

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA – SEMESTER-III– • EXAMINATION – SUMMER - 2017

Subject Code: 630003

Date: 02-06-2017

Subject Name: Statistical Methods

Time: 02:30 pm - 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.

- Q.1 (a)** State only the meaning of the following terms: **07**
- (i) Ogive
 - (ii) Empirical Rule
 - (iii) Bar Graph
 - (iv) Mutually Exclusive Events
 - (v) Conditional Probability
 - (vi) Conditions for using Binomial Distribution
 - (vii) Coefficient of Determination
- (b)** State whether the following statements are 'true' or 'false' and rewrite the false statement in its correct form: **07**
- (i) The value of every observation in the data set is taken into account when we calculate its median.
 - (ii) The difference between the highest and the lowest observations in the data set is called the inter quartile range.
 - (iii) " $Q_1 = P_{25}$ "
 - (iv) Sum of squares of deviations taken from mean is always positive.
 - (v) Correlation coefficient is independent of unit of measure.
 - (vi) If two events A and B are independent, conditional probability $p(A|B) = p(A \cap B)$.
 - (vii) The mean of a binomial distribution is 3 and its variance is 4.
- Q.2 (a)** Answer the following questions: **07**
- (i) Find Standard deviation for binomial distribution if $n=10$ and $p=0.3$.
 - (ii) What is the chance of getting at least one defective item if 3 items are drawn randomly from a lot containing 6 items of which 2 are defective items?
 - (iii) If $P(A)=a$, $P(B)=b$, and $P(A \cap B) = c$ then find the value of $P(A' \cap B')$.
 - (iv) If 'A' and 'B' are mutually exclusive events, then what is the value of $P(A \cap B)$?
 - (v) Consider a sample with data values of 27, 25, 20, 15, 30, 34, 28 and 25 then what is 65th percentile?

- (vi) Following are the wages of 8 workers in rupees:
50, 62, 40, 70, 45, 56, 32 and 45 then if one of the workers is selected at random, what is the probability that his wages would be lower than the average wages?
- (vii) If $\sigma = 9.65$ and error is 2 then at 95% confidence level, then what will be the sample size? (You may take the critical value as 1.96)

- (b) A questionnaire provides 58 Yes, 42 No, and 20 no-opinion answers. Construct frequency, relative frequency and percent frequency distributions. Also construct bar-graph and pie-chart. **07**

OR

- (b) From the following frequency distribution compute Sample Mean, Sample Variance, Sample Standard Deviation and Coefficient of Variation: **07**

Class	3 – 7	8 – 12	13 – 17	18 - 22
Frequency	4	7	9	5

- Q.3 (a)** Consider the following data to answer the questions given hereinafter: **07**

X_i	7	4	8	6	5
Y_i	6	5	9	8	2

- (i) Find out the covariance between ' X_i ' and ' Y_i '.
- (ii) Find out the coefficient of correlation between ' X_i ' and ' Y_i '.

- (b) There are 3 families having the following number of children: **07**

Family 1: 3 girls and 1 boy

Family 2: 2 girls and 2 boys

Family 3: 2 girls and 3 boys

- (i) If one child is selected at random from each family, what is the probability that the group selected consists of 1 girl and 2 boys?
- (ii) If one child is selected at random from each family, what is the probability that the group selected consists of 2 girls and 1 boy?
- (iii) If one child is selected at random from each family, what is the probability that the group selected consists of all 3 girls?
- (iv) If one child is selected at random from each family, what is the probability that the group selected consists of all 3 boys?

OR

- Q.3 (a)** Given the five observations for two variables x and y: **07**

x_i	3	12	6	20	14
y_i	55	40	55	10	15

The estimated regression equation for these data is $\hat{y} = 68 - 3x$.

- (i) Compute SSE, SST and SSR.
- (ii) Find the coefficient of determination r^2 . Comment on the goodness of fit.
- (iii) Also find the coefficient of correlation.

- (b) On the basis of information given by a reliable source there was a plan for sudden raid on shops in an area by the government authorities. The shops that were decided to be raided were 275 out of the 500 shops in the area. The raid included both small shops and big shops. These shops were noted for their sales of smuggled goods as well as non-smuggled goods. The following is the estimated classification based on the information given:

Goods	Shops		Total
	Big (A)	Small (B)	
Non-smuggled goods (C)	125	100	225
Smuggled goods (D)	175	100	275
Total	300	200	500

- (1) Prepare the table showing all joint and marginal probabilities.
- (2) A shop is selected at random –
 - (i) If it is a small shop, what is the probability that it sells smuggled goods?
 - (ii) Given that it is a Non-smuggled goods selling shop, what is the probability that it is a big shop?

- Q.4 (a)** Military radar and missile detection systems are designed to warn a country of an enemy attack. A reliability question is whether a detection system will be able to identify an attack and issue a warning. Assume that a particular detection system has a 0.90 probability of detecting a missile attack. Use the binomial probability distribution to answer the following questions. 07

- (1) What is the probability that a single detection system will detect an attack?
- (2) If two detection systems are installed in the same area and operate independently, what is the probability that at least one of the systems will detect the attack?
- (3) If three systems are installed, what is the probability that at least one of the systems will detect the attack?
- (4) Would you recommend that multiple detection systems be used? Explain.

- (b) An average of 15 aircraft accidents occur each year. Use Poisson Distribution to answer the following questions: (Given: $e^{-1.25} = 0.2865$) 07

- (1) Compute the mean number of aircraft accidents per month.
- (2) Compute the probability of no accidents during a month.
- (3) Compute the probability of exactly one accident during a month.
- (4) Compute the probability of more than one accident during a month.

OR

- Q.4 (a)** Find out $E(X)$, $V(X)$ and Standard Deviation for the following probability distribution: 07

Demand (x)	1	2	3	4	5	6
Probability	0.10	0.15	0.20	0.25	0.18	0.12

- (b) A coin is tossed 900 times. Using the normal approximation of the binomial distribution, find the probability that the number of heads is between 435 and 465. 07

Q.5 (a) 200 digits were selected at random from a set of tables. The frequencies of the digits were as follows:

07

Digits	0	1	2	3	4	5	6	7	8	9
Frequencies	18	19	23	21	16	25	22	20	21	15

Use chi-square test to assess the correctness of the hypothesis that digits were distributed in equal numbers in the table from which these were chosen. (Given: The critical value of χ^2 at 5% level of significance for 9 degrees of freedom is 16.919)

- (b)** A candidate for election made a speech in city A but not in city B. A sample of 500 voters from city A showed that 59.6% of the voters were in favour of him. Whereas a sample of 300 voters from city B showed that 50% of the voters favoured him. Using Z – Test discuss whether his speech would produce any effect on voters in city A? [Use 5% level of significance. Given: The critical value of Z for two tailed test is 1.96 and for one tailed test is 1.645]

07

OR

Q.5 (a) From the adult male population in 4 large cities, random samples of sizes given below were taken and the number of married and single men recorded. Using χ^2 test, state whether the data indicate any significant variation among the cities in the tendency of men to marry.

07

	Cities			
	A	B	C	D
Married	137	164	152	147
Single	32	57	56	35

(Given: The critical value of χ^2 at 5% level of significance for 3 degrees of freedom is 7.815)

- (b)** Two types of batteries are tested for length of time and following data are obtained:

07

Type	Sample	Mean (hrs.)	Variance
A	9	600	121
B	8	640	144

Is there a significant difference between the two means? (Use 't' – Test) [Given: The critical value of 't' at 5 % level of significance for 15 degrees of freedom is 1.753]
