

## LIST OF FIGURES

| Figure No. | Title  | Page No. |
|------------|--|----------|
| 1          | Konigsberg bridge Problem                        | 3        |
| 2          | (a) A 5-coloring and (b) a 3-coloring of a graph | 9        |
| 3          | b-coloring of $G_2$ with 2 colors                | 15       |
| 4          | b-coloring of $G_2$ with 3 colors                | 15       |
| 5          | b-coloring of $G_2$ with 4 colors                | 15       |
| 6          | The graph $G$ is a 5-coloring of $G$             | 17       |
| 7          | The Traffic lanes at street intersections        | 18       |
| 8          | The graph $G$ is a 3-coloring of $G$             | 19       |
| 1.1        | Chromatic number of $G$                          | 34       |
| 2.1        | Bistar Graph                                     | 36       |
| 2.2        | Origami Graph                                    | 36       |
| 2.3        | The corona product of two graphs                 | 37       |
| 2.4        | Edge corona graphs                               | 38       |
| 2.5        | $C_6 * K_2$                                      | 39       |
| 2.6        | The b- chromatic number of $C_4 \circ O_4$       | 42       |
| 2.7        | The b- chromatic number of $C_4 \circ O_4$       | 45       |
| 2.8        | The $b$ -chromatic number of $B_{5,5} \circ P_5$ | 49       |
| 2.9        | The $b$ -chromatic number of $P_4 \circ B_{4,4}$ | 52       |
| 3.1        | Barbell Graph $B_6$                              | 55       |
| 3.2        | The b-coloring of $T_{3,4} \circ P_4$            | 56       |

| Figure No. | Title                                     | Page No. |
|------------|---|----------|
| 3.3        | The b-coloring of $T_{4,3} \circ P_3$     | 58       |
| 3.4        | The b-coloring of $T_{5,3} \circ P_3$     | 58       |
| 3.5        | The b-coloring of $P_4 \circ T_{3,4}$     | 61       |
| 3.6        | The b-coloring of $T_{3,3} \circ C_3$     | 64       |
| 3.7        | The b-coloring of $B(K_5, K_5) \circ C_5$ | 67       |
| 3.8        | The b-coloring of $B(K_5, K_5) \circ P_5$ | 70       |
| 4.1        | Cycle Graph                               | 71       |
| 4.2        | Path Graph                                | 72       |
| 4.3        | Connected and Disconnected Graph          | 72       |
| 4.4        | Fan Graph $F_5$                           | 72       |
| 4.5        | Double Fan Graph( $DF_n$ )                | 73       |
| 4.6        | Tadpole graph $G = T_{4,5}$               | 73       |
| 4.7        | The b-coloring of $C_4 \circ B(K_4, K_4)$ | 75       |
| 4.8        | The b-coloring of $C_5 \circ T_{4,5}$     | 78       |
| 4.9        | The b-coloring of $C_4 \circ F_{1,4}$     | 80       |
| 4.10       | The b-coloring of $C_4 \circ F_{2,4}$     | 82       |
| 5.1        | The b-coloring of $F_{2,4} \circ C_4$     | 84       |
| 5.2        | The b-coloring of $F_{1,4} \circ K_{1,4}$ | 86       |
| 5.3        | The b-coloring of $F_{1,5} \circ W_5$     | 89       |
| 5.4        | The b-coloring of $F_{2,3} \circ P_3$     | 91       |
| 5.5        | The b-coloring of $P_4 \circ B(K_4, K_4)$ | 94       |
| 6.1        | Star Graph                                | 95       |

| <b>Figure No.</b> | <b>Title</b>  | <b>Page No.</b> |
|-------------------|---|-----------------|
| 6.2               | The b-coloring of $K_{1,4} \circ F_{1,4}$                       | 98              |
| 6.3               | The b-coloring of $W_5 \circ F_{1,5}$                           | 101             |
| 6.4               | The b-coloring of $F_{1,4} \circ C_4$                           | 104             |
| 6.5               | The b-coloring of $F_{1,4} \circ P_4$                           | 107             |
| 6.6               | The b-coloring of $P_3 \circ F_{1,3}$                           | 109             |
| 6.7               | The b-coloring of $P_4 \circ F_{1,4}$                           | 111             |
| 7.1               | VANET Architecture  | 113             |
| 7.2               | Evolving Vertex colouring graph connectivity in VANETs          | 114             |
| 7.3               | Process involved in the CLAT scheme                             | 117             |
| 7.4               | Overall flow of the proposed CLAT scheme                        | 118             |
| 7.5               | CLAT method based VANET node generation                         | 120             |
| 7.6               | CLAT method based VANET node separation                         | 121             |
| 7.7               | Creation of the Group Managers                                  | 122             |
| 7.8               | Node compromised and Investigates suspicious Node               | 123             |
| 7.9               | Establish the pair wise encryption                              | 124             |
| 7.10              | Key sharing node path generation                                | 125             |
| 7.11              | Key Pair Share through the Path                                 | 126             |
| 7.12              | Vanet node detects the roadside event                           | 127             |
| 7.13              | RSU1 disseminates the alert messages to its communication range | 128             |

| <b>Figure No.</b> | <b>Title</b>   | <b>Page No.</b> |
|-------------------|--|-----------------|
| 7.14              | VANET nodes disseminates the alert messages to the nearest nodes                     | 129             |
| 7.15              | RSU2 disseminates the alert messages to its communication range from RSU1            | 130             |
| 7.16              | RSU3 disseminates the alert messages to its communication Range from RSU2            | 131             |
| 7.17              | Vertex colour Graph for communication of nodes through RSU                           | 133             |
| 7.18              | Alert message exchanges between the VANET nodes 41-42-24                             | 134             |
| 7.19              | Communication of nearest nodes in the network topology                               | 135             |
| 7.20              | Nodes moving in the safe directions after communicating with nearest nodes           | 136             |
| 7.21              | Vertex Color Graph for communications between the nodes                              | 138             |
| 7.22              | Alert message dissemination comparison results for CRT and CLAT algorithms           | 139             |
| 7.23              | Packet delivery ratio comparison result for CLAT and CRT algorithms                  | 140             |
| 7.24              | Number of nodes vs. energy consumption comparison result for CLAT and CRT algorithms | 141             |

## LIST OF TABLES

| <b>Table No.</b> | <b>Title</b>                        | <b>Page No.</b> |
|------------------|-------------------------------------|-----------------|
| 7.1              | Parameters and values of CLAT VANET | 119             |
| 7.2              | Communication of nodes through RSU  | 132             |
| 7.3              | Communication between the nodes     | 137             |