

CVL 731 Optimization Techniques in Water Resources

Minor Test

Course Coordinator: Prof. A. K. Keshari
Semester: 1st, 2020-2021

Marks: 30
Time: 1 hr.

Answer all questions

- [1.] (a) What do you mean by multiobjective optimization problem? Discuss with an example stating clearly the objectives and constraints. (5)
- (b) Consider the following optimization problem and answer the questions: (6)
- Maximize $Z = x_1 + 4x_2$
ST $x_1 + 2x_2 \leq 5$
 $-x_1^2 + x_2 = 0$
 $x_1 - x_2 \leq 3$
 $x_1 \geq 0, x_2 \geq 0$
- (i) Draw the feasible region.
(ii) What is the optimal solution?
(iii) Is it a LP or NLP? Justify your answer.
(iv) What will happen if the second constraint is removed?
- [2.] (a) Convert the following LP to SLP and answer the following questions: (5)
- Maximize $Z = 2x_1 + 5x_2$
ST $3x_1 + 2x_2 \leq 12$
 $2x_1 + 3x_2 \geq 6$
 $x_1 \geq 0, x_2$ is unrestricted in sign
- (i) State whether the obtained SLP is in a canonical form. Justify your answer.
(ii) Write down the obtained SLP in a matrix form.
- (b) Solve the following LP Problem using Simplex method: (5)
- Maximize $Z = 2x_1 + x_2$
ST $4x_1 + 3x_2 \leq 12$
 $2x_1 + x_2 \leq 4$
 $x_1 + 2x_2 \leq 4$
 $x_1 \geq 0; x_2 \geq 0$
- [3.] (a) Distinguish between slack and artificial variables. Explain whether values of artificial variables can be more than that of slack variables? (4)
- (b) Construct the first tableau for the LP problem described in Q2(a) using Big 'M' Simplex method. Obtain the basic feasible solution and state with your logic whether this solution is optimal or not. (5)
