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Research paper

Equitable Power Domination Number of Mycielskian of Certain Graphs

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Abstract

Let $G(V, E)$ be a simple graph with vertex set V and edge set E. A set $S \subseteq V$ is called a power dominating set (PDS), if every vertex $u \in V - S$ is observed by some vertices in S by using the following rules: (i) if a vertex v in G is in PDS, then it dominates itself and all the adjacent vertices of v and (ii) if an observed vertex v in G has $k > 1$ adjacent vertices and if $k - 1$ of these vertices are already observed, then the remaining one non-observed vertex is also observed by v in G. A power dominating set $S \subseteq V$ in $G(V, E)$ is said to be an equitable power dominating set (EPDS), if for every $v \in V - S$ there exists an adjacent vertex $u \in S$ such that the difference between the degree of u and degree of v is less than or equal to 1, i.e., $|d(u) - d(v)| \leq 1$. The minimum cardinality of an equitable power dominating set of G is called the equitable power domination number of G and denoted by $\gamma_{epd}(G)$. The Mycielskian of a graph G is the graph $\mu(G)$ with vertex set $V \cup V' \cup z$, where $V' = \{v' : v \in V\}$, and edge set $E = \{uv' : uv \in E\} \cup \{v'z : v' \in V'\}$. In this paper we investigate the equitable power domination number of Mycielskian of certain graphs.

***Keywords**: Dominating set; Equitable dominating set; Power dominating set; Equitable power dominating set; Equitable power domination number, Mycielskian graph.*

1. Introduction

All the graphs considered in this paper are finite, connected, simple, and undirected. The notion of domination in graphs was introduced by Hedetniemi and Laskar [7] and the concept of equitability in the graphs was studied by Swaminathan et al. [9]. Haynes et al. introduced the concept of power domination in graphs and power domination number of graphs.

A dominating set [6, 7] of a graph $G = (V, E)$ is a set S of vertices such that every vertex v in $V - S$ has at least one neighbor in S. The minimum cardinality of a dominating set of G is called the domination number of G and denoted by $\gamma_d(G)$. The degree $d(v)$ of a vertex v in G is the total number of edges of G incident with v and any two adjacent vertices u and v in G are said to hold equitable property if $|d(u) - d(v)| \leq 1$. A dominating set $S \subseteq V$ in $G(V, E)$ is called equitable dominating set [1] if for every $v \in V - S$ there exists an adjacent vertex $u \in S$ such that the difference between degree of u and degree of v is less than or equal to 1, that is $|d(u) - d(v)| \leq 1$. The minimum cardinality of an equitable dominating set of G is said to be equitable domination number of G and denoted by $\gamma_{ed}(G)$.

A set $S \subseteq V$ is called a power dominating set (PDS) [2, 4] of G if every vertex $u \in V - S$ is observed by some vertices in S by using the following rules:

If a vertex v in G is in PDS, then it dominates itself and all the adjacent vertices of v.

If an observed vertex v in G has $k > 1$ adjacent vertices and if $k - 1$ of these vertices are already observed, then the remaining one non-observed vertex is also observed by v in G. The minimum cardinality of an power dominating set of G is called the power domination number of G and denoted by $\gamma_{pd}(G)$.

Banu Priya et al. introduced the concept of equitable power domination in graphs [3]. A power dominating set $S \subseteq V$ in $G(V, E)$ is said to be an equitable power dominating set, if for every vertex $v \in V - S$ there exists an adjacent vertex $u \in S$ such that the difference between degree of u and degree of v is less than or equal to 1, that is $|d(u) - d(v)| \leq 1$. The minimum cardinality of an equitable power dominating set of G is said to be the equitable power domination number of G and denoted by $\gamma_{epd}(G)$. It is interesting to note that the equitable power dominating set S of a graph G is not unique.

Let $G(V, E)$ be a graph. The Mycielskian of G [10] is the graph $\mu(G)$ with vertex set $V \cup V' \cup z$, where $V' = \{v' : v \in V\}$, and edge set $E = \{uv' : uv \in E\} \cup \{v'z : v' \in V'\}$. We call the vertices of V'as the corresponding vertices of V for convenience sake. In this paper we establish the equitable power domination number of Mycielskian of certain graphs.

