


Name:			
Enrolment No:			
UPES End Semester Examination, December 2023			
Course: Biostatistics Program: BT-Biotechnology Course Code: HSCC2022		Semester : IV Duration : 3 Hours Max. Marks: 100	
Instructions: Attempt all questions as per instructions given in each section.			
S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	<p>How does the strategy for a case-control study differ from that of a cohort study?</p> <p>A. Case-control studies are retrospective, while cohort studies are always prospective.</p> <p>B. Randomization can be used in a cohort study, but can't be used in a case-control study.</p> <p>C. In case-control studies subjects are selected and grouped based on their disease status, but in cohort studies subjects are selected and grouped based on exposure status.</p> <p>D. The goal of cohort studies is to test an association, but case-control studies just document the frequency of risk factors.</p>	1.5	CO3
Q2	<p>What is the responsibility of researchers regarding adverse events or unanticipated problems in research studies?</p> <p>a) They are required to report adverse events to the IRB promptly</p> <p>b) They can decide whether or not to report adverse events to the IRB</p> <p>c) They must report adverse events to the funding agency only</p> <p>d) They are not required to report adverse events to anyone</p>	1.5	CO4
Q3	<p>Who typically serves as members of an Institutional Review Board (IRB)?</p> <p>a) Only medical doctors</p> <p>b) Only research participants</p> <p>c) A multidisciplinary group including scientists, ethicists, and community representatives</p>	1.5	CO2

	d) Government officials only		
Q4	What data collection method involves asking questions to individuals or groups to gather information about their opinions, behaviors, or characteristics? a) Observation b) Experiment c) Survey d) Interview	1.5	CO2
Q5	Which of the following is an example of continuous data? a) Number of siblings b) Type of car owned c) Weight of individuals in kilograms d) Blood type	1.5	CO2
Q6	What type of data can take any value within a given range and is measured on a continuous scale? a) Categorical data b) Discrete data c) Continuous data d) Ordinal data	1.5	CO1
Q7	Which of the following is an example of a disease with identifiable stages? a) The common cold b) Allergic rhinitis c) Rheumatoid arthritis d) Acute gastroenteritis	1.5	CO3
Q8	How does Public Health Surveillance contribute to early detection of health threats? a) By implementing quarantine measures b) By providing treatment to affected individuals c) By identifying and investigating unusual patterns or clusters of disease d) By distributing preventive medications	1.5	CO1
Q9	Which of the following types of diseases are commonly monitored through Public Health Surveillance? a) Only chronic diseases b) Only non-communicable diseases c) Only mental health disorders d) Communicable diseases and outbreaks	1.5	CO2
Q10	What does the term "disease spectrum" refer to in medicine? a) The range of severity of a particular disease b) The number of diseases present in a population c) The distribution of diseases across different age groups d) The variety of symptoms and manifestations associated with a disease	1.5	CO4
Q 11	Which is not a measure of central tendency (a) Arithmetic mean	1.5	CO2

	(b) Geometric mean (c) Harmonic mean (4) Variance														
Q 12	Algebraic sum of the deviations of a set of values from their arithmetic mean is zero. [True/False]	1.5	CO2												
Q 13	<table border="1" style="display: inline-table; margin-right: 20px;"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>f</td> <td>4</td> <td>5</td> <td>y</td> <td>1</td> <td>2</td> </tr> </table> <p>If the mean of the distribution is 2.6, then the value of y is (a) 24 (b) 13 (c) 8 (c) 3</p>	x	1	2	3	4	5	f	4	5	y	1	2	1.5	CO2
x	1	2	3	4	5										
f	4	5	y	1	2										
Q 14	The harmonic mean of 4, 8, 16 is (a) 6.4 (b) 6.7 (c) 6.85 (d) 7.8	1.5	CO2												
Q 15	A batsman scores runs in 10 innings 38, 70, 48, 34, 42, 55, 63, 46, 54, 44, then the mean deviation about median is (a) 8.6 (b) 6.4 (c) 10.6 (d) 9.6	1.5	CO2												
Q 16	Coefficient of correlation between observations (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1) is (a) 1 (b) -1 (c) 0 (d) None of these	1.5	CO3												
Q 17	In the following expressions $P(X = x) = \binom{n}{x} p^x (1 - p)^{n-x}, \quad x = 0, 1, 2, \dots, n$ represents (a) Probability of Success (b) Number of success (c) Number of total trials (d) Both (a) and (b)	1.5	CO3												
Q 18	For any two events A and B, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. [True/False]	1.5	CO3												
Q 19	The probability of not committing a type-II error is called (a) Probability (b) Statistical Inference (c) Power of the test (d) Null Hypothesis	1.5	CO3												
Q 20	Confidence interval is a measure of reliability of an estimate. [True/False]	1.5	CO3												

Section B
(4Qx5M=20 Marks)

