

[This question paper contains 11 printed pages.]

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Your Roll No.

M.Com./Semester I (OC)

F

Paper 6102 : Statistical Analysis

Time : 3 Hours

Maximum Marks : 100

(Write your Roll No. on the top immediately
on receipt of this question paper.)

Attempt All questions.

All questions carry equal marks.

1. (a) Explain the addition rule and multiplication rule of probability. (6)
- (b) In a survey of MBA students, the following data were obtained on "students' first reason for application to an MBA institute"

Reason for Application

	Brand name	Cost or Convenience	Other	Total
Full Time	421	393	76	890
Part Time	400	593	46	1039
Total	821	986	122	1929

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- (i) On the basis of marginal probabilities, what is the most important reason for choosing an institute?
- (ii) If a student goes full time, what is the probability that the brand name is the first reason for choosing an institute?
- (iii) If a student goes part time, what is the probability that the brand name is the first reason for choosing an institute?
- (iv) If a student gives cost or convenience as the first reason for choosing an institute, what is the probability that he is a full time student?
- (v) Let A denote the event that a student is full time and let B denote the event that the student lists brand name as the first reason for applying. Are events A and B independent? Justify your answer. (7)
- (c) A customer service supervisor regularly conducts a survey of customer satisfaction. The results of the latest survey indicate that 8% of customers were not satisfied with the service they received at their last visit to the store. Of those who are not satisfied, only 22 % return to the store within a year. Of those who are satisfied, 64% return within a year. A customer has just entered the

store. In response to your question, he informs you that it is less than 1 year since his last visit to the store. What is the probability that he was satisfied with the service he received? (7)

OR

(d) Distinguish between the classical and relative frequency approach to probability. (6)

(e) A marketing research firm specializes in providing assessments of the prospects for kids apparel shops in shopping malls. The prospects are assessed as good, fair or poor. Records from previous assessments show that 60% of the time the prospects were rated as good, 30% of the time fair and 10% of the time poor. Of those rated good, 80% made a profit the first year; of those rated fair, 60% made a profit the first year; and of those rated poor, 20% made a profit the first year.

(i) XYZ Ltd. was a client of this firm and made a profit last year. What is the probability that it was given an original rating of poor?

(ii) If XYZ Ltd. did not make a profit last year, what is the probability that it was given an original rating of fair? (7)

- (f) (i) If events A and B are independent, will $P(A|B)$ be greater than, less than, or equal to $P(A)$? Explain.
- (ii) The probability that a new marketing approach will be successful is 0.6. The probability that expenditure for developing the approach can be kept within the original budget is 0.5. The probability that both the objectives can be achieved is 0.3. Determine whether the events are independent or dependent? (7)
2. (a) What are the conditions for using a binomial distribution? Explain. (6)
- (b) A survey in a city showed that 9% of undergraduate students carry credit card balances greater than Rs. 70,000. Suppose 10 undergraduate students are selected randomly to be interviewed about credit card usage.
- (i) What is the probability that two of the students will have a credit card balance greater than Rs.7000? (6)
- (ii) What is the probability that none will have a credit card balance greater than Rs. 7000? (7)

- (c) The daily number of visitors to a web site follows a normal distribution with mean 15,830 and standard deviation 458. The average number of visitors on 10 randomly chosen days is computed. What is the probability that the estimated average exceeds 16,000? (7)

OR

- (d) Distinguish between statistics and parameters. Give examples. (6)
- (e) The number of pages printed before replacing the cartridge in a laser printer is normally distributed with a mean of 11,500 pages and a standard deviation of 800 pages. A new cartridge has just been installed.
- (i) What is the probability that the printer produces more than 12,500 pages before this cartridge must be replaced?
- (ii) What is the probability that the printer produces fewer than 9,500 pages? (7)
- (f) A media research firm reported that the household mean television viewing time during the 8 p.m. to 11 p.m. time period is 8.5 hours per week. Given a sample size of 300 households and a population standard deviation of 3.5 hours, what is the 95%

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confidence interval estimate of the mean television viewing time per week during the 8 p.m. to 11 p.m. time period? (7)

3. (a) What are the advantages and disadvantages of using non-parametric tests? Explain. (8)

(b) A tax firm is interested in comparing the quality of work at two of its regional offices. By randomly selecting samples of tax returns prepared at each office and verifying the sample returns' accuracy, the firm will be able to estimate the proportion of erroneous returns prepared at each office. Independent random samples from the two offices provide the following information:

	Sample size	Number of returns with errors
Office 1	250	35
Office 2	300	27

Conduct a hypotheses test to determine whether the error proportions differ between the two offices. ($\alpha=0.10$) (12)

OR

(c) Explain the procedure for hypotheses testing. (8)

(d) In an experiment to determine which of two cars (A and B) is perceived to have the more

comfortable ride, 15 people rode (separately) in the back seat of each of these two cars. They were then asked to rate the ride on a 5-point scale, with a higher rating indicating more comfort. The results are given below. Use the sign test to decide if it is reasonable to conclude at 5% level of significance that car A is perceived to be more comfortable than car B?

Comfort ratings

Respondent	Car A	Car B	
1	4	5	
2	2	1	
3	5	4	
4	3	2	
5	2	1	
6	5	3	
7	1	3	
8	4	2	
9	4	2	
10	2	2	
11	3	2	
12	4	3	
13	2	1	
14	3	4	
15	2	1	(12)

4. (a) Explain the concept of p-chart in quality control. (8)

(b) A management behavior analyst has been studying the relationship between male/female supervisory structure in the workplace and the level of employees' job satisfaction. The results of his recent survey are shown below.

Level of satisfaction	Boss/employee			
	Female/Male	Female/Female	Male/Male	Male/Female
Satisfied	21	25	54	71
Neutral	39	49	50	38
Dissatisfied	31	48	10	11

Is there sufficient evidence to infer that the level of job satisfaction depends on the boss/employee gender relationship? (Use a 10% significance level) (12)

OR

- (c) Distinguish between a point estimate and interval estimate. Which one is considered better and why? (8)

(d) A pharmaceutical manufacturer needs to control the concentration of the active ingredient in a certain formulation. The concentration should be around 10%. A quality control engineer tests 3 observations from each of the last 10 batches of formulations and records the following results

Batch	\bar{x}	R
1	10.3	0.15
2	10.4	0.53
3	10.5	0.69
4	10.2	0.45
5	9.75	0.55
6	10.4	0.71
7	10.3	0.9
8	10.4	0.68
9	10.2	0.11
10	10.2	0.24

Construct an \bar{X} chart and comment on quality control.
(12)

5. (a) Explain the concept of coefficient of determination.
(8)

(b) The temperature at which a plant is maintained is believed to affect the rate of production. The table below gives the number of units produced in one hour when the production process in the plant was

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operating at three different temperature levels. Do these data suggest that there is a difference in the production levels for different temperature levels? (Use significance level of 5%).

Sample from 68° F	Sample from 72° F	Sample from 76° F
10	7	3
12	6	3
10	7	5
9	8	4
	7	

(12)

OR

(c) What are Type I and Type II errors in hypotheses testing? Explain. (8)

(d) For the given set of data,

(i) calculate the multiple regression equation.

(ii) Predict Y when $X_1 = 3.0$ and $X_2 = 2.7$

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Y	X_1	X_2	
25	3.5	5.0	
30	6.7	4.2	
11	1.5	8.5	
22	0.3	1.4	
27	4.6	3.6	
19	2.0	1.3	(12)