2. The Equitable Power Domination Number of the Myceilskian of Cycle and Path

One can note that the equitable power domination number of the Mycielskian of a cycle C_n, for $3 \leq n \leq 5$ is 2. One such example is given in Figure. 1.

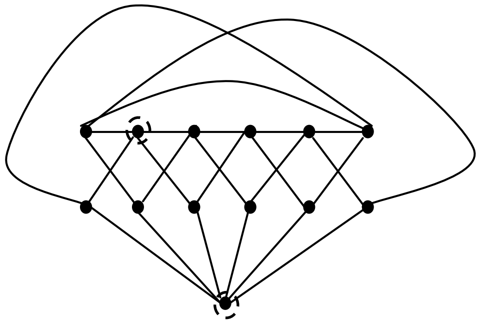

Figure.1: Equitable power domination number of $C_{5,}\gamma_{epd}(C_n) = 2$

2.1. Theorem

Let C_n be a cycle on n vertices. Then $\gamma_{epd}(\mu(C_n)) = 3$, for $n \geq 6$.

Proof

Let C_n be a given cycle on $n \geq 6$ vertices $u_1, u_2, \ldots, u_n$. Obtain the Mycielskian of a cycle $C_n, \mu(C_n)$ with $V(\mu(C_n)) = u_1, u_2, \ldots, u_n, u_1^{'}, u_2^{'}, \ldots, u_n^{'}, v$. Note that the vertices $u_1, u_2, \ldots, u_n$ are of degree 4, and $u_1^{'}, u_2^{'}, \ldots, u_n^{'}$ are of degree 3 and the degree of the root vertex v is n in $\mu(C_n)$. To obtain the equitable power dominating set S of $\mu(C_n)$, one has to choose the root vertex v to be in S. Because $|d(u_1^{'}) - d(v);\ 1 \leq i \leq n \mid \gneqq 1$. There are $2n$ non-observed vertices and without loss of generality, let u_k be in S. Since the degree of u_k is 4, it observes $u_{k-1}, u_{k+1}, u_{k-1}^{'}$, and $u_{k+1}^{'}$. One can also see that $u_{k-1}^{'}$ and $u_{k+1}^{'}$ have only one non-observed vertex, namely u_{k-2} and u_{k+2} respectively. So u_{k-2} and u_{k+2} are observed by $u_{k-1}^{'}$ and $u_{k+1}^{'}$, respectively by the definition of power domination in graphs. One can note that all the observed vertices are having at least two non-observed adjacent vertices, so the equitable power domination property fails. So one has to choose any one of the non-observed vertices $u_{k-3}, u_{k+3}, u_{k-2}{'}$ or $u_{k+2}{'}$ to be in S in order to get the minimum cardinality. We choose, without loss of generality u_{k-3}, for discussion sake. Now u_{k-3} dominates $u_{k-4,}\, u_{k-4}^{'}$, and $u_{k-2}^{'}$. Now one can see that the remaining non-observed vertices are observed by the observed vertices by the equitable power domination property. Thus $\gamma_{epd}\,(\mu(C_n)) = 3$ for $n \geq 6$.

2. 2. Definition [5]

A path P_n is a graph whose vertices can be listed in the order $v_1, v_2, \ldots, v_n$ such that the edges are $\{v_i, v_{i+1}\}$ where $i = 1, 2, \ldots, n-1$.

2.3. Lemma

Let P_n be a path on n vertices.

Then $\gamma_{epd}\left(\mu(P_n)\right) = \begin{cases} 1, \text{ for } n = 2, \\ 3, \text{ for } n = 3, \\ 4, \text{ for } n = 4, 5, 6. \end{cases}$

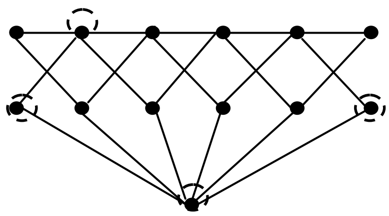

Figure.2: Equitable power domination number of a path P_6, $\gamma_{epd}(P_6) = 4$

2.4. Theorem

Let P_n be a path. Then $\gamma_{epd}(\mu(P_n)) = 5$, for $n \geq 7$.

