Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2021

Subject Code:3130006 Date:06/09/2021

Subject Name:Probability and Statistics

Time:10:30 AM TO 01:00 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)**	An MBA applies for a job in two firms X and Y. The probability of his being selected in firm X is 0.7 and being rejected in Y is 0.5. The probability of at least one of his applications being rejected is 0.6. What is the probability that he will selected in one the firms?	**03**
	(b)	A study showed that 65% of managers had some business education and 50% had some engineering education. Furthermore 20% the managers had some business education but no engineering education. What is the probability that a manager had some business education, given that he has some engineering education?	**04**
	(c)	A manufacturing firm produces steel pipes in three plants with daily production volume of 500, 1000, 2000 units respectively. According to past experience it is know that the fractions of defective output produced the three plants are respectively 0.05, 0.08, and 0.10. If a pipe is selected from a day's total production and found to be defective. What is the probability that it came from the first plant? Also find out from which plant the defective pipe comes.	**07**
Q.2	**(a)**	The probability that an item produced by a machine will be defective is $\frac{1}{10}$. If 12 such items are produced, find the probability that (i) Exactly one will be defective, (ii) at least two will be defective (iii) None of the item is defective.	**03**
	(b)	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 $\mu = 1.5$. Calculate the proportion of days on which neither car is used and proportion of days on which some demand is refused. $(e^{-1.5} = 0.2231)$	**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 a) Rs. 120 thousand and Rs. 145 thousand b) Rs. 140 thousand and Rs. 165 thousand. P(0<z<2)=0.4772, P(0<z<0.33)=0.1293, P(0<z<1)=0.2486	
		OR	
	(c)	Accidents occur with a Poisson distribution at an average 2 per week. Then a) Obtain the probability of more than 3 accidents during a week. b) What is the probability that at least two weeks will elapse between accidents.	**07**
Q.3	**(a)**	A fair die is thrown 300 times. Find the lower bound for the probability of getting 30 to 60 sixes.	**03**

(b) Find the quartile deviation and its coefficients. Also find inter quartile range and coefficient of variations. **04**

Marks	< 35	35-37	38-40	41-43	> 43
Students	8	16	13	8	5

(c) The following data relate to the profits of 1,000 companies: **07**

Profits Rs. in thousands	100-120	120-140	140-160	160-180	180-200	200-220	220-240
No. of companies	17	53	199	194	327	208	02

Calculate the coefficient of skewness.

OR

Q.3 **(a)** Following is the table showing number of visitors in 180 days to a zoo. Obtain average number of visitors per day. **03**

Marks	1-10	11-20	21-30	31-40	41-50	51-60
Students	22	28	35	45	30	20

(b) Define moments about the assumed mean A. Obtain fist four moments about arbitrary origin from the following table, **04**

Scorers	50-60	60-70	70-80	80-90	90-100
Players	8	11	18	09	04

(c) Find the mean, median and mode from the following table. **07**

class	50-53	53-56	56-59	59-62	62-65	65-68	68-71	71-74	74-77
frequency	3	8	14	30	36	28	16	10	3

Q.4 **(a)** Airscrew escape systems powered by a solid propellant. The burning rate of this propellant is an important product characteristics. Specifications require that the mean burning rate must be $\mu = 50$ centimeters per second and standard deviation of burning rate $\sigma = 2$ centimeters per second. The experimenter choose $\alpha = 0.05$ level of significance and selects random sample of $n = 25$ and obtain a sample average of $\bar{x} = 51.3$ centimeters per second. What conclusions should be drawn? ($z_{0.025} = \pm 1.96$) **03**

(b) Psychological tests of intelligence and of engineering ability were applied to 10 students as per the following data. Find the coefficient of correlation. **04**

Intelligence ration	105	104	102	101	100	99	98	96	93	92
Engineering ability	101	103	100	98	95	96	104	92	97	94

(c) The following table gives the aptitude test scores and productivity indices of 10 workers selected at random **07**

Aptitude scores	60	62	65	70	72	48	53	73	65	82
Productivity index	68	60	62	80	85	40	52	62	60	81

Estimate (i) the productivity index of a worker whose test score is 0.92 (ii) the test score of a worker whose productivity index is 0.75.

OR

Q.4 **(a)** You are working as a purchase manager for a company. The following information has been supplied to you by two manufactures of electric bulbs. **03**

	Company A	Company B
Mean life in hours	1300	1248
Standard deviation	82	93

Sample size	100	100

Which brand of bulbs are you going to purchase if you desire to take a risk at 5%? ($Z_{0.05} = \pm 1.96$)

(b) An examination of eight applicants for a critical post was given by a firm. From the marks obtained by the applicants in the Accountancy and Statistics papers, compute rank coefficient correlations. **04**

Marks in accountancy	15	20	28	12	40	60	20	80
Marks in statistics	40	30	50	30	20	10	30	60

(c) In partially destroyed laboratory record of an analysis of correlation data, the following results are eligible. **07**

- Variance of *x*, $\sigma_x^2 = 9$
- Two line of regressions: 8x-10y+66=0, 40x-18y=214.

From the above obtain mean values of *x* and *y*, the standard deviation of *y* and correlation coefficient.

Q.5 (a) 500 units from a factory are inspected and 12 are found to be defective, 800 units from another factory are inspected and 12 are found to be defective. Can it be concluded at 5% level of significance that production at second factory is better that in first factory. ($Z_{0.05} = \pm 1.96$) **03**

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

	A	**B**
Number of sales	20	18
Average sales in Rs.	170	205
Standard deviation in Rs.	20	25

The critical value of t at 5% level of significance and 36 degree of freedom is more than 36.

(c) A simply supported beam carries a concentrated load P(lb) at its mid-point. Corresponding to various values of P the maximum deflection y (in) is measured. The corresponding table is given below. Find the low of the $y = a + bP$. **07**

P	100	120	140	160	180	200
y	0.45	0.55	0.60	0.70	0.80	0.85

OR

Q.5 (a) A random sample of size 15 from a bivariate normal population gave correlation coefficient *r*=0.5. Is this indicate the correlation in the population? Choose $\alpha = 0.05$ as level of significance, $\left[t_{(\alpha/2,13)} = 2.160\right]$ **03**

(b) By the method of least square fit a curve of the form $y = ax^b$ to the following data. **04**

x	2	3	4	5
y	27.8	62.1	110	161

(c) The number of defects in printed circuit board is hypothesized to follow Poisson distribution. A random sample of *n*=60 printed board has been collected and the following number of defects observed. **07**

Number of defects	0	1	2	3
Observed frequency	32	15	09	04

Use chi-square distribution to test the claim that the number defects follows the Poisson distribution. $\chi^2_{(0.05,1)} = 3.84$

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