MAY 2012

P/ID 77502/PMBB/ PMB1B

Time : Three hours Maximum : 100 marks

PART A — ($5 \times 6 = 30$ marks)

Answer any FIVE questions.

All questions carry equal marks.

1. State Bayes' theorem and illustrate it with an example.
2. In an organization, out of 200 employees, 40 are having their monthly salary more than Rs. 15,000 and 120 of them are regular takers of Alpha Brand Tea. Out of those 40 who are having their monthly salary more than Rs. 15,000, 20 are regular takers of Alpha Brand Tea. If a particular employee is selected, what is the probability that he is having monthly salary more than Rs. 15,000, if he is a regular taker of Alpha Brand Tea.
3. Illustrate maximin criterion with an example.
4. Explain cluster sampling.
5. Distinguish between Completely Randomized Design and Randomized Complete Block Design.
6. Illustrate the scattered plot method of cluster analysis with an example.
7. Differentiate $\left(X^2 - 2\right)\left(3X + 1\right)$.
8. Discuss the printing guide lines of a research report.

PART B — ($5 \times 10 = 50$ marks)

Answer any FIVE questions.

All questions carry equal marks.

9. In a survey with a sample of 300 respondents, the monthly income of the respondents follows normal distribution with its mean and standard deviation as Rs. 15,000 and Rs. 3,000, respectively. Assume the significance level as 0.10 and answer the following.

   (a) What is the probability that the monthly income is less than Rs.12,000? Also, find the number of respondents having income less than Rs. 12,000.

   (b) What is the probability that the monthly income is more than Rs. 16,000? Also, find the number of respondents having income more than Rs. 16,000.

   (c) What is the probability that the monthly income is in between Rs. 10,000 and Rs. 17.000? Also, find the number of respondents having income in between Rs. 10,000 and Rs. 17,000.

10. What are the approaches to probability? Explain them with suitable examples.

11. A company owns a lease on a certain property. It may sell the lease for Rs. 75,000 or may drill the said property for oil. Various possible drilling

results are as under along with the probabilities of happening and rupee consequences.

Possible result	Probability	Rupee consequences
Dry well	0.10	-1,00,000
Gas well only	0.40	45,000
Oil and gas combination	0.30	98,000
Oil well	0.20	1,99,000

Draw a decision tree for the above problem and determine whether the company should drill or sell.

12. List and explain different sampling methods in brief.

13. A production manager wishes to test the effect of 5 similar milling machines on the surface finish of small castings so, he selected 5 such machines and conducted the experiment with four replications under each machine as per "Completely randomized design" and obtained the readings in microns as shown below.

    (a) State H0 and H1.

    (b) Perform the required ANOVA and state the inference at the significance level of 0.05.

	Machnine				
	M1	M2	M3	M4	M5
Replication	25	10	40	27	15
	30	20	30	20	8
	16	33	49	35	45
	36	42	22	48	34

14. Explain the steps of discriminant analysis.

15. Suppose a manufacturer can sell x items per week at a price $P = 30 - 0.001x$ rupees each when it costs, $y=4x+1800$ rupees to produce x items. Determine the number of items he should produce per week for maximum profit.

16. Assume a research topic of your interest and give the complete format of its research report.

PART C — (20 marks)

(Compulsory)

17. The rate of return (in percentage) of a product as a function of R&D expenditure (in lakhs of rupees) and annual advertising expenditure (in lakhs of rupees) for the past 7 years are summarized below. Design a regression model to forecast the rate of return of the product.

Rate of return (Y)	R & D Expenditure (X1)	Annual advertising expenditures (X2)
12	12	30
15	16	50
14	18	65
18	20	75
17	18	80
15	25	95
20	30	105

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