Proof

Let P_n be a path on n vertices $u_1, u_2, \ldots, u_n$. Obtain the Mycielskian of a path P_n, $\mu(P_n)$ with the vertex set $V(\mu(P_n)) = u_1, u_2, \ldots, u_n, u_1^{'}, u_2^{'}, \ldots, u_n^{'}, v$ where v is the root vertex of $\mu(P_n)$. It is interesting to see that the vertices $u_1, u_1^{'}\ u_n$, and $u_n^{'}$ are of degree 2. The vertices $u_2, \ldots, u_{n-1}$ are of degree 4, vertices $u_2^{'}, \ldots, u_{n-1}^{'}$ are of degree 3, and $d(v) = n$ in $\mu\,(P_n)$. In order to obtain an equitable power dominating set S of $\mu\,(P_n)$, one has to choose the vertex v, as $|d(u_i^{'}) - d(v);\ 1 \leq i \leq n \mid \gneqq 1$. And also, one has to put the vertices $u_1^{'}$ and $u_n^{'}$ in S since $u_1^{'}$ and $u_n^{'}$ have the neighbors whose degrees are more than two that of itself, which clearly violates the equitable property. Now there are $2(n-1)$ non-observed vertices in $\mu(P_n)$. Without loss of generality, choose u_k to be in S. Now u_k equitably power dominates $u_{k-1}, u_{k+1,}\, u_{k-1}^{'}$, and $u_{k+1}^{'}$. And also the observed vertices $u_{k-1}^{'}$ and $u_{k+1}^{'}$ eventually equitably power dominate u_{k-2} and u_{k+2}, respectively as they are the only non-observed vertices of $u_{k-1}^{'}$ and $u_{k+1}^{'}$. Now the observed vertices $u_i^{'}$s have more than one non-observed vertices and also the observed vertices u_i's have no adjacent vertices to equitably power dominate. Therefore one has to choose any one of the vertices $u_{k-3}, u_{k+3}, u_{k-2}^{'}$, and $u_{k+2}^{'}$ to be in S in obtaining the optimum cardinality. So select u_{k-3} to be in S. Next u_{k-3} equitably power dominates its adjacent non-observed vertices. Consequently the observed vertices u_i and $u_i^{'}$ equitably power dominate the remaining non-observed vertices alternatively in both the directions. Thus $S = \{v, u_1^{'}, u_n^{'}, u_k, u_{k-3}\}$ and |S| = 5.

3. The Equitable Power Domination Number of the Mycielskian of Complete Bipartite Graphs

3.1. Definition [5]

A complete bipartite graph, denoted $K_{m,n}$, is a simple bipartite graph with bipartition (X, Y) in which each vertex of X is joined to each vertex of Y.

3.2. Theorem [3]

Let $K_{m,n,}$ $m, n \geq 2$ be a complete bipartite graph. Then $\gamma_{epd}(K_{m,n}) = \begin{cases} m+n & if \quad |m-n| \geq 2 \\ 2 & if \quad |m-n| < 2\,. \end{cases}$

3.3. Theorem

Let $K_{m,n}$ be a complete bipartite graph. Then

$$\gamma_{epd}\,(\mu(K_{m,n})) = \begin{cases} 2n + 3 & \text{for } m = 2,\ n \geq 5, \\ m+n+3 & \text{for } |2m-n-1| < 2, \\ 2(m+n)+1 & \text{for } |2m-n-1| \geq 2. \end{cases}$$

Proof

Let $K_{m,n}$ be a complete bipartite graph with partitions $V_1 = \{a_1, a_2, \ldots, a_m\}$ and $V_2 = \{b_1, b_2, \ldots, b_n\}$. The Mycielskian of complete bipartite graph $K_{m,n}$, denoted $\mu(K_{m,n})$ is obtained as follows: $V\left(\mu(K_{m,n})\right) = V_1 \cup V_2 \cup V_3 \cup$ w, where $V_1 = V(K_{m,n})$ = $\{a_1, a_2, \ldots, a_n,\ b_1, b_2, \ldots, b_n\}$, $V_2 = V'(K_{n,n})$ = $\{a_1{'}, a_2{'}, \ldots, a_n{'}, b_1{'}, b_2{'}, \ldots, b_n{'}\}$ and $V_3 = \{w\}$. $E\left(\mu(K_{m,n})\right) = E_1 \cup E_2 \cup E_3$, where $E_1 = E(K_{m,n})$, $E_2 = \{a_i{'}b_j: 1 \leq i \leq m, 1 \leq j \leq n\}$, $E_3 = \{a_i b_j^{'}: 1 \leq i \leq m, 1 \leq j \leq n\}$ and $E_4 = \{wa_i^{'}, wb_j^{'}: 1 \leq i \leq m, 1 \leq j \leq n\}$. It is interesting to see that the degree of vertices in $V\left(\mu(K_{m,n})\right)$ are as follows. The vertices in the partition V_1 are of degree $2n$, the vertices in the partition V_2 are of degree $2m$, the corresponding vertices of the partition V_1 are of degree $n+1$, the corresponding vertices of the partition V_2 are of degree $m+1$ and the root vertex is of degree