Q 21	Describe the study type, features, and justify your answer.		5	CO3
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Q 22	<p>Explain the <u>process</u> shown in the Figure. Provide this process “<u>name</u>” as discussed in the class.</p> <div style="text-align: center;"> </div>	5	CO3
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Q 23	<p>Fit the linear regression line $y = a + bx$ using following data:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">8</td> <td style="padding: 5px;">4</td> <td style="padding: 5px;">5</td> <td style="padding: 5px;">-1</td> </tr> <tr> <td style="padding: 5px;">y</td> <td style="padding: 5px;">-2</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;">6</td> </tr> </table>	x	8	4	5	-1	y	-2	0	2	6	5	CO4
x	8	4	5	-1									
y	-2	0	2	6									

Q 24	<p>Write down the t-test statistics for testing of single mean. A population of cats is known to have 160 heart beats per minute. When cats were each fed on fixed quantity of a drug and data taken on their beats, the mean $\bar{x} = 147$ and standard deviation $s = 27.5$. Find if there is a change in heart beat due to drug (that is test the hypothesis $H_0: \mu = 160$ Vs $H_0: \mu \neq 160$).</p> <p>Given that: tabulate value of t-test statistics $t_{12} = 2.179$ at 5% level of significance.</p>	5	CO4
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Section C
(2Qx15M=30 Marks)

Q 25	<p>Your 36-year-old patient has just tested positive for HIV. He asks that you not inform his wife of the results and claims he is not ready to tell her yet.</p> <p>a) <u>Provide the case/condition name. What is your role legally? What would you say to your patient?</u> (5)</p> <p>A 64-year-old woman with MS is hospitalized. The team feels she may need to be placed on a feeding tube soon to assure adequate nourishment. They ask the patient about this in the morning and she agrees. However, in the evening (before the tube has been placed), the patient becomes disoriented and seems confused about her decision to have the feeding tube placed. She tells the team she doesn't want it in. They revisit the question in the morning, when the patient is again lucid. Unable to recall her state of mind from the previous evening, the patient again agrees to the procedure.</p> <p>a) <u>Provide the case name. Is this patient competent to decide? Which preference should be honored?</u> (5)</p> <p>A 22-year-old woman is admitted to the hospital with a headache, stiff neck and photophobia but an intact mental status. Lab test reveal cryptococcal meningitis, an infection commonly associated with HIV infection. When given the diagnosis, she adamantly refuses to be tested for HIV.</p> <p>b) <u>Should she be tested anyway by the medical staff? Justify.</u> (5)</p>	15	CO3
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Q 26	<p>A sample of broad bean was examined. For each bean, the length and the weight were measured and recorded. Find the coefficient of correlation between weight and length of broad beans</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">Bean no.</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">4</td> <td style="padding: 5px;">5</td> <td style="padding: 5px;">6</td> <td style="padding: 5px;">7</td> <td style="padding: 5px;">8</td> <td style="padding: 5px;">9</td> <td style="padding: 5px;">10</td> </tr> <tr> <td style="padding: 5px;">Weight (g)</td> <td style="padding: 5px;">0.7</td> <td style="padding: 5px;">1.2</td> <td style="padding: 5px;">0.9</td> <td style="padding: 5px;">1.4</td> <td style="padding: 5px;">0.2</td> <td style="padding: 5px;">1.1</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">0.9</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">0.8</td> </tr> </table>	Bean no.	1	2	3	4	5	6	7	8	9	10	Weight (g)	0.7	1.2	0.9	1.4	0.2	1.1	1	0.9	1	0.8	15	CO4
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	Length (cm)	1.7	2.2	2	2.3	2.4	2.2	2	1.9	2.1	1.6																																			
Section D (2Qx10M=20 Marks)																																														
Q 27	<p>In a study, the serum vitamin D levels was compared in individuals who experience migraine headaches with their matched controls. Studied over a period of thirty days, individuals with higher levels of serum Vitamin D were associated with lower odds of migraine headache.</p> <p>a) Find out the type of study and explain it. (5)</p> <p>b) What do you conclude in this study. Justify. (5)</p>											10	CO3																																	
Q 28	<p>Calculate the coefficient of rank correlation from the following data showing marks obtained by students in Biology and Biostatistics:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Student no.</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>Biology</td> <td>8</td> <td>36</td> <td>98</td> <td>25</td> <td>75</td> <td>82</td> <td>92</td> <td>62</td> <td>65</td> <td>35</td> </tr> <tr> <td>Biostatistics</td> <td>84</td> <td>51</td> <td>91</td> <td>60</td> <td>68</td> <td>62</td> <td>86</td> <td>58</td> <td>35</td> <td>49</td> </tr> </tbody> </table>											Student no.	1	2	3	4	5	6	7	8	9	10	Biology	8	36	98	25	75	82	92	62	65	35	Biostatistics	84	51	91	60	68	62	86	58	35	49	10	CO4
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