No of Pages :2 Course Code : 15XW43

Roll No:
(To be filled in by the candidate)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

SEMESTER EXAMINATIONS, APRIL 2017

MSc - SOFTWARE SYSTEMS Semester : 4

15XW43 OPTIMIZATION TECHNIQUES

Time : 3 Hours **Maximum Marks :100**

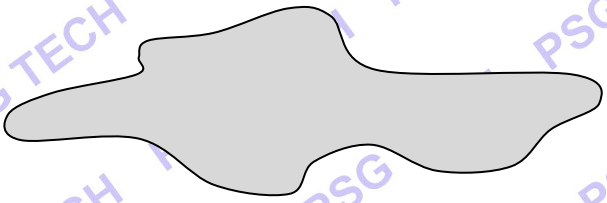
INSTRUCTIONS:

1. Answer **ALL** questions from GROUP–I.
2. Answer any **FOUR** questions from GROUP–II.
3. Answer any **ONE** question from GROUP – III.
4. Ignore the box titled as **"Answers for Group III"** in the Main Answer Book.
5. **Graph sheets shall be provided.**

GROUP - I **Marks : 10 x 3 = 30**

1. Under what circumstances the condition $f'(x) = 0$ cannot be used to find the maximum or minimum of the function $f(x)$?
2. What is a convex programming problem? What is its significance?
3. What are artificial variables in linear programming problem (LPP)? What is their use?
4. What is an assignment problem? How do you interpret it as a linear programming model?
5. Distinguish between decision under risk and decision under uncertainty in decision making.
6. How is ''utility' a superior criterion as compared to expected value criterion in decision theory?
7. What is a multi-stage decision problem? Give an example.
8. How can you estimate the area of the lake in Fig.1 using Monte-Carlo method? Just state the procedure. No need to find the area.

Fig.1



9. What is meant by discrete event simulation?
10. What is the difference between Dichotomous method and Golden section method for solving non-linear programming problem?

GROUP - II **Marks : 4 x 12.5 = 50**

11. Minimize $f(x_1, x_2) = (x_1 - 4)^2 + (x_2 - 4)^2$ subject to the constraints $x_1 + x_2 \leq 4$ and $x_1 + 3x_2 \leq 9$, using Kuhn-Tucker conditions.
12. A construction contractor estimates that the size of the work force needed over the next 5 weeks will be 6, 5, 3, 6, and 8 respectively. Excess labor kept will cost `300 per worker per week and new hiring in any week will incur a fixed cost of `400 plus `200 per worker.

Use dynamic programming technique to find the policy that minimizes total costs. Initially no workers are available.

13. a) You are the author of what promises to be a successful novel. You have the option to either publish the novel yourself or use a publisher. The publisher is offering you $20,000 for signing the contract. If the novel is successful, it will sell 200,000 copies. Otherwise, it will sell only 10,000 copies. The publisher pays a $1 royalty per copy. A market survey by the publisher indicates that there is a 70% chance that the novel will be successful. If you publish yourself, you will incur an initial cost of $90,000 for printing and marketing, but each copy sold will net you $2. Based on the given information, would you accept the publisher's offer or publish the book yourself? [5]

    b) Consider the decision problem in (a). Suppose that you contract a literary agent to conduct a survey concerning the potential success of the novel. From past experience, the agent advises you that when a novel is successful, the survey will predict the wrong outcome 20% of the time. When the novel is not successful, the survey will give the correct prediction 85% of the time. How would this information affect your decision? [7.5]

14. a) Explain the Acceptance-rejection method for generating successive random samples from a probability distribution for simulation. [5]

    b) A military equipment is to be transported from origins O_1, O_2, and O_3 to destinations D_1, D_2, D_3, and D_4. The supply at the origins, the demand at the destinations, and the time required for shipment are given as in Table.1. Work out a transportation plan in order to minimize the total time required for shipment. [7.5]

Table.1

	W_1	W_2	W_3	W_4	Supply
A	10	22	0	22	8
B	15	20	12	8	13
C	20	12	10	15	11
Demand	5	11	8	8	

15. Using Steepest ascent method, solve the nonlinear programming problem:
Maximize $f(x_1, x_2) = 4x_1 + 6x_2 - 2{x_1}^2 - 2x_1x_2 - 2{x_2}^2$, starting with initial point $X_0 = (1, 1)$. Carry out at most six iterations.

GROUP - III

Marks : 1 x 20 = 20

16. a) A company produces two products A and B on two machines M_1 and M_2. One unit of product A requires 2 hours on M_1 and 1 hour on M_2, while product B requires 1 hour on M_1 and 3 hours on M_2. The revenue per unit of products A and B are 30$ and 20$ respectively. The total daily processing time available for each machine is 8 hours. Formulate this problem as an LPP and solve it using simplex method. [14]

    b) For the problem in (a), using graphical method, perform the following sensitivity analysis: (i) Determine the range of the ratio c_1/c_2 that will keep the optimum unchanged; (ii) Find the optimality ranges for c_1 and c_2, assuming that the other coefficient is kept constant at its present value.
    Note: c_1 and c_2 are coefficients in the objective function of the LPP. [6]

17. a) Using artificial variables technique, solve the LPP:
    Maximize $z = 6x_1 + 4x_2$
    subject to $2x_1 + 3x_2 \leq 30$, $3x_1 + 2x_2 \leq 24$, $x_1 + x_2 \geq 3$, and $x_1, x_2 \geq 0$. [14]

b) Verify the solution obtained for the LPP in (a) by solving it using graphical method. [6]

FD/RL /END/