Dec 2016

TE (Sem-VI) CBSGS

QP Code:564702

Biomedical – Biostatistics

(3 Hours) Marks:80

6418

(1) Attempt any four questions. Each question is of 20 marks.
(2) Question number 1 is compulsory.
(3) Scientific calculator can be used.
(4) Appropriate Statistical Tables can be used.

1](a) [5+5+5+5]

Castillo and Lillioja (A-I) describe a technique they developed for peripherallymphatic cannulation in humans. The authors claim that their technique simplifies the procedure and enables the collection of adequate volumes of lymph for kinetic and metabolic studies. The investigators' subjects were 14 healthy adult males representing a wide range of body weight. One of the variables on which measurements were taken was body mass index (BMI) = weight (kg) /height^2 (m^2). The results are shown in the following Table. We wish to know if we can conclude that the mean BMI of the population from which the sample was drawn is not 35.

Subject	BMI	Subject	BMI	Subject	BMI
1	23	6	21	11	23
2	25	7	23	12	26
3	21	8	24	13	31
4	37	9	32	14	45
5	39	10	57		

(b)

The following table shows the outcome of 500 interviews completed during a survey to study the opinions of residents of a certain city about legalized abortion. The data are also classified by the area of the city in which the questionnaire was attempted.

Area of city	Outcome: For (F)	Against (A)	Undecided (R)	Total
A	100	20	5	125
B	115	5	5	125
D	50	60	15	125
E	35	50	40	125
Total	300	135	65	500

If a questionnaire is selected at random from the 500, what is the probability that:
1. The respondent was for legalized abortion?
2. The respondent was undecided?
3. The respondent was for legalized abortion, given that he/she resided in area E
4. P(A ∩ R)
5. P(QU D)

(c) A discrete random variable X has the following probability density function

X	:	-2	-1	0	1	2	3
P(X)	:	0.2	k	0.1	2k	0.1	2k

Find the value of k, the expectation of X and variance.

(d) Find the mean, standard deviation and co-efficient of variation of the heights of 100 male students given below:

Height (cm) :	150-156	157-163	164-170	171-177	178-184
No. of Students:	5	18	42	27	8

[6 + 6 + 8]

2](a) Hemoglobin (g %) values were recorded for a sample of 20 children who were part of a study of acute leukemia. The variance of the observations was 5. Do these data provide, sufficient evidence to indicate that the population variance is greater than 4?

Let $\alpha = 0.05$

(b) A box contains 5 white balls and 6 black balls. Another box contains 6 white balls and 4 black balls. A box is selected at random and then a ball is drawn from it.

i) What is the probability that the ball drawn will be white ?

ii) Given that the ball drawn is white, what is the probability that it came from the first box?

(c) To assess the significance of possible variations in performance in a certain test between grammer schools of a city, a common test was given to a number of students taken at random from four schools. Test at 5% level of a significance whether there is a difference in the four schools at the 0.01 level of significance. (Subtract a suitable number from all the data.)

School A	School B	School C	School D
8	12	18	13
10	11	12	9
12	9	16	12
8	14	6	16
7	4	8	15

3] (a) [6 + 6 + 8]

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

Sex	Size	No. of overweight people
Males	150	21
Females	200	48

Can we conclude that in the sampled population there is a significant difference in the proportion who are overweight.

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

Number of Organisms per sample	Frequency
0	15
1	30
2	25
3	20
4	5
5	4
6	1
7	0

Test the null hypothesis that these data were drawn from a Poisson distribution if $\alpha = 0.1$

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

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

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

(c) 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

[6+6+8]

4](a) In an article in the *American journal of Public Health*, Colsher describe the results of a health survey of 119 male inmates 50 years of age and older residing in a state's correctional facilities. They found that 21.6 percent of the respondents reported a history of venereal disease. On the basis of these findings, can we conclude that in the sampled population more than 15 percent have a history of a venereal disease? Let $\alpha = 0.05$.

(b) Based on their analysis of data collected by the National Center for Health Statistics, Najjar and Rowland report that 25.7 percent of U.S. adults are overweight. If we select a simple random sample of 20 U.S. adults, find the probability that the number of overweight people in the sample will be (round the percentage to 26 for computation purposes)

a) Exactly three b) Three or more c) fewer than three d) between three and seven, inclusive

(c) Define the following
1) Null and alternative Hypothesis
2) Conditional Probability
3) Median
4) Correlation and Regression

5] [6+6+8]

(a) Find the correlation coefficient and the equations of regression for the following values of X and Y.

X :	1	2	3	4	5
Y :	2	5	3	8	7

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

Blood group	Carriers	Non carriers	Total
0	72	230	302
A	54	192	246
B	16	63	79
AB	8	15	23
Total	150	500	650

Can one conclude from these data that the two populations from which the samples were drawn differ with respect to blood group distribution? Let $\alpha = 0.05$

c)

In a simple random sample of 250 industrial workers with cancer, researchers found that 102 had worked at jobs classified as 'high exposure' with respect to suspected cancer causing agents. Of the remaining, 84 had worked at jobs classified as 'moderate exposure' jobs and 64 had experienced no known exposure because of their jobs. In an independent simple random sample of 250 industrial workers from the same area who had no history of cancer, 31 worked in 'high exposure' jobs, 60 worked in 'moderate exposure' jobs and 159 worked in jobs involving no known exposure to suspected cancer- causing agents. Does it appear from these data that persons working in jobs that expose them to suspected cancer-causing agents have an increased risk of contracting cancer? Let $\alpha = 0.05$

[10 + 10]

6]

(a) A physical therapist wished to compare three methods for 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.

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

Use two way ANOVA to determine whether treatment effects are equal or not

(Given : $F_{0.05}(2,8) = 4.46$)

(b) Nancy Stearns Burgess conducted a study to determine weight loss, body composition, body fat distribution, and resting metabolic rate in obese subjects before and after 12 weeks of treatment with a very-low-calorie diet (VLCD). The women's weights before and after the 12-week VLCD treatment are shown in the following table. We wish to know if these data provide sufficient evidence to allow us to conclude that the treatment is effective in causing weight reduction in obese women.

B	147.3	111.4	98.6	104.3	105.4	100.4	81.7	89.5	78.2
A	83.3	85.9	75.8	82.9	82.3	77.7	62.7	69	63.9