Proceedings of the Jangjeon Mathematical Society
23 (2020), No. 2, pp. 149 - 157

www.jangjeon.or.kr
http://dx.doi.org/10.17777/pjms2020.23.2.149

S- CORONA OPERATIONS OF STANDARD GRAPHS IN TERMS OF DEGREE SEQUENCES

M. MANJUNATH AND V. LOKESHA

Abstract. Let G and H be two graphs with vertices n_1 and n_2 and edges e_1 and e_2 respectively. The corona of graphs G and H with disjoint vertex sets $V(G)$ and $V(H)$ and edge sets $E(G)$ and $E(H)$ is obtained by taking one copy of G and $|V(G)|$ copies of H, by joining the i^{th} vertex of $V(G)$ to each vertex in the i^{th} copy of H. The degree sequence (DS) of a graph is the set of vertex degrees. In this article, we determine the (DS) of S- vertex (edge) corona and S- edge neighbourhood corona operation of standard graphs.

2010 Mathematics Subject Classification: 05C90, 05C12;

Keywords and phrases: S- vertex (edge) corona, S- edge neighbourhood corona, Standard graphs and degree sequences;

Dedicated to Professor Chandrashekar Adiga on his 62^{nd} Birthday.

1. Introduction

Let $G = (V, E)$ be a graph with $\mid V \mid= p$ vertices and $\mid E \mid= q$ edges. Here, we consider simple connected graph having no loops and multiple edges. Degree of vertex $v \in V(G)$ is the number of edges incident on it and is denoted as $d_G(v)$ or $\deg_G(v)$. Path is a finite or infinite walk and no vertex is repeated, a closed path is called cycle and complete graph with n-vertices having each vertex degree as $(n-1)$[2].

Complete bipartite graph $G = (V = \{V_1, V_2\}, E)$ connects each vertex from set V_1 to each vertex from set V_2[6]. A Star graph is a complete bipartite graph if a single vertex belongs to one set and all other vertices belongs to another set. A graph having each vertex degree is r is called r-regular graph.

The degree sequences DSs of G is $DS(G) = \{\lambda_1^{\xi_1}, \lambda_2^{\xi_2}, \lambda_3^{\xi_3}, ..., \lambda_n^{\xi_n}\}$ can be obtained by degree of vertices v_i of a graph G in ascending or descending order [[1],[9]]. In 1981, Bolloas[3] started the study DSs and Tyshkevich et al., established a correspondence between DSs of graph and some structural properties of this graph in same year[8]. Chemical graph theory is a branch of Mathematical chemistry concerned with the study of chemical graphs. Chemical graph is graph obtained by atoms as vertices and bonds as edges in molecule[7]. A graph invariant is any function on a graph that does not depend on a labeling of its vertices. A topological index is the graph invariant which is correlated to the physical and chemical properties of a chemical compound of a molecular graph. The topological indices defined on vertex degrees are namely, forgotten, first and second Zagreb indices and many more.

Let G and H be two graphs with vertices p_1 and p_2 and edges q_1 and q_2 respectively. The S- vertex corona of graphs G and H with disjoint vertex sets $V(G)$ and $V(H)$ and edge sets $E(G)$ and $E(H)$ is obtained from $S(G)$ and $|V(G)|$ copies of H, by joining the i^{th} vertex of $V(G)$ to each vertex in the i^{th} copy of H [[4],[5]]. Then, $|V(G \odot_S H)| = p_1(1 + p_2) + q_1$ and $|E(G \odot_S H)| = 2q_1 + p_1(q_2 + p_2)$.

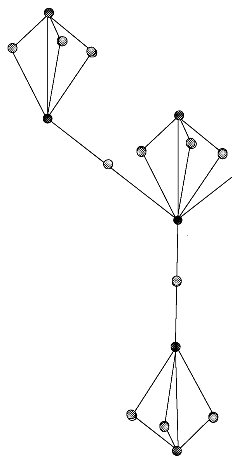

FIGURE 1. $S_4 \odot_S S_4$

The S- edge corona of graphs G and H with disjoint vertex sets $V(G)$ and $V(H)$ and edge sets $E(G)$ and $E(H)$ is obtained from $S(G)$ (Subdivision graph of G) and $|E(G)|$ copies of H, by joining the i^{th} vertex of $I(G)$ ($I(G)$ is the inserted vertices in $S(G)$) to each vertex in the i^{th} copy of H. Then, $|V(G \ominus_S H)| = p_1 + q_1(1 + p_2)$ and $|E(G \ominus_S H)| = q_1(2 + q_2 + p_2)$.

