LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **APRIL 2022**

PST 3601 – ADVANCED OPERATIONS RESEARCH

Date: 24-06-2022 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

SECTION A

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

1. Define a General Linear Programming Problem.
2. What is an unbounded solution in an LPP?
3. What is the need for dynamic programming?
4. Explain two types of integer programming.
5. Define Pure Integer Programming Problem.
6. Define Non Linear Programming Problem?
7. Define a Quadratic programming model.
8. What is inventory?
9. What is lead time in inventory cost?
10. What is queue discipline?

SECTION B

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

11. Solve, maximize $Z = 2X + Y$, subject to the constraints, $X + Y \leq 30$; $X - Y \geq 0$; $Y \geq 3$; $0 \leq X \leq 20$, $0 \leq Y \leq 12$.
12. Derive Gomory's constraint for solving a Pure Integer Programming Problem.
13. Explain the branch and bound method for solving a Mixed Integer Programming Problem.
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. Use dynamic programming to solve the following problem: Minimize $z = y_1^2 + y_2^2 + y_3^2$ subject to the constraints: $y_1 + y_2 + y_3 = 15$ and $y_1, y_2, y_3 \geq 0$.
16. Consider the economic order quantity with price breaks and derive expressions for optimum order quantity and Total cost per unit.
17. Explain the factors affecting inventory control.
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 $Z = 7 X_1 + 9 X_2$, subject to the constraints, $- X_1 + 3 X_2 \leq 6$,

$7 X_1 + X_2 \leq 35$ and X_1 , X_2 are non-negative integers.

20. Derive the Khun-Tucker necessary and sufficient conditions for solving,

(i) Maximization GNLPP with lesser than or equal to constraints

(ii) Minimization GNLPP with greater than or pequal to constraints (10+10)

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. For a (M/M/1) : (∞/FIFO) queuing model in the steady-state case, 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.

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