T.E- VI Sem - Biomed.

TE/VI/BM/CBSGNS/KT/Biostatistics

(14)

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3 hours **Marks : 80**

(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.

[5 + 5 + 5 + 5]

1] (a) In a study of preeclampsia, the mean systolic blood pressure of 10 healthy nonpregnant women was found to be 119 with a S.D. of 2.1 Find the 90, 95 and 99 percent confidence intervals for μ.

(b) One hundred people were asked to specify which mode of transport they preferred. The following table shows the responses 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 :-

1. P (T)
2. P (H/O)
3. $P(\overline{V} \cap G)$
4. $P(\overline{B})$

(c) The daily consumption of electric power (in million kwh) is a random variable X with probability density function

$$f(x) = \begin{cases} kxe^{-x/3}, & x \geq 0 \\ 0, & x \leq 0 \end{cases}$$

Find the value of k, the expectation of X and the probability that on a given day the electric consumption is more than the expected value.

(d) The following are the gestation ages (in weeks) of 20 growth – retarded fetuses :

33 26 34 28 35 28 36 30 33 24 34 30 27 35 31 28 35 32 29 32

Compute

a) the mean
b) the median
c) the mode
d) the variance
e) the coefficient of variance

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

The table given below shows the lifetimes in hours of samples from three different types of television tubes manufactured by a company. Test at the 0.05 significance level whether there is a difference in the three types. (Given : $F_{0.05}(2,9) = 4.26$) . It is convenient to subtract a suitable number, say, 400.

Sample 1	407	411	409		
Sample 2	404	406	408	405	402
Sample 3	410	408	406	408	

(b) 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

(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 jobs that expose them to suspected cancer-causing agents have an increased risk of contracting cancer? Let $\alpha = 0.05$

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

Researchers wish to know if the data they have collected provide sufficient evidence to indicate a difference in the mean serum uric acid levels between normal individuals and individuals with Down's syndrome. The data consist of serum uric acid readings on 12 individuals with Down's syndrome and 15 normal individuals . Solve treating the variances as equal at 95% level of significance.

Sample	mean(mg/100ml)	variance
Down's syndrome	4.5	1
normal	3.4	1.5

(b) In the study of fingerprints an important quantitative characteristic is the total ridge count for the 10 fingers of an individual. Suppose the total ridge counts of individuals in a certain population are normally distributed with a mean of 140 and a standard deviation of 50. Find

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the probability that an individual picked at random from this population will have a ridge count

i) 200 or more

ii) less than 100

iii) between 100 and 200

iv) between 200 and 250

(c) The table shows the yield per acre of four different plant crops grown on lots treated with three different types of fertilizer. Test at .01 level of significance whether there is a significant difference in yield per acre due to fertilizers.

	Crop1	Crop2	Crop3	Crop4
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 : $F_{0.05}(2,8) = 4.46$).

[6 + 6 + 8]

4](a)

It was found that 66 percent of a sample of 670 infants had completed the hepatitis B vaccine series. Can we conclude on the of these data that, in the sampled population more than 60 percent have completed the hepatitis B vaccine series? Let $\alpha = 0.05$.

(b) Concern about acquired immunodeficiency syndrome (AIDS) was the motivation for a survey conducted by Professor Patty J. Hale of the University of Virginia. She used a mailed questionnaire to survey businesses. Among the information she collected were size of business and whether or not the employer had provided AIDS education for employees. The following results were reported.

May we conclude on the basis of these data that whether or not a business provides AIDS education is independent of the size of the business? Let $\alpha = 0.05$.

	AIDS education provided	
Number of Employees	Yes	No
0-50	2	20
50-500	5	11
More than 500	11	5

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(c) Define the following
1) One and two tailed test
2) Conditional Probability
3) Mode
4) Correlation and Regression

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

Sample variances were computed for the tidal volumes (milliliters) of two groups of patients suffering from atrial septal defect. The results and sample sizes were as follows: $n_1=31,\ s_1^2 = 35000,\ n_2=41,\ s_2^2 = 20000$

Construct the 95 percent confidence interval for the ratio of the two population variance. (Given : $F_{0.05}(30,40) = 1.94$ and $F_{0.05}(40,30) = 0.4975$)

b) A coin is tossed. If it turns up heads two balls are drawn from urn A otherwise two balls are drawn from urn B. Urn A contains 3 black and 5 white balls. Urn B contains 7 black and 1 white balls. What is the probability that urn A was used, given that both balls drawn are black?

(c) The face 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.

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

Test the goodness – of – fit of these data to the binomial distribution with p = .2.

6](a) [10 + 10]

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

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(b) John M. Morgan examined gallbladder function before and after fundoplication. The author measured the gallbladder ejection fraction (GBEF) before and after fundoplication. The goal of fundoplication is to increase GBEF. The data are shown below. We wish to know if these data provide sufficient evidence to allow us to conclude that fundoplication increases GBEF functioning.

Pre operation (%)	Post operation (%)
22	63.5
63.3	91.5
96	59
9.2	37.8
3.1	10.1
50	19.6
33	41
69	87.8
64	86
18.8	55
0	88
34	40

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