$m+n$. When obtaining the equitable power dominating set S of $\mu(□_{□,□})$, the following three cases arise.

Case 1: When m = 2 and n ≥ 5
In this case one has to select all the vertices except duplicate vertices of the partition $□_1$ to be in the equitable dominating set S, since the root vertex which is of degree □ + □ equitably power dominates corresponding vertices of the partition $□_1$ (whose degree is □ + 1). Therefore $□ = □\left(\mu(□_{□,□})\right)\backslash\{□_1', □_2', \ldots, □_□'\}$ and thus $|□| = 2□ + 3$.

Case 2: When $|2□ - □ - 1| < 2$
In this case one can obtain EPD set □ by choosing all the corresponding vertices of the partition $□_2$ and the vertices of $□_1$ since they have no adjacent vertices satisfying equitable domination property and hence they are neither equitably power neither dominated nor observed by any other vertices. We also choose the root vertex □ to be in □ since it is of maximum degree □ + □ and not observed by any other vertices. Then finally choosing any 2 vertices from the corresponding vertices of partition $□_1$ which equitably power dominate the remaining non-observed vertices. Hence $□ = \{□_1', □_2', \ldots, □_□', □_1, □_2, \ldots, □_□, □, □_1', □_2'\}$ and $|□| = □ + □ + 3$.

Case 3: When $|2□ - □ - 1| \geq 2$
To obtain the equitable power dominating set □ one must choose all the vertices of $\mu(□_{□,□})$ since no adjacent vertices satisfy EPD property and for every □ and □ is such that $|□(□) - □(□)| \geq 2$. $□ = □_1, □_2, \ldots, □_□, □_1, □_2, \ldots, □_□, □_1', □_2', \ldots, □_□', □_1', □_2', \ldots, □_{□□}'$. and $|□| = 2(□ + □) + 1$.

3.4. Theorem

Let $□_{□,□}$ be a complete bipartite graph. Then $□_{□□□}(\mu(□_{□,□})) = 2□ + 3$ for $□ \geq 3$.

Proof.
Let $□_{□,□}$ be a complete bipartite graph with partitions $□_1 = \{□_1, □_2, \ldots, □_□\}$ and $□_2 = \{□_1, □_2, \ldots, □_□\}$. The Mycielskian of complete bipartite graph $□_{□,□}$, denoted $\mu(□_{□,□})$ is obtained as follows: $□\left(\mu(□_{□,□})\right) = □_1 \cup □_2 \cup □_3$ where $□_1 = □(□_{□,□}) = \{□_1, □_2, \ldots, □_□, □_1, □_2, \ldots, □_□\}$, $□_2 = □'(□_{□,□}) = \{□_1', □_2', \ldots, □_□', □_1', □_2', \ldots, □_□'\}$ and $□_3 = \{□\}$. $□\left(\mu(□_{□,□})\right) = □_1 \cup □_2 \cup □_3$, where $□_1 = □(□_{□,□})$, $□_2 = \{□_□'□_□ : 1 \leq □ \leq □\}$, $□_3 = \{□_□□_□' : 1 \leq □ \leq □\}$ and $□_4 = \{□□_□', □□_□' : 1 \leq □ \leq □\}$. It is interesting to see that the vertices in $□_1$ are of degree $2□$, the vertices in $□_2$ are of degree $□ + 1$ and the root vertex is of degree $2□$ in $(\mu(□_{□,□}))$. To obtain the equitable power dominating set □, the root vertex □, must be in □ as there are no adjacent vertices with $|□(□) - □(□); □ □ □_2| \leq 1$. Next the newly added vertices namely $□_□$'s and $□_□$'s must be in □. This is because there are no adjacent vertices of $□_□$'s and $□_□$'s satisfying the required equitable power domination property. Finally, there are 2□ non-observed vertices with degree 2□ each. Then it is enough to choose any one vertex from $□_□$'s and one vertex from $□_□$'s to get the required equitable power dominating set □. We choose $□_1$ and $□_1$ to be in □. Thus $□ = \{□_1', □_2', \ldots, □_□', □_1', □_2', \ldots, □_□', □_1, □_1, □\}$ and $|□| = 2□ + 3$.

