Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER-1 (NEW) EXAMINATION – WINTER 2016

Subject Code: 2713107 **Date:03/01/2017**

Subject Name: Statistics for Biomedical Engineers

Time: 2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define below given terms with appropriate example. **07**

i) Data ii) Population iii) Sample iv) Variable v) Parameter

(b) 1) What is Biostatistics? How is biostatistics helpful to a biomedical engineer? **07**

2) Enlist the various elements of scientific method.

Q.2 **(a)** Define below terms with proper statement. **07**

1) False Positive 3) Sensitivity 5) Predictive value positive

2) False Negative 4) Specificity 6) Predictive value negative

(b) 13 patients who were treated with highly active antiretroviral therapy for at least 3 months. The CD3 T cell counts (× 106 /L) at baseline for the 13 subjects are listed below. **07**

230	150	170	133	220	165	169
180	153	190	56	98	106	

Treat the above data set as a sample and compute the following;

a) The mean, b) The median, c) The mode, d) The range, e) The variance,

f) The standard deviation, g) The coefficient of variation, h) The interquartile range.

OR

(b) Let's consider a random sample of 15 concentrations of Calcium sulfate in milligrams per liter. **07**

130.4	129.2	131.4	131.1	129.5
132.3	131.3	127.2	133.2	132.2
134.8	131.7	133.9	129.5	131.4

Create a stem-and-leaf plot & Box plot of the data.

Q.3 **(a)** A medical research team wished to evaluate a proposed screening test for Alzheimer's disease. The test was given to a random sample of 250 patients with Alzheimer's disease and independent random sample of 250 patients without symptoms of the diseases. The two samples were drawn from populations of subjects who were 60 years of age or older. The results are as follows: P(D) = 0.113, Find out the values for P(D | T) and P(~D | ~T). **07**

Test Result	Yes (D)	No(~D)	Total
Positive(T)	236	5	241
Negative (~T)	14	245	259
Total	250	250	500

(b) Write a brief note on Bayesian Inference. **07**

OR

Q.3 **(a)** Patients who were involved in problem gambling treatment were asked about co-occurring drug and alcohol addictions. Let the discrete random variable X represent the number of co-occurring addictive substances used by the subjects. Table summarizes the frequency distribution for this random variable. **07**

Number of co- occurring addictive substances used by patients in selected Gambling treatment programs	
No. of Substances used	**Frequency**
0	125
1	25
2	18
3	45
4	38
5	75
6	15
7	167
8	156
9	120

1) Construct a table of the relative frequency and the cumulative frequency for this discrete distribution.
2) Construct a graph of the probability distribution and a graph representing the cumulative probability distribution for these data.
3) Find the mean of this frequency distribution.
4) Find the variance, and standard deviation of this frequency distribution

(b) Explain the difference between Normal Distribution and Standard Normal distribution with appropriate case study. **07**

Q.4 **(a)** Common breath metabolites such as ammonia, acetone, isoprene, ethanol, and acetaldehyde in five subjects over a period of 25 days. Each day, breath samples were taken and analyzed in the early morning on arrival at the laboratory. For subject A, a 25 year-old female, the ammonia concentration in parts per billion (ppb) followed a normal distribution over 30 days with mean 491 and standard deviation 119. What is the probability that on a random day, the subject's ammonia concentration is between 292 and 649 ppb? (area between -∞ and -1.67 to be 0.475 and the area between -∞ and 1.33 to be .9082. **07**

(b) Write a brief note on central limit theorem with case study. **07**

OR

Q.4 **(a)** In the 2000 National Health Interview Survey, researchers found that among U.S. adults ages 75 or older, 34 percent had lost all their natural teeth and for U.S. adults ages 65–74, 26 percent had lost all their natural teeth. Assume that these proportions are the parameters for the United States in those age groups. If a random sample of 250 adults ages 65–74 and an independent random sample of 200 adults ages 45–64 years old are drawn from these populations, find the probability that the difference in percent of total natural teeth loss is less than 5 percent between the two populations. (area to the left of z = -.70 is .2420.) **07**

(b) In a certain area of a large city it is hypothesized that 40 percent of the houses are in dilapidated condition. A random sample of 75 houses from this section and 90 houses from another section yielded difference of 0.09 if there is no difference between the two areas in the proportion of dilapidated houses, what is the probability of observing a difference this large or larger.(It is based on sampling distribution of two data and z= 1.17 gives an area of 0.8790) **07**

Q.5	**(a)**	Define the role of Estimation in data analysis? also explain the various types of estimation available for statistics with case study.	**07**
	(b)	Write a brief note on partial and multiple correlation with case study.	**07**

OR

Q.5	**(a)**	Illustrate the effect of p value and p/2 value in statistical interpretation.	**07**
	(b)	Draw a flow chart for various statistical method in regards to the one sample problem and the variable analysis. Enlist the various possible methods.	**07**

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