JURNAL MODUL V

GRAPH

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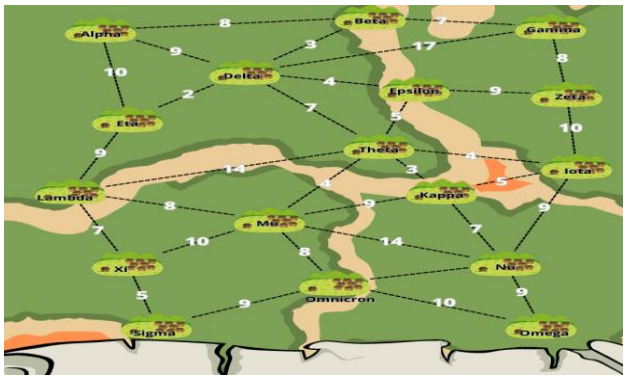
A. PERMASALAHAN

Pak ophet adalah calon bupati dari kabupaten merembu, pak ophet berasal dari salah satu desa di kabupaten tersebut dalam rangka melakukan kampanye pak ophet menginginkan supaya bisa mengujungin semua desa dengan rute tercepat yang dimana berarti kalian di minta untuk membuat list jalur dari desa pak ophet ke setiap desa lainnya dalam jalan tercepat Perlu di perhatikan bahwa jalan tercepat blum tentu berasal dari jalan langsung ke tempatnya, dan bisa saja ada jalan yang lebih pendek dengan mengitari desa lainnya Perlu di perhatikan bahwa juga untuk di urutkan desa terdekat terlebih dahulu karena pak ophet menginginkan untuk kampane di desa desa terdekatnya terlebih dahulu




```
Theta
Theta => Kappa
Theta => Iota
Theta => Mu
Theta => Epsilon
Theta => Delta
Theta => Delta => Eta
Theta => Delta => Beta
Theta => Kappa => Nu
Theta => Mu => Lambda
Theta => Mu => Omnicron
Theta => Epsilon => Zeta
Theta => Mu => Xi
Theta => Delta => Alpha
Theta => Delta => Beta => Gamma
Theta => Kappa => Nu => Omega
Theta => Mu => Xi => Sigma
```

```
Alpha
Alpha => Beta
Alpha => Delta
Alpha => Eta
Alpha => Delta => Epsilon
Alpha => Beta => Gamma
Alpha => Delta => Theta
Alpha => Eta => Lambda
Alpha => Delta => Theta => Kappa
Alpha => Delta => Theta => Iota
Alpha => Delta => Theta => Mu
Alpha => Delta => Epsilon => Zeta
Alpha => Delta => Theta => Kappa => Nu
Alpha => Eta => Lambda => Xi
Alpha => Delta => Theta => Mu => Omnicron
Alpha => Eta => Lambda => Xi => Sigma
Alpha => Delta => Theta => Kappa => Nu => Omega
```

```
Mu
Mu => Theta
Mu => Theta => Kappa
Mu => Theta => Iota
Mu => Lambda
Mu => Omnicron
Mu => Theta => Epsilon
Mu => Xi
Mu => Theta => Delta
Mu => Omnicron => Nu
Mu => Theta => Delta => Eta
Mu => Theta => Delta => Beta
Mu => Xi => Sigma
Mu => Theta => Epsilon => Zeta
Mu => Omnicron => Omega
Mu => Theta => Delta => Alpha
Mu => Theta => Delta => Beta => Gamma
```

B. SOURCE CODE

1. Kelas Node

```
class Node {
    String nama, parent;
    int jarak;
    Node next;

    public Node(String nama, int jarak, String parent) {
        this.nama = nama;
        this.jarak = jarak;
        this.parent = parent;
        this.next = null;
    }
}
class Edge {
    String from, to;
    int jarak;
    Edge next;

    public Edge (String from, String to, int jarak) {
        this.from = from;
        this.to = to;
        this.jarak = jarak;
        this.next = null;
    }
}
```

2. Kelas Edge

```
class Edge {
    String from, to;
    int jarak;
    Edge next;

    public Edge(String from, String to, int jarak) {
        this.from = from;
        this.to = to;
        this.jarak = jarak;
        this.next = null;
    }
}
```

