CHAPTER 1 INTRODUCTION

1.1 Rational

Radial Basis Functions (RBFs) are successfully for solving differential equations, which RBFs are developed for approximation functions that are (i) depends on many variables (ii) have many observations and (iii) those observations are scattered.

Integrated Radial Basis Functions (IRBFs) are developed from radial basis function (RBFs). The purposes of using integration to construct the approximants are (i) to avoid the reduction in convergence rate caused by differential and (ii) to improve the numerical stability of a discrete solution.

For solving biharmonic problems numerically are significant challenges with respect to the approximation of high-order derivatives. In this thesis, we are approximated biharmonic equations by using Integrated Radial Basis Functions (IRBFs) solved this problem.

1.2 Literature Review

Wright and Fornberg (2006) propose for scattered nodes and radial basis functions (RBFs) achieves the goal of still keeping the number of stencil nodes small without a similar reduction in accuracy by analyze the accuracy of these new compact RBF-FD formulas by applying them to some model problems, and study the effects of the shape parameter.

Mai-Duy and Tanner (2007) developed new collocation method for numerically solving partial differential equations (PDEs) in rectangular domains by the proposed method is based on a Cartesian grid and a one-dimensional integrated radial basis function (1D-IRBF) scheme. The employment of integration to construct the RBF approximations representing the field variables facilitates a fast convergence rate, while the use of a 1dimension interpolation scheme leads to considerable economy in forming the system matrix and improvement in the condition number of RBF matrices over a two dimensions interpolation scheme.

Mai-Duy and Tran-Cong (2011) developed a compact 9-point IRBF stencil that is applicable to second-order elliptic PDEs defined on rectangular and non-rectangular domain.

Mai-Duy and Tran-Cong (2013) developed new compact IRBFs stencil by used reduced number of node from 9 to 5 for solving second-order parabolic and elliptic partial differential equations (PDEs) in two dimensions. If problems in case are elliptic PDEs, one algebraic equation, which involves 5 nodal values of u, is generated for each interior node. But the case of parabolic PDEs, there are three algebraic equations for each interior node, and we then adopt the ADI method and the implicit elimination approach to yield a set of two tridiagonal algebraic equations.

1.3 Objective of the Thesis

The objective of this thesis is to develop a numerical method of biharmonic problem by using a local approximation based on integrated radial basis function which higher accuracy.

1.4 Scopes of the Thesis

In this thesis, the biharmonic problem will be studied in two dimensions.