(3 hours) **Total Marks:80**

N.B: (1) Question no.**1** is **compulsory.**

(2)Attempt any **three** questions from remaining **five** questions.

(3)**Figures** to the **right** indicate **full** marks.

(4)Assume suitable data if necessary.

1. (a)Cardiac patients were implanted pacemakers to central heartbeats. A plastic connector module mounts on top of the pacemaker. Assuming standard deviation of 0.0015 inches and normal distribution, find 95% confidence interval for the mean size of the connector module. A random sample of 75 modules has an average of 0.31 inches. **(5)**

(b)One hundred people were asked to specify the mode of transport they preferred. The following table shows the response cross-classified by the educational level of the respondent. Educational level

Mode of Transport	High (H)	College (C)	Graduate School(G)
Train(T)	15	8	7
Bus(B)	3	7	20
Own Vehicle(V)	5	5	15
Others(O)	10	3	2

Find the following probabilities:-

(i)P(V) (ii)P(C/O) (iii)P(B∩G) **(5)**

(c)Thirteen patients with severe chronic airflow limitation were the subjects of a study by Fernandez et al who investigated the effectiveness of a treatment to improve gas exchange in such subjects. The following are the body surface area (metre sq) of the patients:- 2.10 , 1.74, 1.68, 1.83, 1.57, 1.71, 1.73, 1.65, 1.74, 1.57, 2.76, 1.90, 1.77.

Compute the (i) mean (ii) median (iii) mode (iv) variance for the above data. **(5)**

(d) Let X be a continuous random variable with p.d.f $f(x) = kx(1-x), 0 \le x \le 1$ .Find k and determine a number b such that $P(X \le b) = P(X \ge b)$. **(5)**

2. (a) A certain test for a particular cancer is known to be 95% accurate. A person submits to the test and the result is positive. Suppose that a person comes from a population of 100,000 where 2000 people suffer from that disease. What can we conclude about the probability that the person under test has that particular cancer? **(6)**

(b) Researchers are interested in the mean age of a certain population. A random sample of 10 individuals drawn from the normal population has a mean age of 27 yrs with a population variance of 20.Can we conclude that mean age of this population is different from 30yrs? **(6)**

(c) Find the correlation coefficient and the line of regression of Y on X for the following data

X	3	5	4	6	2
Y	3	4	5	2	6

(8)

3. (a)The purpose of a study by Eidelman et al was to investigate the nature of lung destruction in cigarette smokers before the development of marked emphysema. Three lung destructive index measurements were made on the lungs of lifelong non-smokers and smokers who died suddenly outside the hospital of non respiratory causes. A larger score indicates greater lung disease. For one of the indices the means and standard deviations of the scores yielded by the lungs of a sample of 9 non-smokers and a sample of 16 smokers is given below. Can we conclude that smokers, in general, have greater lung damage as measured by this destructive index than do non-smokers? **(6)**

	Mean	Standard Deviation
Non-smokers	12.4	4.8492
Smokers	17.5	4.4711

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

(i)Between the ages of 8.5 and 14.5 yrs?

(ii)Over 10 yrs of age.

(iii) Under 12. **(6)**

(c) There are three main brands of powder. A set of its 120 sales is examined and found to be allocated among four groups A, B, C, D and brand names P, Q, and R as shown in the table given below. Is there any significant difference in brand preferences? Answer at 5% LoS using one way ANOVA.Given $(Given: F_{0.05}(3,8) = 4.07$

	Groups			
Brand	A	B	C	D
P	0	4	8	15
Q	5	8	13	6
R	18	19	11	13

(8)

4. (a) In a survey of injection drug users in a large city, Coates et al found that 18 out of 423 were HIV positive. We wish to know if we can conclude that fewer than 5% of the injection drug users in the sampled population are HIV positive. **(6)**

(b)Investigate the association between the darkness of eye colour in father and son from the following data.

Colour of son's eyes	Colour of father's eyes		
	Dark	Not Dark	Total
Dark	48	90	138
Not Dark	80	782	862
Total	128	872	1000

(6)

(c) Define the following:

(i)Null and Alternate hypothesis
(ii)Median and Mode
(iii)Correlation
(iv)Regression **(8)**

5. (a)Mathers et al found that in a sample of 591 patients admitted to a psychiatric hospital,204 admitted to using cannabis at least once in their lifetime. Construct a 95% confidence interval for the proportion of lifetime cannabis users in the sampled population of psychiatric hospital admissions. **(6)**

(b)A certain injection administered to 12 patients resulted in the following changes of blood pressure: 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4.

Can it be conclude that the injection will be in general accompanied by an increase in blood pressure? **(6)**

(c)The fact sheet of patients' records maintained in a local health department contains 10 entries. A sample of 100 records revealed the following distribution of erroneous entries. Test the goodness- of- fit of the following data to the binomial distribution with p=0.2.

No. of erroneous entries(out of 10	0	1	2	3	4	5 or more
No. of records	8	25	32	24	10	1

(8)

6. (a)The table shows the corresponding values of three variables x,y,z.

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

(ii) Estimate z when x =4 and y =6.

(iii) Find r_{12} , r_{13} , r_{23} (10)

X	1	2	3	5
Y	10	1	2	4
Z	22	20	28	44

(b) The table shows the yield/acre of 4 different plant crops grown on lots treated with three different types of fertilizers. Test at 0.05 LoS whether there is significant difference in yield /acre due to fertilizers.

	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 $(Given: F_{0.05}(3,6)) = 4.76$.

(10)