3. Kelas EdgeList

```
class EdgeList {
    Edge head;
    public void add(String from, String to, int jarak) {
        Edge newEdge = new Edge(from, to, jarak);
        if (head == null) {
            head = newEdge;
        } else {
            Edge temp = head;
```

```
            while (temp.next != null) {temp = temp.next;}
            temp.next = newEdge;
        }
    }

    public LinkedList getNeighbors(String nama) {
        LinkedList neighbors = new LinkedList();
        Edge temp = head;
        while (temp != null) {
            if (temp.from.equals(nama)) {neighbors.add(temp.to,
temp.jarak, nama);}
            else if (temp.to.equals(nama)) {neighbors.add(temp.from,
temp.jarak, nama);}
            temp = temp.next;
        }
        return neighbors;
    }

    public int getDistance(String from, String to) {
        Edge temp = head;
        while (temp != null) {
            if ((temp.from.equals(from) && temp.to.equals(to)) ||
(temp.from.equals(to) && temp.to.equals(from))) {
                return temp.jarak;
            }
            temp = temp.next;
        }
        return Integer.MAX_VALUE;
    }
}
```

4. Kelas LinkedList

```
class LinkedList {
    Node head;

    public void add(String nama, int jarak, String parent) {
        Node newNode = new Node(nama, jarak, parent);
        if (head == null) {head = newNode;}
        else {
            Node temp = head;
            while (temp.next != null) {temp = temp.next;}
            temp.next = newNode;
        }
    }

    public boolean contains(String nama) {
        Node temp = head;
        while (temp != null) {
            if (temp.nama.equals(nama)) {return true;}
            temp = temp.next;
        }
        return false;
    }
```

```
    public void remove (String nama) {
        if (head != null && head.nama.equals(nama)) {
            head = head.next;
            return;
        }
        Node temp = head;
        while (temp != null && temp.next != null) {
            if (temp.next.nama.equals(nama)) {
                temp.next = temp.next.next;
                return;
            }
            temp = temp.next;
        }
    }

    public Node getMinDistanceNode() {
        Node minNode = head;
        Node temp = head;
        while (temp != null) {
            if (temp.jarak < minNode.jarak) {minNode = temp;}
            temp = temp.next;
        }
        return minNode;
    }

    public void updateDistance(String nama, int newDistance, String
parent) {
        Node temp = head;
        while (temp != null) {
            if (temp.nama.equals(nama)) {
                temp.jarak = newDistance;
                temp.parent = parent;
                return;
            }
            temp = temp.next;
        }
    }

    public void clear() {head = null;}

    public void sortByDistance() {
        if (head == null || head.next == null) {
            return;
        }

        boolean swapped;
        do {
            swapped = false;
            Node current = head;
            while (current.next != null) {
                if (current.jarak > current.next.jarak ||
                    (current.jarak == current.next.jarak &&
current.nama.compareTo(current.next.nama) > 0)) {
                    String tempNama = current.nama;
                    int tempJarak = current.jarak;
                    String tempParent = current.parent;
```

```
                    current.nama = current.next.nama;
                    current.jarak = current.next.jarak;
                    current.parent = current.next.parent;

                    current.next.nama = tempNama;
                    current.next.jarak = tempJarak;
                    current.next.parent = tempParent;

                    swapped = true;
                }
                current = current.next;
            }
        } while (swapped);
    }

    @Override
    public String toString() {
        Node temp = head;
        StringBuilder result = new StringBuilder();
        while (temp != null) {
            result.append(temp.nama).append("
(").append(temp.jarak).append(")");
            if (temp.next != null) result.append(" => ");
            temp = temp.next;
        }return result.toString();
    }

    public void addWithPriority(String nama, int jarak, String
parent) {
        Node newNode = new Node(nama, jarak, parent);
        if (head == null || head.jarak > jarak || (head.jarak ==
jarak && head.nama.compareTo(nama) > 0)) {
            newNode.next = head;
            head = newNode;
        } else {
            Node temp = head;
            while (temp.next != null &&
                    (temp.next.jarak < jarak || (temp.next.jarak ==
jarak && temp.next.nama.compareTo(nama) <= 0))) {
                temp = temp.next;
            }
            newNode.next = temp.next;
            temp.next = newNode;
        }
    }
}

class EdgeList {
    Edge head;
    public void add(String from, String to, int jarak) {
        Edge newEdge = new Edge(from, to, jarak);
        if (head == null) {
            head = newEdge;
        } else {
            Edge temp = head;
            while (temp.next != null) {temp = temp.next;}
```

```
            temp.next = newEdge;
        }
    }

    public LinkedList getNeighbors(String nama) {
        LinkedList neighbors = new LinkedList();
        Edge temp = head;
        while (temp != null) {
            if (temp.from.equals(nama)) {neighbors.add(temp.to,
temp.jarak, nama);}
            else if (temp.to.equals(nama)) {neighbors.add(temp.from,
temp.jarak, nama);}
            temp = temp.next;
        }
        return neighbors;
    }

    public int getDistance(String from, String to) {
        Edge temp = head;
        while (temp != null) {
            if ((temp.from.equals(from) && temp.to.equals(to)) ||
(temp.from.equals(to) && temp.to.equals(from))) {
                return temp.jarak;
            }
            temp = temp.next;
        }
        return Integer.MAX_VALUE;
    }
}
```

