M 17299

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STATISTICS
Paper – 4.1 : Advanced Operations Research

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer **any five** questions, choosing **one from each** Unit.*
*2) **All** questions carry **equal** marks.*

UNIT – I

1. a) Write down the computational step for the unrestricted search method with fixed step size. Also explain what difficulties can arise if you use a fixed step size length.

   b) Using Dichotomous search method, determine the maximum of $f = x(1.5 - x)$ in the interval (0.0, 1.00) to within 10% of the exact value.

OR

2. a) Maximise

$$f(x)\} = \begin{matrix} x/2 \text{ for } x \le 2 \\ -x+3 \text{ for } x > 2 \end{matrix}$$

   in the interval (0, 3) by Fibonacci method using N = 6.

   b) Briefly explain Random Walk method. State the advantages of random search methods.

UNIT – II

3. a) What is a stochastic linear programming model ? Explain how to get optimal solution where the objective function coefficients in a linear programming problem are random variables.

   b) Explain the Gomery's cutting plane method for solving all-integer programming problems.

OR

P.T.O.

4. a) Find the optimum solution to the LPP :

Maximise $Z = x_1 - 2x_2$ subject to the constraints

$4x_1 + 2x_2 \leq 15$

$x_1, x_2 \geq 0$ and integers.

b) What are the advantages of geometric programming ? Give a general method of solving geometric programming problem.

UNIT – III

5. a) A newspaper boy buys papers for Rs. 0.35 each and sells them for Rs. 0.60 each. He cannot return unsold papers. Daily demand has the following distribution :

No. of Customers :	230	240	250	260	270	280	290	300	310	320
Probability :	0.01	0.03	0.06	0.10	0.20	0.25	0.15	0.10	0.05	0.05

If each day's demand in independent of the previous day's demand, how many papers should be order each day ?

b) Explain the difference between back order case and lost sales cases in inventory theory.

OR

6. a) For a single period stochastic inventory model, obtain an expression for the total expected profit.

b) Define :

i) A periodic review inventory system

ii) Lead time

iii) Reorder point in inventory theory.

UNIT – IV

7. a) Define :

   i) Hazard rate

   ii) Survival function

   iii) Failure density function of a system. Also show that the mean time to failure can be expressed interms of hazard rate.

   b) Describe the importance of exponential distribution and Weiball distribution in the context of survival analysis.

OR

8. a) Distinguish between Type I censoring, independent random censoring and type II censoring. Give the practical applications in each case.

   b) Define an empirical survivor function. For censored lifetime data obtain Kaplan-Meier estimate of the survivor function.

UNIT – V

9. a) Obtain the likelihood ratio statistic for testing the equality of m distributions, based on independent censored samples from the m distribution.

   b) Let $t_{(r)}$ be the r^{th} smallest observation in a random sample of size n from the exponential distribution with mean θ. Then prove that

$$E(t_{(r)}) = \theta \sum_{i=1}^{r} \frac{1}{n-i+1}.$$

OR

10. a) Discuss the likelihood based inference procedures for estimating the parameters of Weiball distribution with Type 1 censored data.

   b) Explain the importance of two parameter exponential distribution in the study of survival analysis.
