Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III(NEW) EXAMINATION – SUMMER 2023

Subject Code:3130006   **Date:24-07-2023**
Subject Name:Probability and Statistics
Time:02:30 PM TO 05:00 PM   **Total Marks:70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	A study showed that 65% of managers had some business education and 50% had some engineering education. Furthermore 20% of managers had some business education but no engineering education. What is probability that a manager has some business education, given that he has some engineering education?	**03**
	(b)	Two computer A and B are to be marketed. A salesman who is assigned the job of finding customers for them has 60% and 40% chances respectively of succeeding in case of Computer A and B. The Computers can be sold independently. Given he was able to sell at least one computer, what is the probability that computer A has been sold?	**04**
	(c)	In a post office, three clerks are assigned to process incoming mails. The first clerk B_1 processes 40%, the second clerk B_2 processes 35% and the third clerk B_3 processes 25% of the total mails. The first clerk has an error rate of 0.04, the second has an error rate of 0.06 and the third has an error rate of 0.03. A mail selected at random from a day's output is found to have an error. The Post Master wishes to know the probability that the mail was processed by the first, second or third clerk respectively.	**07**

Q.2	**(a)**	The incidence of occupational disease in an industry is such that the workers 20% chance of suffering from it. What is the probability that out of six workers 4 or more will contract disease?	**03**

	(b)	On an average one in 400 times items is defective. If the items are packed in boxes of 100, what is the probability, that any given box of items will contain
		   a) No defective
		   b) Less than two defectives
		   c) One or more defectives
		   d) More than three defectives.
			04

	(c)	The average daily sales of 500 branch offices was Rs. 150 thousand and the standard deviation Rs. 15 thousand. Assuming the distribution to be normal, indicate how many branches have sales between:
		   1. Rs. 120 thousand and Rs. 145 thousand.
		   2. Rs. 140 thousand and Rs. 165 thousand.
		$\begin{bmatrix} P(0 < z < 3.3) = 0.4772, P(0 < z < 2) = 0.1293, \\ P(0 < z < 0.67) = 0.2486, P(0 < z < 1) = 0.3413 \end{bmatrix}$	

		OR	
	(c)	In a Normal distribution 31% of the items are under 45 and 8% are above the 64. Find mean and standard deviation of the distribution.	**07**

Q.3 **(a)** The mean monthly salary paid to all employees in a company is Rs. 1600. The mean monthly salaries paid to technical and non-technical employees are Rs. 1800 and Rs. 1200 respectively. Determine the percentage of technical and non-technical employees of the company.   **03**

(b) Calculate average deviation from mean from the following data: **04**

Sales	10-20	20-30	30-40	40-50	50-60
No. of days	3	6	11	3	2

(c) The median and mode of the following wage distribution are Rs. 33.5 and Rs. 34 respectively. However, three frequencies are missing. Determine their values.   **07**

Wages	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
f	4	16	f_0	f_1	f_2	6	4	230

OR

Q.3 **(a)** The following data relate to the sales of 100 companies: **03**

Sales	Below 60	60-62	62-64	64-66	66-68	68-70	70-72
No. of Companies	12	18	25	30	10	3	2

Calculate the value of modal sales.

(b) The following data relate to the profits of 1000 companies.   **04**

Profits	100-120	120-140	140-160	160-180	180-200	200-220	220-240
No. of Companies	17	53	199	194	327	208	2

Calculate the coefficient of skewness and comment on its value.

(c) The profits earned by 100 companies during 1998-99 are given below. Calculate $Q_1, median, D_4$ and P_{80}.   **07**

Profits	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of Companies	4	8	18	30	15	10	8	7

Q.4 **(a)** Find correlation of coefficient between the sales and expenses from the data given below: **03**

Firm	1	2	3	4	5	6	7	8	9	10
Sales	50	50	55	60	65	65	65	60	60	50
Expense	11	13	14	16	16	15	15	14	13	13

(b) Two housewives, Geeta and Rita, asked to express their preferences for different kinds of detergents, gave the following replies.   **04**

Detergent	A	B	C	D	E	F	G	H	I	J
Geeta	4	2	1	3	7	8	6	5	9	10
Rita	4	1	2	3	8	7	5	6	9	10

To what extent the preferences of these two ladies go together?

(c) Obtain both the regression equations form the data given below.   **07**

X	1		2	3	45	6	7	8	9
Y	9	8	10	12	11	13	14	16	15

Also calculate the coefficient of correlation.

OR

Q.4 **(a)** Find the coefficient of correlation by Karl Pearson's method between X and Y and interpret the values.   **03**

X	57	42	40	33	42	45	42	44	40	56	44	43
Y	10	60	30	41	29	27	27	19	18	19	31	29

(b) An examination of eight applicants for a clerical post was taken by a firm. From the marks obtained by the applicants in the accountancy and statistics papers, compute the rank coefficient of correlation. **04**

Applicant	A	B	C	D	E	F	G	H
Marks in accountancy	15	20	28	12	40	60	20	80
Marks in Statistics	40	30	50	30	20	10	30	60

(c) In a partially destroyed laboratory record of an analysis of correlation data the following results are eligible. **07**
$Variance\ of\ X = 9, 8x - 10y + 66 = 0, 40x - 18y = 214$.
Find on the basis of the above information:
1. The mean values of X and Y.
2. Coefficient of correlation between X and Y
3. Standard deviation of Y.

Q.5 **(a)** The mean lifetime of a sample of 100 light tubes produced by a company is found to be 1580 hours with standard deviation of 90 hours. Test the hypothesis that mean lifetime of the tube produced by the company is 1600 hours. (The critical value of z at 5% level of significance is ± 1.96). **03**

(b) Two salesman A and B are working in a certain district. From a sample survey conducted by the Head office, the following results were obtained. State whether there is any significant difference in the average sales between the two salesmen? **04**

	A	B
No. of sales	20	18
Average sales	170	205
Standard deviation	20	25

The table value of t at 5% level of significance and 36 df is 1.9

(c) Fit a curve $y = ab^x$ to the following data. **07**

x	2	3	4	5	6	8
y	8.3	15.4	33.1	65.2	126.4	146

OR

Q.5 **(a)** The Prices of shares of a company on the different days in a month were found to be : **03**
$$66, 65, 69, 70, 69, 71, 70, 63, 64, and\ 68.$$
Test whether the mean price of the shares in the month is 65. (The table value of t for 9 degrees of freedom at 5% level of significance is 1.833.)

(b) In random sample of 100 persons taken from village A, 60 are found to be consuming tea. In another sample of 200 persons taken from village B, 100 persons are found to be consuming tea. Do the data reveal significant difference between the two villages as far as the habit of consuming tea is concerned? (The critical value of z at 5% level of significance is ± 1.96). **04**

(c) Fit a second degree parabola to the following data: **07**

x	1	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1