5. Kelas ShortPathFinder

```
class ShortestPathFinder {
    public static void findShortestPaths(String start, EdgeList
edges) {
        LinkedList visited = new LinkedList();
        LinkedList unvisited = new LinkedList();
        unvisited.add(start, 0, null);

        while (unvisited.head != null) {
            Node currentNode = unvisited.getMinDistanceNode();
            unvisited.remove(currentNode.nama);
            visited.add(currentNode.nama, currentNode.jarak,
currentNode.parent);

            LinkedList neighbors =
edges.getNeighbors(currentNode.nama);
            Node temp = neighbors.head;
            while (temp != null) {
                if (!visited.contains(temp.nama)) {
                    int newDistance = currentNode.jarak +
edges.getDistance(currentNode.nama, temp.nama);
                    if (!unvisited.contains(temp.nama)) {
                        unvisited.add(temp.nama, newDistance,
currentNode.nama);
```

```
                    } else {
                        unvisited.updateDistance(temp.nama,
newDistance, currentNode.nama);
                    }
                }
                temp = temp.next;
            }
        }
        visited.sortByDistance();
        Node temp = visited.head;
        while (temp != null) {
            printRoute(temp.nama, visited);
            temp = temp.next;
        }
    }

    public static void printRoute(String nama, LinkedList visited) {
        StringBuilder route = new StringBuilder();
        buildRoute(nama, visited, route);
        System.out.println(route);
    }

    public static void buildRoute(String nama, LinkedList visited,
StringBuilder route) {
        Node temp = visited.head;
        while (temp != null) {
            if (temp.nama.equals(nama)) {
                if (temp.parent != null) {
                    buildRoute(temp.parent, visited, route);
                    route.append(" => ");
                }
                route.append(temp.nama);
                return;
            }
            temp = temp.next;
        }
    }
}
```