3.5. Theorem

Let $□_{1,□}$ be a star graph. Then $□_{□□□}(\mu(□_{1,□})) = 2(□ + 1)$, for $□ \geq 3$.

Proof
Let $□_{1,□}$ be a star graph with pendant vertices $□_1, □_2, \ldots, □_□$ and the common vertex □. Obtain the Mycielskian of a star $□_{1,□}$, denoted by $\mu(□_{1,□})$ with the vertex set $□(\mu(□_{1,□})) = \{□, □_1, □_2, \ldots, □_□, □', □_1', □_2', \ldots, □_□', □\}$, where □ is the root vertex of $\mu(□_{1,□})$. It is interesting to see that there are 2□ vertices namely $□_1, □_2, \ldots, □_□, □_1', □_2', \ldots, □_□'$ are of degree 2 and the common vertex □ in $□_{1,□}$ is of degree 2□ in $\mu(□_{1,□})$. Moreover the newly added vertex $□'$ which is the corresponding vertex of the common vertex □ in $□_{1,□}$ and the root vertex □ are of degree $□ + 1$ in $\mu(□_{1,□})$. To obtain the equitable power dominating set □ of $\mu(□_{1,□})$, the vertex □ must be in □, this is because □ is of degree 2□ which clearly violates the required equitable property with all other vertices in $\mu(□_{1,□})$. Now one also has to choose all the vertices $□_1, □_2, \ldots, □_□$ and $□_1', □_2', \ldots, □_□'$ to be in □ because they are of degree 2 and the remaining three vertices are of degree greater than 3, which violates the equitably dominating condition. Finally one has a choice of choosing either $□'$ or the adjacent root vertex □ to be in □ as they are of same degree. So we choose □ to be in □ .
fore $□ = \{□, □_1, □_2, \ldots, □_□, □', □_1', □_2', \ldots, □_□', □\}$ and $|□| = 2(□ + 1)$.

4. Equitable Power Domination Number of the Mycielskian of Comb, Complete, and Fan Graphs

3.6. Definition

Comb is a graph obtained by joining a single pendant edge to each vertex of a path.
One can see that the equitable power domination number of the Mycielskian of a comb graph $□_{□,□}$ is 4 for $□ = 2$, as given in Figure 3. We have the following theorem when $□ \geq 3$.

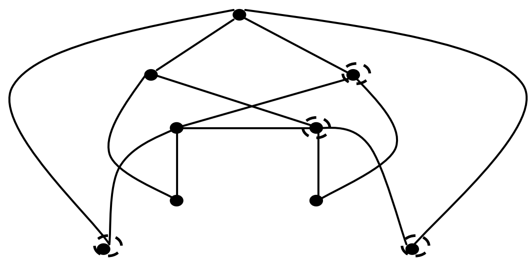

Figure.3: Equitable power domination number of $□_{2,2}$, $\gamma_{epd}(□_{2,2}) = 4$.

4.1. Theorem

Let $□_{□,□}$ be a comb graph. Then $□_{□□□}(\mu(□_{□,□})) = 3□$, for $□ \geq 3$.

