Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– III EXAMINATION – SUMMER 2026

Subject Code:3130006 Date:03-07-2026

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 committee of 4 people is to be appointed from 3 teachers, 4 health officers, 2 security personnel and 1 chartered accountant. Find the probability of forming the committee so that the chartered accountant is mandatorily present in the committee.	**03**
	(b)	A student doing his online homework on a regular basis has a chance of 83 percent to get a good grade; but the chance drops to 58 percent if he doesn't do the homework regularly. The student figures out that he has only 69 percent chance of doing the homework regularly. What is his chance of not getting a good grade in the course?	**04**
	(c)	From a vessel containing 3 white and 5 black balls, 4 balls are transferred into an empty vessel. From this new vessel, a ball is drawn and is found to be white. What is the probability that out of the 4 balls transferred, 3 are white and 1 is black?	**07**
Q.2	**(a)**	Two variates have the regression lines as x + 4y + 3 = 0 and 4x + 9y + 5 = 0. Find the correlation coefficient.	**03**
	(b)	If $p(x) = x/15$; $x = 1, 2, 3, 4, 5$ $= 0$, otherwise (i) Find $P(X = 1 \text{ or } 2)$ (ii) Find $P(1/2 < X < 5/2 \mid X > 1)$	**04**
	(c)	A car hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days on which (i) neither car is used (ii) some demand is refused.	**07**
		OR	
	(c)	The joint probability function of X and Y is given as f (x, y) = $e^{-(x+y)}$, $0 \le x < \infty, 0 \le y < \infty$. Evaluate P (1 < X + Y < 2).	**07**
Q.3	**(a)**	A random variable X with unknown probability distribution has a mean 8 and standard deviation 3. Evaluate the bounds on P (- 4 < X < 20).	**03**
	(b)	Fit the curve $y = ax^b$ to the given data:	**04**

x	61	26	7	2.6
y	350	400	500	600

(c)	Find the coefficient of variation of the marks obtained by the students of a college:				**07**
	Marks	: 20-30	30-40	40-50	50-60	60-70
	No. of Students :	2	35	46	12	5

OR

Q.3 **(a)** A sample of 12 fathers and their eldest sons gave the following data about their height in inches. Calculate coefficient of rank correlation. **03**

Father: 65 63 67 64 68 62 70 66 68 67 69 71
Son : 68 66 68 65 69 66 68 65 71 67 68 70

(b) An incomplete frequency distribution is given with N = 229 and median = 46. Determine the missing frequencies. **04**

Obs.	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Freq.	12	30	?	65	?	25	18

(c) Obtain the line of regression of monthly sales (Y) on advertisement expenditure (X) and estimate the monthly sales when the company will spend Rs. 50,000 on advertisement, if the data on X and Y are as follows: **07**

Y (in lac) : 74 76 60 68 79 70 71 94
X (in thousand) : 43 44 36 38 47 40 41 54

Q.4 **(a)** The arrival rate of cars at a gas station is 40 customers per hour. What is the probability of having no arrival of cars in a 5 minute interval? **03**

(b) The standard deviations calculated from two random samples of sizes 9 and 13 are 2.1 and 1.8 respectively. May the samples be regarded as drawn from normal populations with the same standard deviation? (Test at 5% significance level) **04**

(c) In a flu epidemic, 500 persons contracted the disease. 200 receives no serum treatment and of these 75 died. Of those who did receive serum treatment, 65 died. Was the serum treatment effective? Use χ^2 test at 1% significance level. **07**

OR

Q.4 **(a)** In a distribution exactly normal, 10.03% of the items are under 25 kg weight and 89.97% of the items are under 70 kg weight. What are the mean and standard deviation of the distribution? **03**

(b) A machine produced 20 defective articles in a batch of 400. After overhauling, it produced 10 defectives in a batch of 300. Has the machine improved? (Test at 5% level of significance) **04**

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

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

Q.5 **(a)** The mean weekly sales of soap bars was 146.3 bars per store. After an advertising campaign, the mean weekly sales in 22 stores for a typical week increased to 153.7 with standard deviation of 17.2. Was the advertising campaign successful? (Test at 5% level) **03**

(b) A test is carried out to check the efficiency of both the factories ascertaining the variability of the life of the bulbs produced by each factory. The results are as follows: **04**

	Factory A	Factory B

Standard deviation of lifetime (hours)	240	220
No. of bulbs in sample	100	200

Determine whether the difference between the variability of life of light bulbs from the two factories is significant (Test at 1% level).

(c) In his experiments on pea-breeding, Mendel obtained the following frequencies of seeds: **07**

Class	Observed Frequency
Round and yellow	315
Wrinkled and yellow	101
Round and green	108
Wrinkled and green	32
Total	556

Theory predicts that the frequencies should be in the proportions 9 : 3 : 3 : 1. Use χ^2 test to examine the correspondence between theory and observations at 5% significance level.

OR

Q.5 **(a)** The correlation coefficient between income and food expenditure for sample of 7 household from a low income group is 0.9. Using 1% level of significance, test whether the correlation coefficient between incomes and food expenditure is positive. Assume that the population of both variables are normally distributed. **03**

(b) A machine part was designed to withstand an average pressure of 120 units. A random sample of size 100 from a large batch was tested and it was found that the average pressure which these parts can withstand is 105 units with a standard deviation of 20 units. Test at 1% significance level whether the batch meets the specification. **04**

(c) The following table gives the joint distribution of X and Y: **07**

X \ Y	0	1	2
1	0.3	0.2	0.1
2	0.1	0	0.3

Are X and Y independent?

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