

(6 pages)

MAY 2012

P/ID 6002/MBB

Time : Three hours

Maximum : 80 marks

PART A — (8 × 5 = 40 marks)

Answer any EIGHT questions.

All questions carry equal marks.

1. Find the inverse of the following matrix

$$A = \begin{bmatrix} 10 & 20 \\ 15 & 8 \end{bmatrix}.$$

2. What is the rank of a matrix? Illustrate it with an example.
3. The arrival rate of vehicles at the raw materials stores of a company follows Poisson distribution and it is 5 vehicles per hour. What is the probability that the number of vehicles arrived at the stores is less than 3? Service rate is 4 per hour.
4. Illustrate Maxmin principle with an example.

5. Differentiate the following :

$$y = \frac{(2X^2 + X - 20)}{\text{Log}X}.$$

6. Distinguish between risk and uncertainty. Also, give suitable examples.
7. Explain cluster sampling.
8. Discuss the applications of integration in business.
9. Distinguish between “ completely randomized design” and “ Randomized complete block design”.
10. Explain factor analysis.
11. Discuss the printing guidelines of a research report.
12. What are the types of hypothesis? Explain them with suitable examples.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

Each question carries 10 marks.

13. Solve the following set of simultaneous equations using Cramer's rule.

$$5X + 2Y + 10Z = 200$$

$$4X + 3Y + 8Z = 150$$

$$9X + 5Y + 6Z = 220.$$

14. (a) In an organization, out of 250 employees, 55 are having their monthly salary more than Rs. 20,000 and 150 of them are regular takers of Beta Brand Tea. Out of those 55 who are having their monthly salary more than Rs. 20,000, 30 are regular takers of Beta Brand Tea. If a particular employee is selected, what is the probability that he is having monthly salary more than Rs. 20,000, if he is a regular taker of Beta Brand Tea?

(b) Based on past experience, the quality control engineer of a Heavy Electrical limited has estimated that the probability of commissioning each project in time at a client site is 0.8. The company is planning to commission 10 such projects in the forthcoming year. Find the following :

(i) the probability of commissioning no project in time.

(ii) the probability of commissioning three projects in time.

15. A retail store desire to determine the optimal daily order size for a perishable item. The stores buys the perishable item at the rate of Rs. 60 per kg and sells at the rate of Rs. 90 per kg. If the order size is more than the demand, the excess quantity can be sold at Rs. 75 per kg in a secondary market; otherwise, the opportunity cost for the store is Rs. 10 per kg for the unsatisfied portion of the demand. Based on the past experience, it is found that the demand varies from 50 kg to 200 kg in

steps of 50 kg. The possible values of the order size are from 100 kg to 300 kg in steps of 10 kg. Determine the optimal order size which will maximize the daily profit of the store using

- (a) Laplace criterion
- (b) Maximin criterion.

16. Integrate the following :

(a) $(2X^2 + 2X - 20)dX$

(b) $\frac{1}{(2X + 2)(8X + 5)}dx$.

17. The results of a survey on the sales of a product (Y) as a function of time period (X) are summarize below :

	X	Y
Mean	40	125
Standard deviation	2.5	16
Correlation coefficient (r)	0.85	

- (a) Fit the regression line of Y on X and estimate the value of Y when X is 45
- (b) Fit the regression line of X on Y and estimate the value of X when Y is 135.

18. The sales manager of a leading textile show room at Chennai wishes to study the opinion of its customers on its service quality in a 0-10 scale. In this experiment, the nature of profession as well as the monthly income level of the customers are taken as fixed factors. Two different customers have been sampled under each experimental combination and the correspondings ratings are as shown below :

		Nature of profession			
		Engineer	Doctor	Lawyer	Others
Income level	Less than	3	3	8	10
	Rs. 10,000	1	8	2	9
	More than	3	10	9	2
	Rs. 10,000	7	4	7	8

Check the significance of each of the factors of the experiment at the significance level of 0.05.