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

Autonomous Institute Affiliated to VTU

January / February 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.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Define the term measurement. When the measurement is performed under different set of rules, can we use similar scales? Justify your answer.	*CO1*	*PO1*	**10**
	b)	Construct i)Frequency distribution ii)Relative frequency distribution iii) Cumulative frequency distribution iv) Cumulative relative frequency distribution v)Histogram vi)Frequency polygon for the data given in table Q1.b. Data is the BMI values of 29 obstructive sleep apnea syndrome (OSAS) patients. Table Q1. b 33.57 27.78 40.81 38.34 29.01 47.78 54.33 28.99 25.21 30.49 27.38 36.42 29.39 24.54 41.75 44.68 24.49 33.23 29.07 28.21 42.10 26.54 27.74 33.48 30.08 26.86 41.50 47.09 31.44 32.42	*CO1*	*PO1*	**10**
		OR			
2	a)	Discuss the keys steps involved in scientific method and design of experiment.	*CO1*	*PO1*	**08**
	b)	Construct a box-and-whisker plot for the following GFR measurements taken from 19 subjects (some subjects were measured more than once) Table Q2.b 18 21 21 23 27 27 30 32 32 32 36 37 41 42 42 43 43 48 48 51 55 58 60 62 67 68 88 63 For the same data compute mean, median, variance, standard deviation and coefficient of variance.	*CO1*	*PO1*	**12**

			UNIT - II			
	3	a)	For the data given in the table Q3.a calculate the following i)P(Male ∩ Split Drugs) ii)P(Male ∪ Split Drugs) iii)P(Male) iv) P(Male | Split Drugs) Table Q3.a <table><tr><th>Gender</th><th>Split Drugs</th><th>Never Split Drugs</th><th>Total</th></tr><tr><td>Male</td><td>349</td><td>324</td><td>673</td></tr><tr><td>Female</td><td>220</td><td>128</td><td>348</td></tr><tr><td>Total</td><td>569</td><td>452</td><td>1021</td></tr></table>	*CO1*	*PO1*	**08**
		b)	Given the binomial parameters p=0.8 and n=3, show by means of the binomial expansion that ∑f(x)=1.	*CO1*	*PO1*	**04**
		c)	If the mean number of serious accidents per year in a large factory (where the number of employees remains constant) is five. Find the probability that in the current year there will be i) Exactly seven accidents ii) Ten or more accidents iii) No accidents iv) Fewer than five accidents	*CO1*	*PO1*	**08**
			OR			
	4	a)	Given two independent events A and B with probabilities P(A) = 0.5 and P(B) = 0.3, what is the probability of both events A and B occurring? List and explain the elementary properties of probability.	*C02*	*P02*	**06**
		b)	What is the law of total probability, and how can it be applied to calculate the probability of a specific event? How would you compute the probability of rolling a sum of 7 with two six-sided dice?	*C02*	*P02*	**06**
		c)	What are the key characteristics of a binomial distribution? How do you use the binomial formula to calculate the probability of getting exactly k successes in n trials?	*C02*	*P02*	**08**
			UNIT - III			
	5	a)	If the uric acid values in normal adult males are approximately normally distributed with a mean and standard deviation of 5.7 and 1 mg percent, respectively, find the probability that a sample of size 9 will yield a mean: i) Greater than 6 ii) Between 5 and 6 iii) Less than 5.2	*CO2*	*PO2*	**06**

		b)	For each of the following sampling situations indicate whether the sampling distributions of the sample proportion can be approximated by a normal distribution and explain why or why not. i) p=0.50 ,n=8 ii) p=0.40 ,n=30 iii) p=0.10 ,n=30 iv) p=0.01 n=1000 v) p=0.90 n=100 vi) p=0.05 n=150	*CO2*	*PO2*	**08**
		c)	If the mean and standard deviation of serum iron values for healthy men are 120 and 15micrograms per 100ml, respectively,what is the probability that a random sample of 50 normal men will yield a mean between 115 and 125 micrograms per 100ml?	*CO2*	*PO2*	**06**
			OR			
	6	a)	For the given μ = 50, σ = 16 and n=64, find i) $P(45 \leq \bar{x} \leq 55)$ ii) $P(\bar{x} > 53)$ iii) $P(\bar{x} < 47)$ iv) $P(49 \leq \bar{x} \leq 56)$	*CO2*	*PO2*	**08**
		b)	It is estimated by a survey that among adults 18 years old or older 53 percent have never smoked. Assume the proportion of adult who have never smoked to be 0.53. Consider the sampling distribution of the sample proportion based on simple random samples of size 110 drawn from this population. What is the functional form of the sampling distribution? Compute the mean and variance of the sampling distribution.	*CO2*	*PO2*	**07**
		c)	In national health survey the researchers found that among adult ages 75 or older, 34 percent had lost all their natural teeth and for adult ages 65-74, 26 percent had lost all their natural teeth. Assume that these proportions are the parameters for the country in those age groups. If a random sample of 200 adults ages 65-74 and an independent random sample of 250 adult ages 75 or older are drawn from these populations, find the probability that the difference in percent of total natural teeth loss is less than 5 percent between the two populations.	*CO2*	*PO2*	**05**
			UNIT - IV			
	7	a)	The average weight of all residents in Bangalore city is 168lbs.A nutritionist believes the true mean to be different. She measured the weight of 36 individuals and found the mean to be 169.5lbs with a standard deviation of 3.9. i)State the null and alternative hypothesis. ii)At a 95% confidence level is there enough evidence to discard the null hypothesis.	*CO3*	*PO3*	**10**
		b)	What are the steps in the procedure of testing the hypothesis?	*CO3*	*PO3*	**10**

			OR			
	8	a)	What is hypothesis testing, and why is it important in statistics? Describe the difference between a null hypothesis (H_0) and an alternative hypothesis (H_1).	*CO3*	*PO3*	**10**
		b)	Outline the procedure for conducting a one-sample t-test. What is the significance of the t-distribution in this context? How do you interpret the p-value in the context of a hypothesis test for a single population mean?	*CO3*	*PO3*	**10**
			UNIT - V			
	9	a)	What is meant by regression? Mention its types in detail. And explain the procedure of linear regression analysis method.	*CO4*	*PO2*	**10**
		b)	Calculate the correlation coefficient between the height of the father and the son in the given data. Test the significance of correlation coefficient and interpret the results. Height of Father: 65, 66, 57, 67, 68, 69, 70, 72 Height of son: 67, 56, 65, 68, 72, 72, 69, 71	*CO4*	*PO2*	**10**
			OR			
	10	a)	What is correlation analysis, and why is it used in statistics? Describe the key differences between correlation and prediction, which are both related to regression analysis.	*C02*	*P02*	**10**
		b)	Describe the components of the simple linear regression model, including the equation and its interpretation. What assumptions must be met for the simple linear regression model to be valid?	*C02*	*P02*	**10**

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