A B S T R A C T

The mathematical modelling and the solutions of physical problems are of immense importance in the different fields of science, technology and other social sciences. They have great importance in view of their applications in the real life as well as for the development of respective fields. The growth of computer technology has lead to the development of general and quite universal methods of solving the problems.

In this connection it is to be mentioned that existing solutions of so many mathematical and numerical problems are lacking in optimality in respect of time and accuracy. Now a day's computer memory is not a problem but optimization of time and accuracy towards the solution of any physical problem is of our main interest even for any known solved problem.

There exist simple and straightforward methods for evaluation of determinant of a matrix or finding solution of simultaneous equations. For a large dimension of matrix or large number of variables involved in simultaneous equations, it is very difficult to manage the situation even with the help of a modern computer. Minimizations of computational cost of these known problems are also considered in our research work.

Existing advance ideas are used to undertake complicated mathematical and numerical problems and also have developed new methods and procedures that are faster and more accurate in respect of existing one. Also investigated some problems related to minimization of computational cost. A detail of our work has been summarized as follows:

The matrix-chain multiplication problem has been considered. Using dynamic programming approach, the solution of this problem can be found in the book of Cormen et al. [2000-2001]. A unique method has been developed (Dutta and Pal [2010]) to solve the same

problem which reduces at least 90% of computational cost of the existing dynamic programming approach.

In 2007, Rezaifar and Rezaee presented a new recursion technique for finding the value of determinant of matrices which has been later modified and generalized by us (Dutta and Pal [2011]).

A new iterative method (Dutta and Pal [2011]) has been developed for solving nonlinear equation of the form $f(x) = 0$ that has at least one root in [a, b] by proper study of the parameters f(a) and f(b). Further it is also shown that the order of convergence of the method can be made linear, quadratic, cubic and even higher by considering higher order terms of the series obtained by the Taylor's expansion.

Another new fourth-order iterative method (Dutta and Pal [2010]) has been considered for solving nonlinear equations by giving a proper weight of the function $f(x)/f'(x)$.

So far, researchers like Alefeld and Potra [1992], Abbasbandy [2003], Ujevic [2006], Noor et al. [2006-2007] and Chen and Li [2007] have concentred through deterministic approach to solve the nonlinear equations but probabilistic concepts are not used by any researcher earlier. In one of our work (Dutta and Pal [2013]) the concept of probability has been introduced to solve the nonlinear equation of the form $f(x) = 0$.

A new efficient technique (Mandal, Dutta and Pal [2012]) has been developed to construct a minimum spanning tree of a simple connected graph.

Lastly, Hungarian method [1955] is modified (Dutta and Pal [2014]) to find out the optimal solution of an assignment problem which reduces the number of steps as well as computational cost of the method.