SOME INVESTIGATIONS OF NP-COMPLETE PROBLEMS OF GRAPH THEORY

Abstract

The abstract of the fundamental chapters embodied in this thesis are described below for convenience of pre-review.

In chapter 1, the discovery graph theory has been discussed starting from the solution of Konigsberg bridge problem and some historical approaches relating to the application of graph theory has also been focused. Different type of applications in various disciplines such as computer science engineering, electronics, mathematical sciences, physical, social, and biological sciences, in linguistics etc have been discussed collecting some research journal of various fields. Besides, some unsolved problems of graph theory have been mentioned and some Np-complete problems have been considered for our research area.

In chapter 2, we have found one algorithm for Clique problem which is NP-Complete. Considering the Minimum Nil Sweeper Algorithm, it has been found that the Minimum Nil Sweeper Algorithm is not applicable to Clique problem for all undirected graphs which was claimed previously. A new algorithm has been developed to study all the clique problems for arbitrary undirected graph and it’s complexity is analysed and experimental result is cited. Here, P = NP for clique problem has been proved. A theorem related to intersection graph is developed.

In chapter 3, various properties of particular type of Hamiltonian graphs are studied and we have found the following theorems.
Theorem 1. The graph $G(2n + 2, 3n + 3)$ for $n \geq 1$, which is regular of degree three, non-bipartite and planner, is always Hamiltonian.

Theorem 2. The regular graph $G(4n + 4, 6n + 6)$ for $n \geq 1$, of degree three and planar of odd number of regions having four edges when $n = 1$ and only two regions covered by $2m + 4$ edges for $m \geq 1$ for simultaneous changes of $n \geq 2$ is always bi-colourable.

Theorem 3. The graph $G(3m + 6, 12 + 6m)$ for $m \geq 1$, which is regular of degree four, non-bipartite and planner, has two edge-disjoint Hamiltonian cycles.

Theorem 4. The graph $G(3m + 7, 6m + 14)$ for $m \geq 1$, which is planner and regular of degree 4, and non-bipartite, has two edge-disjoint Hamiltonian circuits.

Theorem 5. If one vertex is added outer side the region of the graph $H(3m + 6, 6m + 12)$ for $m \geq 1$, making the degree of added vertex of degree four, the new graph $H(3m + 7, 6m + 16)$ for $m \geq 1$, which is planar, non-regular, non-bipartite but always Hamiltonian graph.

Theorem 6. Intersection graph obtained from Euler diagram is not Hamiltonian.

Theorem 7. The graph structure $G(3m + 6, 12 + 6m)$ for $m \geq 1$, which is regular of degree four, non-bipartite and planner, has two-equal path partitions.

Theorem 8. The graph structure $G(3m + 7, 6m + 14)$ for $m \geq 1$, which is regular of degree four, non-bipartite and planner, has two-equal path partitions.

Theorem 9. The graph $H(3m + 7, 6m + 14)$ for $m \geq 1$, which is planner, regular of degree four, non-bipartite but Hamiltonian graph, has perfect matching 4 with non-repeated edge when $m$ is odd.
In chapter 4, a heuristic algorithm has been developed to find the minimum cost route for a particular type of weighted graph $G(3m + 7, 6m + 16)$ for $m \geq 1$, which is planar, non-regular, non-bipartite and Hamiltonian related with traveling salesman problem.

In chapter 5, a special type of K-CCNF Boolean formula has been considered and the satisfiability condition has been discussed with the help of theoretical explanation. An algorithm has also been focused for K-CCNF SAT problem.

In chapter 6, a comparative study of some heuristic algorithms discussed previously by different authors has been discussed for the solution of TSP of complete graphs.

Chapter -7 includes conclusion and future trends of the works.