U.S.N.										

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

Autonomous Institute Affiliated to VTU

September / October 2023 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Industrial Engineering and Management **Duration: 3 hrs.**
Course Code: 22IM4BSSFE **Max Marks: 100**
Course: Statistics for Engineers **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.
3. Use of Statistical table permitted.

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.

		UNIT - I	*CO*	*PO*	Marks
1	a)	"All the statistical data are numerical facts but all the numerical facts are not statistical data." Comment on the above statement.	*CO1*	*PO1*	**04**
	b)	The data on the fuel blends of gasoline are as given in the table below:	*CO2*	*PO2*	**16**

88.3	94.3	92.7	92.3	89.7	92.8	88.9	86.9
93.1	88.2	89.0	91.2	93.2	84.5	85.8	90.0
90.6	94.2	91.7	92.2	87.8	91.1	92.7	87.3
96.6	88.5	90.0	87.4	85.5	90.8	88.2	92.0
97.8	89.7	94.5	87.5	87.8	88.8	89.9	92.2

i) Construct a frequency distribution for the fuel blend data. Use six bins, start value of bin 83.75 with increment of 2.5
ii) Draw the histogram and comment on the shape of the distribution of data.
iii) What are Mean, Median and Mode? What is the expected distribution you obtain?
iv) Determine the sample variance and sample standard deviation using frequency distribution

		OR			
2	a)	Explain any two of the following with examples i) Retrospective study ii) Observational study iii) Designed experiment	*CO1*	*PO1*	**04**

	b)	A transmission channel is being continuously monitored by recording the number of deviations in a string of 1000 bits. data for 20 of these strings are as given below (read the data row wise i.e from left to right, then down) 3 1 0 1 3 2 4 1 3 1 1 1 2 3 3 2 0 2 0 1 i) Construct a stem and leaf plot of the data ii) Find the sample average and sample standard deviation iii) Construct a time series Plot. Is there any evidence that there was an increase or decrease in the number of errors in a string? Comment.	*CO2*	*PO2*	**16**
		UNIT - II			
3	a)	The file transfer speed from BMS college server to student desktop computer at student's hostel on a weekend is normally distributed with a mean of 60 KBPS and a standard deviation of 4 KBPS. (i) What is the probability that a file will transfer at 70 KBPS speed or More ? (ii) What is the Probability that the file speed is less than 58 KBPS? (iii) If the file transfer speed is 1 MBPS, what is the average time it will take to transfer the file (Assume 8 bits per byte)	*CO2*	*PO2*	**10**
	b)	Suppose you have a dataset of repair times that are exponentially distributed with a mean repair time of 4 hours. What is the probability that a randomly selected repair time is greater than 6 hours?	*CO2*	*PO2*	**05**
	c)	Define the following distribution: (i) Chi-Square distribution (ii) Weibull distribution	*CO1*	*PO1*	**05**
		OR			
4	a)	Let X be the variable representing the distribution of grades in a statistics course. It can be assumed that these grades are approximately normally distributed with $\mu = 75$ and $\sigma = 10$. If the professor wants no more than 10% of the class to get an A, what should be the cutoff grade?	*CO2*	*PO2*	**04**
	b)	Determine the probability mass function of X from the following: Cumulative distribution function (CDF) = $F(x) = \begin{cases} 0 & x < -2 \\ 0.2 & -2 \le x < 0 \\ 0.7 & 0 \le x < 2 \\ 1 & 2 \le x \end{cases}$	*CO2*	*PO2*	**06**

		c)	Records of an electrical distribution system in a particular area indicate that over the past twenty years there have been just six years in which lightning has not hit a transformer. Assume that the factors affecting lightning hits on transformers have not changed over that time, and that hits occur at random and independently. Then what would be the best estimate of the average number of hits on transformers per year? In how many of the next ten years would we except to have more than two hits on transformers in a year?	*CO2*	*PO2*	**10**
			UNIT – III			
	5	a)	You are conducting a survey to estimate the average income of a population. You take random samples of 50 individuals from this population and calculate the sample mean income for each sample. If the population's income distribution has a mean of INR 50,000 and a standard deviation of INR 10,000, what is the probability that the sample mean income from one of your samples will be greater than INR 52,000?	*CO2*	*PO2*	**05**
		b)	A manufacturer produces connecting rods for an SUV. it is known that rod diameter is normally distributed with $\sigma = 0.0010$ millimeters. A sample of 15 rods has a mean diameter of $\bar{x} = 74.036\ millimeter$. (i) Construct a 99% two sided – confidence interval on the mean connecting rod diameter. (ii) construct a 95% lower – confidence interval on the mean connecting rod.	*CO3*	*PO3*	**08**
		c)	List reasons for having good estimators in statistics. Also explain any two properties	*CO1*	*PO1*	**07**
			UNIT - IV			
	6	a)	With suitable examples explain Type – I error, Type – II error, Null Hypothesis and Alternate hypothesis	*CO1*	*PO1*	**08**
		b)	The diameter holes for automobile cables are know to have $\sigma = 0.020$ inches. A random samle of size 10 yields the following data: 1.76 1.69 1.74 1.73 1.76 1.77 1.75 1.78 1.75 1.76 Assume level of significance of 0.01 (i) Test the hypotheses that the mean diameter is 1.75 inches (ii) Determine the p – value from the test	*CO3*	*PO3*	**08**
		c)	If the error in estimating the mean burning rate of liquefied petroleum gas is less than 1.5 mm / sec with 95% confidence level given $\sigma = 2$ mm / sec. determine the required sample size.	*CO2*	*PO2*	**04**

			UNIT - V			
	7	a)	You are studying the relationship between the number of years of experience (independent variable) and salary (dependent variable) for a group of employees. You have the following data: Years of Experience: [2, 3, 5, 7, 10] Corresponding Salaries (in thousands of rupees): [50, 60, 75, 85, 100] a) Draw the scatter plot b) Calculate the slope and intercept of the regression line. c) Determine the coefficient of correlation. d) Perform a t-test to determine if the slope of the regression line is significantly different from zero (assume significance level = 0.05)	*CO2, CO3*	*PO2, PO3*	**12**
		b)	Define the following terms: i) Factor ii) ANOVA iii) Coefficient of determination iv) Types of data analytics	*CO1*	*PO1*	**08**

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