Proof
Let $□_{□,□}$ be a comb graph with vertex set $□ = \{□_1, □_2, \ldots, □_□, □_1, □_2, \ldots, □_□\}$. The Mycielskian of a comb graph is denoted by $(\mu(□_{□,□}))$ is obtained as follows. $□\left(\mu(□_{□,□})\right) = □_1 \cup □_2 \cup \{□\}$, Where $□_1 = □(□_{□,□}) = \{□_1, □_2, \ldots, □_□, □_1, □_2, \ldots, □_□\}$, $□_2 = □'(□_{□,□}) = \{□_1', □_2', \ldots, □_□', □_1', □_2', \ldots, □_□'\}$. Edge set $□(\mu(□_{□,□})) = □_1 \cup □_2 \cup □_3 \cup □_4 \cup □_5$, where $□_1 = (□_{□,□})$, $□_2 = \{□_□'□_□ ; 1 \leq □ \leq □\}$, $□_3 = \{□_□□_□' ; 1 \leq □ \leq □\}$, $□_4 = \{□_□', □□_□' ; 1 \leq □ \leq □\}$ and $□_5 = \{□_□□_□', □_□'□_□ ; 1 \leq □ \leq □ - 1, □ = □ + 1\}$. It is easy to see that $□(□_□) = □(□_□') = 2$, for $1 \leq □ \leq □$, $□(□) = 2□$, $□(□_1') = □(□_□') = 3$, $□(□_□') = 4$ for $2 \leq □ \leq □ - 1$, $□(□_1) = □(□_□) = 4$, $□(□_□) = 6$, for $2 \leq □ \leq □ - 1$. To obtain the

equitable power dominating set of $□_{□,□}$ one must choose □ which is of maximum degree 2□. One should also choose $□_□$, $□_□{}'$ for $1 \le □ \le □$ and $□'_□$ for $2 \le □ \le □ - 1$ since there are no adjacent vertices satisfying the equitable property. Now $□_1$and $□_□$ observes $□'_1$and $□'_□$, respectively. Finally, it suffices to choose any one of the vertices from $□_2$ to $□_{□-1}$ to be in □, since they are of same degree and also all its adjacent neighbors are already observed.

4.2. Definition [5]

Any two distinct vertices of a graph □ are adjacent, then □ is said to be a complete graph and it is denoted by $□_□$.
One can see the equitable power domination number of the Mycielskian of a complete graph $□_□$, for $□ = 3$, as given in Figure 4. We have the following theorem when $□ > 3$.

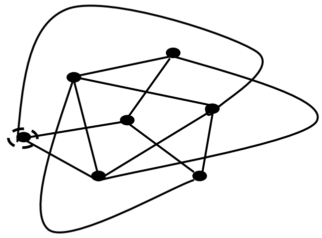

Figure.4: Equitable power domination number of the complete graph $□_3$, $\gamma_{epd}(□_3) = 1$

4.3. Theorem

Let $\mu(□_□)$ be a Mycielskian graph of a complete graph $□_□$. Then $□_{□□□}(\mu(□_□)) = 2$, for $□ \ge 4$.

Proof
Let $□_□$ be a complete graph with vertex set $□ = \{□_1, □_2, \dots, □_□\}$. The Mycielskian of a complete graph $\mu(□_□)$ is obtained with the vertex set $□(\mu(□_□)) = \{□, □_1, □_2, \dots, □_□, □'_1, □'_2, \dots, □'_□\}$, where □ is the root vertex of $\mu(□_□)$. It is interesting to see that the degree of the vertices $□, □'_1, □'_2, \dots, □'_□$ in the graph $\mu(□_□)$ is □ and the vertices $□_1, □_2, \dots, □_□$ are of degree $2(□ - 1)$. In order to obtain an equitable power dominating set □, let us first choose □ which equitably power dominates $□'_1, □'_2, \dots, □'_□$ and from the remaining vertices, it is enough to choose at least any one vertex from $□_1, □_2, \dots, □_□$ of $\mu(□_□)$ say $□_1$, then $□_1$ equitably power dominates $□_2, □_3 \dots, □_□$. Thus $S = \{□, □_1\}$ and hence $□_{□□□}(\mu(□_□))$=2.

4.3. Definition

A fan graph $□_{(1,□)}$ [9] is defined as the graph $□_1 \wedge □_□$, where $□_1$is the empty graph on one vertex and $□_□$ is a path on □ vertices.

4.4. Theorem

Let $□_{1,□}$ be a fan graph. Then $□_{□□□}(\mu(□_{1,□})) = □ + 3$ for $□ \ge 7$.