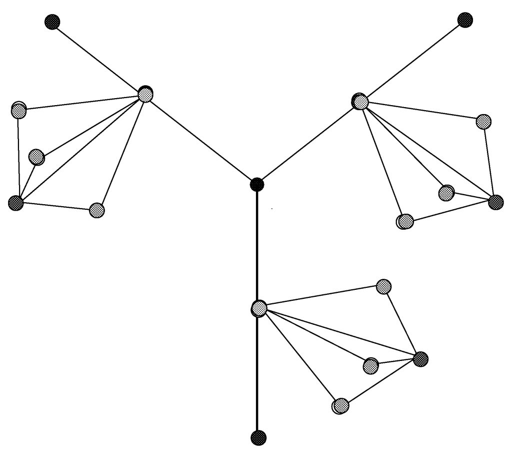

FIGURE 2. $S_4 \ominus_S S_4$

The S- edge neighbourhood corona of graphs G and H with disjoint vertex sets $V(G)$ and $V(H)$ and edge sets $E(G)$ and $E(H)$ is obtained from $S(G)$ and $|E(G)|$ copies of H, by joining the neighbours of i^{th} vertex of $I(G)$ ($I(G)$ is the inserted vertices in G) to each vertex in the i^{th} copy of H. Then, $|V(G \ominus_{nS} H)| = p_1 + q_1(1+p_2)$ and $|E(G \ominus_{nS} H)| = q_1(2 + q_2 + 2p_2)$.

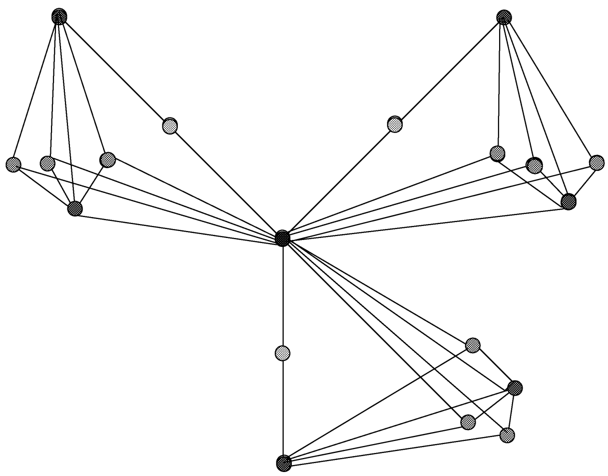

FIGURE 3. $S_4 \ominus_{nS} S_4$

2. MAIN RESULTS

In this section, the DSs of the S- vertex(edge) corona and S- edge neighbourhood corona of graphs G_1 and G_2 chosen from P_n, K_n, C_n, S_n, $K_{n,m}$ and r-regular graphs are obtained.

Theorem 2.1. *The DSs of all possible S-vertex corona of the path, complete graph, cycle, star, complete bipartite and r-regular graphs.*

Proof. First, the proof of $S_n \odot_S S_m$ is observing.

Let $DS(S_n) = \{1^{n-1}, (n-1)^1\}$ and $DS(S_m) = \{1^{m-1}, (m-1)^1\}$. To understand situation see FIGURE 1.

There are two types of vertices in each of S_n and S_m. Therefore there are $2 + 2 + 1 = 5$ types of vertices in $S_n \odot_S S_m$. The first type is the centre vertex (blue) of S_n which are connected with the $(n-1)$ vertices (pink) in $I(S_n)$ and mn-vertices in n-copies of S_m. Each of these $(n-1)$ vertices add $(1+m)$ to the DSs of $S_n \odot_S S_m$. Therefore they add $(1+m)^{n-1}$.

The second type of vertices (green) of S_n which are connected with the vertex (pink) of $I(S_n)$ and nm-vertices in n-copies of S_m. Each of these one vertex add

$(n+m-1)$ to the DSs of $S_n \odot_S S_m$. Therefore they add $(n+m-1)^1$.

