U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**

Branch: Medical Electronics Engineering **Duration: 3 hrs.**

Course Code: 22MD6PE2CD **Max Marks: 100**

Course: Clinical Data Analytics

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			CO	PO	Marks
		UNIT - I			
1	a)	Explain the different types of measurement scales used in biostatistics. Provide examples for each scale in the context of clinical data analysis.	*CO1*	*PO1*	**10**
	b)	Given the following data representing the systolic blood pressure (SBP) of 10 patients: 120, 130, 115, 140, 135, 125, 110, 145, 130, 120 Calculate the mean, median, and mode.	*CO2*	*PO1*	**10**
		OR			
2	a)	Discuss the significance of frequency distribution, measures of central tendency, and measures of dispersion in summarizing medical and health-related data. Provide relevant examples to support your answer.	*CO1*	*PO1*	**12**
	b)	Evaluate the significance of variance and standard deviation in understanding the variability of biological datasets. Provide relevant examples.	*CO2*	*PO1*	**08**
		UNIT - II			
3	a)	Discuss the two views of probability—objective and subjective. Analyze their significance in biostatistical applications and provide real-world examples where each approach is preferred.	*CO1*	*PO1*	**10**
	b)	Explain the elementary properties of probability with suitable examples. How do these properties help in calculating the probability of an event in healthcare research?	*CO2*	*PO1*	**10**
		OR			
4	a)	Compare and contrast binomial and Poisson distributions.	*CO2*	*PO1*	**10**

		b)	Analyze the significance of normal distribution in statistical analysis.	*CO2*	*PO1*	**10**
			UNIT - III			
	5	a)	A clinical trial compares two groups: • Group A: 40 patients, Mean heart rate = 75 bpm, Standard deviation = 10 bpm • Group B: 50 patients, Mean heart rate = 80 bpm, Standard deviation = 12 bpm Calculate the standard error of the difference in sample means.	*CO3*	*PO9*	**10**
		b)	Examine the distribution of the difference between two sample proportions. How is it utilized in comparative studies related to disease prevalence or treatment efficacy?	*CO2*	*PO1*	**10**
			OR			
	6	a)	Explain the concept of sampling distribution and its significance in statistical inference. How does it differ from a population distribution?	*CO3*	*PO9*	**10**
		b)	Analyze the distribution of the sample mean. How does the Central Limit Theorem contribute to its properties, and why is it essential in biostatistics?	*CO2*	*PO1*	**10**
			UNIT - IV			
	7	a)	Explain the process of hypothesis testing for a single population mean. Discuss its significance in biomedical research, highlighting the steps involved in statistical hypothesis testing.	*CO3*	*PO2*	**10**
		b)	Two different drug formulations are tested on two patient groups. Group A (n = 50) has a mean recovery time of 10 days with a standard deviation of 2 days, while Group B (n = 40) has a mean recovery time of 12 days with a standard deviation of 2.5 days. Perform a hypothesis test to determine if there is a significant difference between the two population means.	*CO3*	*PO3*	**10**
			OR			
	8	a)	A researcher claims that the average cholesterol level in a population is 200 mg/dL. A sample of 40 individuals shows a mean of 195 mg/dL with a standard deviation of 15 mg/dL. Perform a hypothesis test at a 5% significance level to determine if the population mean differs from 200 mg/dL.	*CO3*	*PO3*	**10**
		b)	Compare and contrast Type I and Type II errors in hypothesis testing. How do they impact the validity of statistical conclusions in healthcare studies? Provide relevant examples.	*CO3*	*PO3*	**10**

<table>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td></td><td>9</td><td>a)</td><td>Explain the concept of linear regression in biostatistics. Discuss its significance in analyzing relationships between variables in healthcare research.</td><td>CO3</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>A study investigates the relationship between daily exercise duration (in minutes) and blood pressure reduction (in mmHg) among 10 participants. The data collected is as follows:
<table>
<tr><th>Participant</th><th>Exercise Duration (minutes)</th><th>Blood Pressure Reduction (mmHg)</th></tr>
<tr><td>A</td><td>30</td><td>5</td></tr>
<tr><td>B</td><td>45</td><td>7</td></tr>
<tr><td>C</td><td>60</td><td>10</td></tr>
<tr><td>D</td><td>20</td><td>3</td></tr>
<tr><td>E</td><td>50</td><td>8</td></tr>
<tr><td>F</td><td>70</td><td>12</td></tr>
<tr><td>G</td><td>25</td><td>4</td></tr>
<tr><td>H</td><td>80</td><td>15</td></tr>
<tr><td>I</td><td>35</td><td>6</td></tr>
<tr><td>J</td><td>55</td><td>9</td></tr>
</table>
Calculate the Pearson correlation coefficient (r) between exercise duration and blood pressure reduction Also, interpret the strength and direction of the correlation.</td><td>CO4</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>10</td><td>a)</td><td>Describe the process of evaluating a regression equation. What statistical measures are used to assess the accuracy and reliability of a regression model?</td><td>CO4</td><td>PO5</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>Given the dataset below on patient weights (kg) and their corresponding blood sugar levels (mg/dL):
Patient Weight (kg) Blood Sugar (mg/dL)
A 60 110
B 70 125
C 80 130
D 90 145
E 100 160
Calculate the least-squares regression equation for predicting blood sugar levels based on patient weight. Also, determine the correlation coefficient between weight and blood sugar. Interpret your results in the context of medical diagnostics.</td><td>CO4</td><td>PO5</td><td>10</td></tr>
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