Proof
Let $□_{1,□}$ be the given fan graph with common vertex $□_0$ and the remaining vertices $□_1, □_2, \dots, □_□$. The Mycielskian of a fan $□_{1,□}$, denoted by $\mu(□_{1,□})$ is obtained with the vertex set $□(\mu(□_{1,□})) = \{□_0, □_1, □, \dots, □_□, □'_0, □'_1, □'_2, \dots, □'_□, □\}$ where □the root vertex of $\mu(□_{1,□})$. It is interesting to see that there are 2□ +3 vertices, namely $□_1, □_2, \dots, □_□, □'_1, □'_2, \dots, □'_□$. When we construct $(\mu(□_{1,□}))$ the degree of vertices are as follows: $□(□_1) = □(□_□) = □(□'_2) = □(□'_3) =, \dots, □(□'_{□-1}) = 4$, $□(□_2) = □(□_3) = □(□_4) = \cdots □(□_{□-1}) = 6$, $□(□'_1) = □(□'_□) = 3$, degree of the common vertex of fan $□_{1,□}$ in $\mu(□_{1,□})$ is $2□$ and the degree of root vertex □ of $□_{1,□}$ in $\mu(□_{1,□})$ is $□ + 1$. Moreover the newly added vertex $□'_0$ which is the corresponding vertex of the common vertex $□_0$ in $□_{1,□}$ is of degree $□ + 1$. To obtain the equitable power dominating set □ of $\mu(□_{1,□})$, $□_0, □'_1, □'_2, \dots, □'_□$ must be in □ since $□_0$ is of maximum degree and no adjacent vertex satisfies EPD property. From the two vertices □ and $□'_0$, it is enough to choose any one because they are of same degree. Now, among the remaining $□_1, □_2, \dots, □_□$ vertices $□_1$and $□_□$will be observed by $□'_2, □'_{□-1}$ respectively. Then it is enough to choose any one among $□_2, □_3, \dots, □_{□-1}$ vertices which equitably power dominates every other vertices, so without loss of generality, let us choose$□_2$. Thus $□ = \{□_0, □'_0, □'_1, □'_2, \dots, □'_□, □_2\}$ and $|□| = □ + 3$.

4.5. Remark

1. $□_{□□□}(\mu(□_{1,□})) = □$, for $□ = 3, 4$.
2. $□_{□□□}(\mu(□_{1,□})) = □ + 2$, for $□ = 5, 6$.

5. Conclusion

In this paper the equitable power domination in the Mycielskian of certain graphs has been studied and the equitable power domination number of the Mycielskian of various classes of graphs has been determined. Establishing the equitable power domination number of other classes of graphs is open and this is for future work.

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References

[1] Anitha A, Arumugam S & Chellali M (2011), Equitable Domination in Graphs, Discrete Mathematics, Algorithms and Applications, Vol. 03, pp. 311-321.
[2] Baldwin TL, Mili L, Boisen MB, & Adapa R (1993), Power System Observability With Minimal Phasor Measurement Placement, IEEE Trans, Vol. 8, pp. 707-715.
[3] Banu Priya S & Srinivasan N (2018), Equitable power domination number of certain graphs, Int. J. of Eng. & Tech. (UAE), Vol. 7, No. 4.10, pp. 349-354.
[4] Barrera R & Ferrero D (2011), Power Domination in Cylinders, Tori, and Generalized Petersen Graphs, Networks, Vol. 58, pp. 43-49.
[5] Bondy JA & Murthy USR (1986), Graph Theory with Applications, Elsevier, North Holland, New York.
[6] Gera R, Horton S & Rasmussen C (2006), Dominator colorings and safe clique partitions, Congressus Numerantium, Vol. 181, pp. 19-32.
[7] Hedetniemi ST & Laskar RC (1990), Bibliography on domination in graphs and some basic definitions of domination parameters, Discrete Mathematics, Vol. 86, No. 1–3, pp. 257–277.
[8] Parthiban A & Gnanamalar David N (2018), On Finite Prime Distance Graphs, Indian Journal of Pure and Applied Mathematics, (To appear).
[9] Swaminathan V & Dharmalingam KM (2011), Degree equitable domination on graphs, Kragujevac Journal of Mathematics, Vol. 35, No. 1, pp. 191–197.
[10] Mycielski (1955), Sur le coloriage des graphes, Colloq. Math., Vol. 3, pp. 161-162.