Module 5: Dynamic Programming

Learning Objectives

It was discussed in modules 3 and 4 that most widely used optimization method is linear programming technique. But this technique is not flexible in some complex problems and is only restricted to linear optimization problems. Problems having a sequential optimization nature can be solved easily using dynamic programming (DP), which is the main objective of this module.

This module gives a brief description of sequential optimization and multistage decision processes. The representation of multistage decision processes is given for a general problem having N decision variables. This will enable the reader to formulate any multistage decision problems. This will be followed by an explanation about the basic concepts on which a problem is solved using dynamic programming. Formulation of recursive equations will be discussed for a general problem. This will help the reader to develop recursive equations using both backward and forward approach for any type of sequential optimization problem. The computational procedure for DP will be discussed for the same general problem. At the end, continuous DP, multiple state variable and curse of dimensionality will be described.

At the end of the module the reader will be able to

1. Represent a multistage decision process
2. Conceptualize the principle of optimality and sub-optimization
3. Formulate recursive equations for a DP
4. Acquire an idea about the computational procedure of DP
5. Differentiate between discrete DP and continuous DP
6. Deal with multiple state variables in DP