (06)

is chosen from random and found to be defective. Find the probability that it was produced by

- (i) Factory A.
 (ii) Factory B
 (c) Four subjects participated in an experiment to compare three methods of relieving stress. Each subject was placed in a stressful situation on three different occasions. Each time a different method for reducing stress was used with the subject. The response variable is the amount of decrease in stress level as measured before and after treatment application. The results were as follows:

Subject	Treatment		
	A	B	C
1	16	26	22
2	16	20	23
3	17	21	22
4	28	29	36

Can we conclude from these data that the three methods differ in effectiveness? Let $\alpha=0.05$.

3. (a) Rates of posttraumatic stress disorder (PTSD) in mothers and fathers were examined. Parents were interviewed 5 to 6 weeks after an accident or a new diagnosis of cancer or diabetes mellitus type 1 for their child. Twenty-eight of the 175 fathers interviewed and 43 of the 180 mothers interviewed met the criteria for current PTSD. Is there sufficient evidence for us to conclude that fathers are less likely to develop PTSD than mothers when a child is traumatized by an accident, cancer diagnosis or diabetes diagnosis? Let $\alpha=0.05$. (06)

- (b) The following are intraocular pressure (mm Hg) values recorded for a sample of 21 elderly subjects: (06)
 14 12 14 16 12 17 14 12 17 12 16 24 12 14 17 10 18 20 16 14 19

Can we conclude from these data that the mean of the population from which the sample was drawn is greater than 14? Let $\alpha=0.05$

- (c) The following are the numbers of a particular organism found in 100 samples of water from a pond: (08)

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

Test then null hypothesis that these data were drawn from a Poisson distribution.

4. (a) Protopyrin levels were measured in two samples of subjects. Sample 1 consisted of 50 adult male alcoholics with ring side obliasts in the bone marrow. Sample 2 consisted of 40 apparently healthy adult nonalcoholic males. The mean protopyrin levels and standard deviations for the two samples were as follows: (06)

Sample	\bar{x}	S
1	340	250
2	45	25

Can one conclude on the basis of these data that protoporphyrin levels are higher in the represented alcoholic population than in the nonalcoholic population? Let $\alpha=0.05$

- (b) The weights of a certain population of young adult females are approximately normally distributed with a mean of 132 pounds and a standard deviation of 15. Find the probability that a subject selected at random from this population will weigh:
- More than 155 pounds
 - 100 pounds or less
 - Between 105 and 145 pounds
- (c) Write Short Notes on:
- Median
 - T-distribution
 - Null Hypothesis
 - Baye's Theorem

5. (a) A total of 3759 individuals were interviewed in a public opinion survey on a political proposal. Of them 1872 were men and the rest were all women. A total of 2257 individuals were in favor of the proposal and 917 were opposed to it. A total of 243 men were undecided and 442 women were opposed to it. Do you justify or contradict the null hypothesis that there is no association between sex and attitude of 5% level of significance? (08)

- (b) In a study of the relationship between age and the EEG, data were collected on 15 subjects between ages 20 and 60 years. Table shows the age and a particular EEG output value for each of the 15 subjects. Calculate Spearman's rank Correlation coefficient. (06)

Age(X)	20	21	21	22	24	27	30	31	33	35	38	40	42	44	46
EEG Output value (Y)	98	75	95	100	99	65	65	70	85	74	65	66	71	62	69

- (c) Toe flexors strength in subjects with plantar fasciitis (pain from heel spurs, or general heel pain) was examined. One of the baseline measurements was the body mass index (BMI). For the 16 women in the study, the standard deviation for BMI was 8.1 and for four men in the study, the standard deviation was 5.9. We wish to construct a 95 percent confidence interval for the ratio of the variances of the two populations from which we presume these sample were drawn at 5% LOS. Given $F_{0.025} = 0.2409, F_{0.975} = 14.25$ (06)

6. (a) A study was conducted to examine those variables thought to be related to the job satisfaction of nonprofessional hospital employees. A random sample of 10 employees gave the following results: (10)

X_1	54	37	30	48	37	37	31	49	43	12
X_2	15	13	15	15	10	14	8	12	1	3
X_3	8	1	1	7	4	2	3	7	9	1

X_1 = Score on Job Satisfaction Test

X_2 = Coded Intelligence Score

X_3 = Index of personal Adjustment

Calculate

i) $R_{1.23}$

ii) The equation of regression of X_1 on X_2 and X_3 .

- (b) Prepare two-way ANOVA table:

Age	Method A	Method B	Method C
Under 20	7	8	10
20 to 29	8	9	10
30 to 39	9	9	12
40 to 49	10	9	12
50 and above	11	12	14