Introduction:

The selection of an appropriate order for finite number of different jobs to be done on a finite number of machines is called sequencing problem. In a sequencing problem we have to determine the optimal order (sequence) of performing the jobs in such a way so that the total time (cost) is minimized. Suppose n jobs are to be processed on m machines for successful completion of a project. Such type of problems frequently occur in big industries. The sequencing problem is to determine the order (sequence) of jobs to be executed on different machines so that the total cost (time) involved is minimum. Since these arrangements are large in number, in particular, 5 jobs on 4 machines can be processed in (5!)4 = 207360000 ways. Thus, by enumeration it is impossible to solve these problems even for small number of jobs and machines. It motivates to devise some technique which can help to locate the specific arrangement in limited number of iterations so that the elapsed time is minimized.

When a number of jobs are given to be done and they require processing on two or more machines, the main concern of a manager is to find the order or sequence to perform these jobs. We shall consider the sequencing problems in respect of the jobs to be performed in a factory and study the method of their solution. Such sequencing problems can be broadly divided in two groups. In the first one, there are n jobs to be done, each of which requires processing on some or all of the k different machines. We can determine the effectiveness of each of the sequences that the technologically feasible (that is to say, those satisfying the restrictions on the order in which each job must be processed through the machines) and choose a sequence which optimizes the effectiveness. To illustrate, the timings of processing of each of the n jobs on each of the **k** machines, in a certain given order, may be given and the time for performing the jobs may be the measure of effectiveness. We shall select the sequences for which the total time taken in processing all the jobs on the machines would be the minimum.

In this unit we will look into solution of a sequencing problem. In this lesson the solutions of following cases will be discussed:

Decision making:

Decision making is one of the attractive research areas in the last decades. The complexity and uncertainty are persistent phenomenon in the real world, and the fuzzy set [1–3] is widely used in decision making process [3, 4]. Much of decision based information is uncertain. Human has a high capability of making logical decisions based on uncertain, incomplete, and/or inaccurate information [5].

-number is a sufficient formalization of real-world information that should roughly be considered in light of its reliability. The critical issue is that the reliability of information is not considered properly. Zadeh has proposed a new notion -number which is more appropriate to describe the uncertainty. -number takes both restraint and reliability. In comparison with the classical fuzzy number, -number has more ability to describe the real information of human [6].

-numbers were firstly presented by Zadeh in 2011 [5], and afterwards the researchers started to discuss -numbers in decision making under uncertainty and in many other fields. One of the main goals of -number is to produce fuzzy numbers with degree of self-confidence in order to know the real information. By using the -number the knowledge of human can be represented in a better way [7].

The computations with -numbers can be viewed as a generalization of computations with numbers, intervals, fuzzy numbers, and random numbers. As specified, the levels of generality can be separated as follows: computation with numbers (ground level zero); computation with intervals (level one); computation with fuzzy numbers (level two) [2]; computation with random numbers (level two); and computation with -numbers (level three). The capability of building realistic models of real-world systems is increased by the increase of the generality level, especially in the realms of economics, risk assessment, decision analysis, planning, and analysis of causality.

Utility theory bases its beliefs upon individuals' preferences. It is a theory postulated in economics to explain behavior of individuals based on the premise people can consistently rank order their choices depending upon their preferences. Each individual will show different preferences, which appear to be hard-wired within each individual. We can thus state that individuals' preferences are intrinsic. Any theory, which proposes to capture preferences, is, by necessity, abstraction based on certain assumptions. Utility theory is a positive theory that seeks to explain the individuals' observed behavior and choices.The distinction between normative and positive aspects of a theory is very important in the discipline of economics. Some people argue that economic theories should be normative, which means they should be prescriptive and tell people what to do. Others argue, often successfully, that economic theories are designed to be explanations of observed behavior of agents in the market, hence positive in that sense. This contrasts with a normative theory, one that dictates that people should behave in the manner prescribed by it. Instead, it is only since the theory itself is positive, after observing the choices that individuals make, we can draw inferences about their preferences. When we place certain restrictions on those preferences, we can represent them analytically using a utility function—a mathematical formulation that ranks the preferences of the individual in terms of satisfaction different consumption bundles provide. Thus, under the assumptions of utility theory, we can assume that people behaved as if they had a utility function and acted according to it. Therefore, the fact that a person does not know his/her utility function, or even denies its existence, does not contradict the theory. Economists have used experiments to decipher individuals' utility functions and the behavior that underlies individuals' utility.