6. Kelas Main

```
public class Main {
        private static final EdgeList edges1;
        private static final EdgeList edges2;
        private static final EdgeList edges3;

        static {
            edges1 = new EdgeList();
            edges1.add("Theta", "Kappa", 3);
            edges1.add("Theta", "Iota", 4);
            edges1.add("Theta", "Mu", 4);
            edges1.add("Theta", "Epsilon", 5);
            edges1.add("Theta", "Delta", 7);
            edges1.add("Delta", "Eta", 2);
            edges1.add("Delta", "Beta", 3);
```

```
            edges1.add("Kappa", "Nu", 7);
            edges1.add("Mu", "Lambda", 8);
            edges1.add("Mu", "Omnicron", 8);
            edges1.add("Epsilon", "Zeta", 8);
            edges1.add("Mu", "Xi", 10);
            edges1.add("Delta", "Alpha", 9);
            edges1.add("Delta", "Gamma", 17);
            edges1.add("Nu", "Omega", 9);
            edges1.add("Beta", "Gamma", 7);
            edges1.add("Xi", "Sigma", 5);

            edges2 = new EdgeList();
            edges2.add("Alpha", "Beta", 8);
            edges2.add("Alpha", "Delta", 9);
            edges2.add("Alpha", "Eta", 10);
            edges2.add("Delta", "Epsilon", 4);
            edges2.add("Beta", "Gamma", 7);
            edges2.add("Delta", "Theta", 7);
            edges2.add("Eta", "Lambda", 9);
            edges2.add("Theta", "Kappa", 3);
            edges2.add("Theta", "Iota", 4);
            edges2.add("Theta", "Mu", 4);
            edges2.add("Epsilon", "Zeta", 9);
            edges2.add("Kappa", "Nu", 7);
            edges2.add("Lambda", "Xi", 7);
            edges2.add("Mu", "Omnicron", 8);
            edges2.add("Xi", "Sigma", 5);
            edges2.add("Nu", "Omega", 9);

            edges3 = new EdgeList();
            edges3.add("Mu", "Theta", 4);
            edges3.add("Theta", "Kappa", 3);
            edges3.add("Theta", "Iota", 4);
            edges3.add("Mu", "Lambda", 8);
            edges3.add("Mu", "Omnicron", 8);
            edges3.add("Theta", "Epsilon", 5);
            edges3.add("Mu", "Xi", 10);
            edges3.add("Theta", "Delta", 7);
            edges3.add("Beta", "Gamma", 7);
            edges3.add("Omnicron", "Nu", 3);
            edges3.add("Delta", "Eta", 2);
            edges3.add("Delta", "Beta", 3);
            edges3.add("Xi", "Sigma", 5);
            edges3.add("Epsilon", "Zeta", 9);
            edges3.add("Omnicron", "Omega", 10);
            edges3.add("Alpha", "Delta", 9);
        }

        public static void main(String[] args) {
            ShortestPathFinder.findShortestPaths("Theta", edges1);
            System.out.println();
            ShortestPathFinder.findShortestPaths("Alpha", edges2);
            System.out.println();
            ShortestPathFinder.findShortestPaths("Mu", edges3);
        }
}
```

C. OUTPUT


Theta
Theta => Kappa
Theta => Iota
Theta => Mu
Theta => Epsilon
Theta => Delta
Theta => Delta => Eta
Theta => Delta => Beta
Theta => Kappa => Nu
Theta => Mu => Lambda
Theta => Mu => Omnicron
Theta => Epsilon => Zeta
Theta => Mu => Xi
Theta => Delta => Alpha
Theta => Delta => Beta => Gamma
Theta => Kappa => Nu => Omega
Theta => Mu => Xi => Sigma
Alpha
Alpha => Beta
Alpha => Delta
Alpha => Eta
Alpha => Delta => Epsilon
Alpha => Beta => Gamma
Alpha => Delta => Theta
Alpha => Delta => Theta => Kappa
Alpha => Eta => Lambda
Alpha => Delta => Theta => Iota
Alpha => Delta => Theta => Mu
Alpha => Delta => Epsilon => Zeta
Alpha => Delta => Theta => Kappa => Nu
Alpha => Eta => Lambda => Xi
Alpha => Delta => Theta => Mu => Omnicron
Alpha => Eta => Lambda => Xi => Sigma
Alpha => Delta => Theta => Kappa => Nu => Omega
Mu
Mu => Theta
Mu => Theta => Kappa
Mu => Theta => Iota
Mu => Lambda
Mu => Omnicron
Mu => Theta => Epsilon
Mu => Xi
Mu => Theta => Delta
Mu => Omnicron => Nu
Mu => Theta => Delta => Eta
Mu => Theta => Delta => Beta
Mu => Xi => Sigma
Mu => Omnicron => Omega
Mu => Theta => Epsilon => Zeta
Mu => Theta => Delta => Alpha
Mu => Theta => Delta => Beta => Gamma