The third type of centre vertices (red) of n^{th}-copies of S_m which are connected with the $(m-1)$ end vertices (orange) in n^{th} copy of S_m and n^{th} vertex in S_n. Each of these $(m-1)n$ vertices add 2 to the DSs of $S_n \odot_S S_m$. Therefore they add $2^{(m-1)n}$.

The fourth type of end vertices (orange) of n^{th}-copy of S_m which are connected with the centre vertex (red) of n^{th}-copy of S_m and n^{th} vertex in S_n. Each of these n vertices add m to the DSs of $S_n \odot_S S_m$. Therefore they add m^n.

The fifth type of vertices (pink) in $I(S_n)$ (Inserted vertices) which are connected with the centre vertex (blue) and $(n-1)$ end vertices (green) in S_n. Each of these $(n-1)$ vertices add 2 to the DSs of $S_n \odot_S S_m$. Therefore they add 2^{n-1}. Therefore,

$$DS(S_n \odot_S S_m) = \{(1+m)^{n-1}, (n+m-1)^1, 2^{(m-1)n}, m^n, 2^{n-1}\}.$$

Table 1. Degree sequences of S-vertex corona for path, complete, cycle, star, complete bipartite and r-regular graphs.

S_n	S_m	$DS(S_n \odot_S S_m)$
P_n	P_m	$\{(1+m)^2, (2+m)^{n-2}, 2^{n-1}, 2^{2n}, 3^{n(m-2)}\}$
P_n	K_m	$\{(1+m)^2, (2+m)^{n-2}, 2^{n-1}, m^{mn}\}$
P_n	C_m	$\{(1+m)^2, (2+m)^{n-2}, 2^{n-1}, 3^{mn}\}$
P_n	S_m	$\{(1+m)^2, (2+m)^{n-2}, 2^{n-1}, 2^{n(m-1)}, m^n\}$
P_n	$K_{m,o}$	$\{(1+m+o)^2, (2+m+o)^{n-2}, 2^{n-1}, (m+1)^{no}, (o+1)^{nm}\}$
P_n	r-regular graph with m-vertices	$\{(1+m)^2, (2+m)^{n-2}, 2^{n-1}, (r+1)^{nm}\}$
K_n	P_m	$\{(n+m-1)^n, 2^{n(n-1)/2}, 2^{2n}, 3^{n(m-2)}\}$
K_n	K_m	$\{(n+m-1)^n, 2^{n(n-1)/2}, m^{nm}\}$
K_n	C_m	$\{(n+m-1)^n, 2^{n(n-1)/2}, 3^{nm}\}$
K_n	S_m	$\{(n+m-1)^n, 2^{n(n-1)/2}, 2^{n(m-1)}, m^n\}$
K_n	$K_{m,o}$	$\{(n+m+o-1)^n, 2^{n(n-1)/2}, (m+1)^{no}, (o+1)^{nm}\}$
K_n	r-regular graph with m-vertices	$\{(n+m-1)^n, 2^{n(n-1)/2}, (r+1)^{nm}\}$
C_n	P_m	$\{(2+m)^n, 2^n, 2^{2n}, 3^{n(m-2)}\}$
C_n	K_m	$\{(2+m)^n, 2^n, m^{nm}\}$
C_n	C_m	$\{(2+m)^n, 2^n, 3^{nm}\}$
C_n	S_m	$\{(2+m)^n, 2^n, 2^{n(m-1)}, m^n\}$
C_n	$K_{m,o}$	$\{(2+m+o)^n, 2^n, (m+1)^{no}, (o+1)^{nm}\}$
C_n	r-regular graph with m-vertices	$\{(2+m)^n, 2^n, (r+1)^{nm}\}$
S_n	P_m	$\{(1+m)^{n-1}, (n+m-1), 2^{n-1}, 2^{2n}, 3^{n(m-2)}\}$
S_n	K_m	$\{(1+m)^{n-1}, (n+m-1), 2^{n-1}, m^{mn}\}$
S_n	C_m	$\{(1+m)^{n-1}, (n+m-1), 2^{n-1}, 3^{nm}\}$
S_n	S_m	$\{(1+m)^{n-1}, (n+m-1), 2^{n-1}, 2^{n(m-1)}, m^n\}$
S_n	$K_{m,o}$	$\{(1+m+o)^{n-1}, (n+m+o-1), 2^{n-1}, (m+1)^{on}, (o+1)^{mn}\}$
S_n	r-regular graph with m-vertices	$\{(1+m)^{n-1}, (n+m-1), 2^{n-1}, (r+1)^{nm}\}$

