LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

THIRD SEMESTER – **NOVEMBER 2018**

16/17PST3ES01 – ADVANCED OPERATIONS RESEARCH

Date: 31-10-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

SECTION A

Answer ALL questions. Each carries two marks. **(10 x 2 = 20)**

1. Define a General Linear Programming Problem.

2. Define feasible solution.

3. What are the applications of dynamic programming?

4. State the principal of optimality in dynamic programming.

5. What do you mean by a pure integer programming problem?

6. Define Non Linear Programming Problem?

7. Define Quadratic programming problem.

8. What is inventory control?

9. What are the costs associated with inventory?

10. Define a queuing system?

SECTION B

Answer any FIVE questions. Each carries eight marks. **(5 X 8 = 40)**

11. Use two-phase simplex method to maximize $Z = 3X_1 + 2X_2$,

subject to the constraints, $2X_1 + X_2 \leq 2$; $3X_1 + 4X_2 \geq 12$; and $X_1, X_2 \geq 0$.

12. Derive Gomory's constraint for solving a Mixed Integer Programming Problem.

13. State the necessary conditions for solving the following Quadratic programming Problem.

Max $Z = 6X_1 + 3X_2 - 4X_1X_2 - 2X_1^2 - 3X_2^2$ subject to the constraints,

$X_1 + X_2 \leq 1$; $2X_1 + 3X_2 \leq 4$; and $X_1, X_2 \geq 0$, and show that Z is strictly concave.

14. Test for extreme values of $f(x_1, x_2, x_3) = x_1^2 + x_2^2 + x_3^2$, subject to the constraints,

$x_1 + x_2 + 3x_3 = 2$ and $5x_1 + 2x_2 + x_3 = 5$.

15. Using Dynamic Programming Problem, maximize $z = \{y_1.y_2.....y_n\}$ subject to the constraints, $y_1 + y_2 +..... + y_n = c$, and $y_j \geq 0$.

16. Derive the Kuhn-Tucker Necessary Conditions to solve a maximization NLPP with one inequality.

17. Use the method of Lagrangian multipliers to solve the following problem,

Optimize $Z = 4X_1^2 + 2X_2^2 + X_3^2 - 4X_1X_2$

subject to the constraints, $X_1 + X_2 + X_3 = 15$; $2X_1 - X_2 + 2X_3 = 20$; $X_1, X_2 \geq 0$.

18. Explain the elements of a queuing system.

SECTION C

Answer any TWO questions. Each carries twenty marks. **(2 x 20 = 40)**

19. Find an optimum integer solution to the following LPP:

Mazimize $Z = 2 X_1 + 2 X_2$, subject to the constraints, $5 X_1 + 3 X_2 \leq 8$, $X_1 + 2 X_2 \leq 4$ and X_1, X_2 are non-negative integers.

20. Solve the following Non Linear Programming Problem: Min $Z = 2 X_1 + 3 X_2 - X_1^2 - 2 X_2^2$

subject to the constraints, $X_1 + 3 X_2 \leq 6$; $5 X_1 + 2 X_2 \leq 10$; and $X_1, X_2 \geq 0$,

21. Solve the following Quadratic programming Problem, by Wolfe's algorithm.

Max $Z = 4 X_1 + 6 X_2 - 2 X_1 X_2 - 2 X_1^2 - 2 X_2^2$ subject to the constraints,

$X_1 + 2 X_2 \leq 2$; $X_1, X_2 \geq 0$.

22. (i) Explain the factors affecting inventory control.

(ii) For a (M/M/1) : (∞/FIFO), derive the steady state difference equations and obtain expressions for the mean and variance of queue length in terms of the parameters λ and μ. (10 + 10)

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