

First Question

- (i) Explain the idea of the weighting method for scalarizing a bi-objective programming problem to find a complete set of efficient solution s.
Also, mention the advantages and disadvantages of this method.
- (ii) Find one of the efficient solution of the bi-objective fractional programming problem, given by

$$\text{Minimize } \left\{ \frac{(2x_2 + 7)}{(x_1 + 3)}, \frac{(-2x_1 + x_2 + 3)}{(x_1 + 3)} \right\}$$

$$\text{S.t}$$

$$x_1 + x_2 \leq 6$$

$$x_2 \leq 3, x_1, x_2 \geq 0$$

Using the weights $w_1 = w_2 = 0.5$.

Second Question

Explain the idea of wolfe's algorithm for solving a quadratic bi-objective programming problem via solving the following problem

$$\text{Minimize } \{(2x^2 - 4y), (2y^2 - 12x)\}$$

$$\text{S.t}$$

$$x + y \leq 4$$

$$y \leq 3, x, y \geq 0$$

Using the weights $w_1 = w_2 = 0.5$.

Third Question

The normal Boundary intersection (NBI), which introduced by Das and Dennis for determining a uniform distribution of a set of efficient solution.

- Explain this method via a mathematical model for two objective functions, declaring the new idea in that approach.
- Try to apply your Discussion via a simple example as in Q2.

Fourth Question

Explain the idea of the sequential linearization method for solving a nonlinear programming model given by $\text{Minimize } f(x) \text{ S.t } g(x) \leq b$. Apply your Discussion via a simple problem in Q1.

With all my best regards
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