$K_{m,n}$	P_o	$\{(m+o)^n, (n+o)^m, 2^{mn}, 2^{2(m+n)}, 3^{(o-2)(n+m)}\}$
$K_{m,n}$	K_o	$\{(m+o)^n, (n+o)^m, 2^{mn}, o^{o(m+n)}\}$
$K_{m,n}$	C_o	$\{(m+o)^n, (n+o)^m, 2^{mn}, 3^{o(m+n)}\}$
$K_{m,n}$	S_o	$\{(m+o)^n, (n+o)^m, 2^{mn}, 2^{(o-1)(m+n)}, o^{(m+n)}\}$
$K_{m,n}$	$K_{r,s}$	$\{(m+r+s)^n, (n+r+s)^m, 2^{mn}, (r+1)^{s(m+n)}, (s+1)^{r(m+n)}\}$
$K_{m,n}$	r-regular graph with o-vertices	$\{(m+o)^n, (n+o)^m, 2^{mn}, (r+1)^{o(m+n)}\}$
r-regular graph with n-vertices	P_m	$\{(r+m)^n, 2^{nr/2}, 2^{2n}, 3^{(m-2)}\}$
r-regular graph with n-vertices	K_m	$\{(r+m)^n, 2^{nr/2}, m^{mn}\}$
r-regular graph with n-vertices	C_m	$\{(r+m)^n, 2^{nr/2}, 3^{mn}\}$
r-regular graph with n-vertices	S_m	$\{(r+m)^n, 2^{nr/2}, 2^{n(m-1)}, m^n\}$
r-regular graph with n-vertices	$K_{m,o}$	$\{(r+m+o)^n, 2^{nr/2}, (m+1)^{no}, (o+1)^{nm}\}$
r_1-regular graph with n-vertices	r_2-regular graph with m-vertices	$\{(r_1+m)^n, 2^{nr_1/2}, (r_2+1)^{mn}\}$

□

Theorem 2.2. *The DSs of all possible S-edge corona of the path, complete graph, cycle, star, complete bipartite and r-regular graphs.*

Proof. First, the proof of $S_n \ominus_S S_m$ is observing.

Let $DS(S_n) = \{1^{n-1}, (n-1)^1\}$ and $DS(S_m) = \{1^{m-1}, (m-1)^1\}$. To understand situation see FIGURE 2.

There are two types of vertices in each of S_n and S_m. Therefore there are $2+2+1 = 5$ types of vertices in $S_n \ominus_S S_m$. The first type is the centre vertex (blue) of S_n which are connected with the $(n-1)$ vertices (pink) in $I(S_n)$. Each of these $(n-1)$ vertices add 1 to the DSs of $S_n \ominus_S S_m$. Therefore they add 1^{n-1}.

The second type of vertices (green) of S_n which are connected with the vertex (pink) of $I(S_n)$. Each of these one vertex add $(n-1)$ to the DSs of $S_n \ominus_S S_m$. Therefore they add $(n-1)^1$.

The third type of centre vertices (red) of $(n-1)^{th}$-copies of S_m which are connected with the $(m-1)$ end vertices (orange) in $(n-1)^{th}$ copy of S_m and vertex in $I(S_n)$. Each of these $(m-1)(n-1)$ vertices add 2 to the DSs of $S_n \ominus_S S_m$. Therefore they add $2^{(m-1)(n-1)}$.

The fourth type of end vertices (orange) of $(n-1)^{th}$-copy of S_m which are connected with the centre vertex (red) in $(n-1)^{th}$-copy of S_m and $(n-1)^{th}$ vertex in $I(S_n)$. Each of these $(n-1)$ vertices add m to the DSs of $S_n \ominus_S S_m$. Therefore they add m^{n-1}.

