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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Medical Electronics **Duration: 3 hrs.**
Course Code: 19ML6PE3CD **Max Marks: 100**
Course: Clinical Data Analytics **Date: 20.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) A researcher studied 13 HIV-positive patients who were treated with highly active antiretroviral therapy for at least 6 months. The CD4 T cell counts ($X\ 10^6/L$) at baseline for the 13 subject are listed below. **06**

230 205 313 207 227 245 173
58 103 181 105 301 169

Compute i) the mean ii) the median iii) the range.

b) Given the binomial parameters p=0.8 and n=3, show by means of the binomial expansion that $\sum f(x) = 1$. **06**

c) Elucidate the features of various measurement scales used in biostatistics. **08**

OR

2 a) A group of researchers examined glomerular filtration rate (GFR) in pediatric renal transplant recipients. GFR is an important parameter of renal function assessed in renal transplant recipients. The following are measurements of GFR measured with diethylenetriamine pent-acetic acid. **08**

18	42	21	21	23	27	27	30	32	32	32	36	37	41
63	88	68	67	62	60	55	58	48	48	43	43	43	42

Construct mean, median, variance and standard deviation.

b) In the study of a certain aquatic organism, a large number of samples were taken from a pond, and the number of organisms in each sample was counted. The average number of organisms per sample was found to be two. Assuming that the number of organisms follows a Poisson distribution, **06**

i) Find the probability that the next sample taken will contain one or fewer organisms.

ii) Find the probability that the next sample taken will contain three organisms.

iii) Find the probability that the next sample taken will contain more than five organisms

c) State the properties of t-distribution. **06**

UNIT - II

3 a) Explain the three main study designs used in Biostatics. **09**

b) Referring to the OC_MI data in the table below, provide a point estimate and a 95%CI for the difference between the proportion of women who develop MI among OC users and the comparable proportion among non-OC users. **08**

	MI incidence over 3 years		
OC-use group	Yes	No	Total
Current OC users	13	4987	5000
Never-OC users	7	9993	10,000
Total	20	14,980	15,000

c) Estimate the RR for breast cancer for women with a late age at first birth(≥30) compared with women with an early age at first birth(≤29) based on the data in **03**
the table below.

	Age at first birth		
Status	≥30	≤29	Total
Case	683	2537	3220
Control	1498	8747	10,245
Total	2181	11,284	13,465

UNIT - III

4 a) Examine the steps involved in the hypothesis testing procedure. **10**

b) Researchers wish to know if the data they have collected provide sufficient evidence to indicate a difference in mean serum uric acid levels between normal individuals and individuals with Down's syndrome. The data consist of serum uric readings on 12 individuals with Down's syndrome and 15 normal individuals. The means are $\overline{x_1}$ =4.5mg/100ml and $\overline{x_2}$ =3.4mg/100ml. Assume α=0.05. **10**

UNIT - IV

5 a) Six guinea pigs were injected with 0.5 mg of medicine. They had taken on an average15.4 seconds to fall asleep with an unbiased standard deviation 2.2 seconds. While six other guinea pigs injected with 1.5mg of the medicine, took on an average 11.2 seconds to fall asleep with an unbiased standard deviation of 2.6 seconds. Use the 5%level of significance to test the null hypothesis that the difference in dosage has no effect for the t-test. **10**

b) In a clinical treatment, the patients were tested to see the effect of a potential hypertensive drug. The 50patients were assigned to receive active drug and other 50 as placebo at random. Their response to treatment was categorized as favourable or unfavourable.The data is given in the table below. **10**

Treatment	Response		Total
	Unfavourable	Favourable	
Placebo	41	9	50
Drug	16	34	50
	57	43	100

Test the hypothesis that drug has a significant effect. Use α=0.05.

UNIT - V

6 a) In an ecological study, water samples were collected in alternate months to study the phytoplanktons population. The number of organisms is expressed as organisms/$1x10^3$ are given. Test the hypothesis that the number of organisms present in each sample does not depend on the particular sample using chi-square test using chi-square test. **07**

Sample numbers	No. of organisms/$1x10^3$
1	80
2	83
3	101
4	60
5	93
6	87

b) For 5 patients, temperature(X) and pulse (Y) are given in the table below. Find the correlation of coefficient for these two measurements and indicate the nature of correlation. **06**

Patient	Temperature	Pulse Y
A	102	100
B	101	90
C	100	80
D	99	70
E	98	60

c) Ten competitors in a dance competition were ranked by two judges in the following order: **07**

Judges	1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	6^{th}	7^{th}	8^{th}	9^{th}	10^{th}
Rank by 1^{st} judge	1	4	8	9	6	10	7	3	2	5
Rank by second judge	4	8	7	5	9	6	10	2	3	1

Calculate coefficient of rank correlation.

OR

7 a) Calculate the coefficient of correlation from the following data by Spearman's Rank Correlation method. **07**

Series X	20	11	24	18	20	22
Series Y	24	9	20	22	9	11

b) Find the coefficient of correlation between the variables X and Y using Karls Pearson's method. **07**

X	1	3	4	6	8	9	11	14
Y	1	2	4	4	5	7	8	9

c) Elucidate the process involved in evaluating the regression equation. **06**

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