The fifth type of vertices (pink) in $I(S_n)$ (Inserted vertices) which are connected with the centre vertex (blue) and $(n-1)$ end vertices (green) in S_n and each vertex of $(n-1)^{th}$ copy of S_m. Each of these $(n-1)$ vertices add $(2+m)$ to the DSs of $S_n \ominus_S S_m$. Therefore they add $(2+m)^{n-1}$. Therefore,

$$DS(S_n \ominus_S S_m) = \{1^{n-1}, (n-1), 2^{(m-1)(n-1)}, m^{n-1}, (2+m)^{n-1}\}.$$

Table 2. Degree sequences of S-edge corona for path, complete, cycle, star, complete bipartite and r-regular graphs.

S_n	S_m	$DS(S_n \ominus_S S_m)$
P_n	P_m	$\{1^2, 2^{n-2}, (2+m)^{n-1}, 2^{2(n-1)}, 3^{(n-1)(m-2)}\}$
P_n	K_m	$\{1^2, 2^{n-2}, (2+m)^{n-1}, m^{m(n-1)}\}$
P_n	C_m	$\{1^2, 2^{n-2}, (2+m)^{n-1}, 3^{m(n-1)}\}$
P_n	S_m	$\{1^2, 2^{n-2}, (2+m)^{n-1}, 2^{(n-1)(m-1)}, m^{n-1}\}$
P_n	$K_{m,o}$	$\{1^2, 2^{n-2}, (2+m+o)^{n-1}, (m+1)^{o(n-1)}, (o+1)^{m(n-1)}\}$
P_n	r-regular graph with m-vertices	$\{1^2, 2^{n-2}, (2+m)^{n-1}, (r+1)^{m(n-1)}\}$
K_n	P_m	$\{(n-1)^n, (2+m)^{n(n-1)/2}, 2^{n(n-1)}, 3^{n(n-1)(m-2)/2}\}$
K_n	K_m	$\{(n-1)^n, (2+m)^{n(n-1)/2}, m^{mn(n-1)/2}\}$
K_n	C_m	$\{(n-1)^n, (2+m)^{n(n-1)/2}, 3^{mn(n-1)/2}\}$
K_n	S_m	$\{(n-1)^n, (2+m)^{n(n-1)/2}, 2^{n(n-1)(m-1)/2}, m^{n(n-1)/2}\}$
K_n	$K_{m,o}$	$\{(n-1)^n, (2+m+o)^{n(n-1)/2}, (m+1)^{on(n-1)/2}, (o+1)^{mn(n-1)/2}\}$
K_n	r-regular graph with m-vertices	$\{(n-1)^n, (2+m)^{n(n-1)/2}, (r+1)^{mn(n-1)/2}\}$
C_n	P_m	$\{2^n, (2+m)^n, 2^{2n}, 3^{n(m-2)}\}$
C_n	K_m	$\{2^n, (2+m)^n, m^{mn}\}$
C_n	C_m	$\{2^n, (2+m)^n, 3^{mn}\}$
C_n	S_m	$\{2^n, (2+m)^n, 2^{n(m-1)}, m^n\}$
C_n	$K_{m,o}$	$\{2^n, (2+m+o)^n, (m+1)^{no}, (o+1)^{mn}\}$
C_n	r-regular graph with m-vertices	$\{2^n, (2+m)^n, (r+1)^{mn}\}$
S_n	P_m	$\{1^{n-1}, (n-1), (2+m)^{n-1}, 2^{2(n-1)}, 3^{(n-1)(m-2)}\}$
S_n	K_m	$\{1^{n-1}, (n-1), (2+m)^{n-1}, m^{m(n-1)}\}$
S_n	C_m	$\{1^{n-1}, (n-1), (2+m)^{n-1}, 3^{m(n-1)}\}$
S_n	S_m	$\{1^{n-1}, (n-1), (2+m)^{n-1}, 2^{(m-1)(n-1)}, m^{n-1}\}$
S_n	$K_{m,o}$	$\{1^{n-1}, (n-1), (2+m+o)^{n-1}, (m+1)^{o(n-1)}, (o+1)^{m(n-1)}\}$
S_n	r-regular graph with m-vertices	$\{1^{n-1}, (n-1), (2+m)^{n-1}, (r+1)^{m(n-1)}\}$
$K_{m,n}$	P_o	$\{n^m, m^n, (2+o)^{mn}, 2^{2mn}, 3^{mn(o-2)}\}$
$K_{m,n}$	K_o	$\{n^m, m^n, (2+o)^{mn}, o^{omn}\}$
$K_{m,n}$	C_o	$\{n^m, m^n, (2+o)^{mn}, 3^{omn}\}$
$K_{m,n}$	S_o	$\{n^m, m^n, (2+o)^{mn}, 2^{(o-1)mn}, o^{mn}\}$
$K_{m,n}$	$K_{r,s}$	$\{n^m, m^n, (2+r+s)^{mn}, (r+1)^{mns}, (s+1)^{mnr}\}$
$K_{m,n}$	r-regular graph with o-vertices	$\{n^m, m^n, (2+o)^{mn}, (r+1)^{mno}\}$

r-regular graph with n-vertices	P_m	$\{r^n, (2+m)^{nr/2}, 2^{nr}, 3^{nr(m-2)/2}\}$
r-regular graph with n-vertices	K_m	$\{r^n, (2+m)^{nr/2}, m^{mnr/2}\}$
r-regular graph with n-vertices	C_m	$\{r^n, (2+m)^{nr/2}, 3^{mnr/2}\}$
r-regular graph with n-vertices	S_m	$\{r^n, (2+m)^{nr/2}, 2^{nr(m-1)/2}, m^{nr/2}\}$
r-regular graph with n-vertices	$K_{m,o}$	$\{r^n, (2+m+o)^{nr/2}, (m+1)^{onr/2}, (o+1)^{nmr/2}\}$
r_1-regular graph with n-vertices	r_2-regular graph with m-vertices	$\{r_1^n, (2+m)^{nr_1/2}, (r_2+1)^{mnr_1/2}\}$

□

Theorem 2.3. *The DSs of all possible S-edge neighbourhood corona of the path, complete graph, cycle, star, complete bipartite and r-regular graphs.*

Proof. First, the proof of $S_n \ominus_{nS} S_m$ is observing.

Let $DS(S_n) = \{1^{n-1}, (n-1)^1\}$ and $DS(S_m) = \{1^{m-1}, (m-1)^1\}$. To understand situation see FIGURE 4.

There are two types of vertices in each of S_n and S_m. Therefore there are $2+2+1 = 5$ types of vertices in $S_n \ominus_{nS} S_m$. The first type is the centre vertex (blue) of S_n which are connected with the $(n-1)$ vertices (pink) in $I(S_n)$ and each vertex in $(n-1)$ copies of S_n. Each of these one vertices add $(n-1+(n-1)m)$ to the DSs of $S_n \ominus_{nS} S_m$. Therefore they add $(n-1+(n-1)m)$.

The second type of vertices (green) of S_n which are connected with the vertex (pink) of $I(S_n)$ and each vertex in one copy of S_n. Each of these $(n-1)$ vertices add $(1+m)$ to the DSs of $S_n \ominus_{nS} S_m$. Therefore they add $(1+m)^{n-1}$.

The third type of centre vertices (red) of $(n-1)^{th}$-copies of S_m which are connected with the $(m-1)$ end vertices (orange) in corresponding $(n-1)^{th}$ copies of S_m and vertex (blue and green) in S_n which are neighbourhood of $(n-1)$ vertex of $I(S_n)$. Each of these $(n-1)$ vertices add $(m+1)$ to the DSs of $S_n \ominus_{nS} S_m$. Therefore they add $(m+1)^{(n-1)}$.

The fourth type of end vertices (orange) of $(n-1)^{th}$-copies of S_m which are connected with the centre vertex (red) in corresponding $(n-1)^{th}$-copies of S_m and vertices (blue and green) of S_n which are neighbourhood of $(n-1)^{th}$ vertex of $I(S_n)$. Each of these $(m-1)(n-1)$ vertices add 3 to the DSs of $S_n \ominus_{nS} S_m$. Therefore they add $3^{(m-1)(n-1)}$.

The fifth type of vertices (pink) in $I(S_n)$ (Inserted vertices) which are connected with the centre vertex (blue) and one end vertices (green) in S_n. Each of these $(n-1)$ vertices add 2 to the DSs of $S_n \ominus_{nS} S_m$. Therefore they add 2^{n-1}. Therefore,

$$DS(S_n \ominus_{nS} S_m) = \{(n-1+(n-1)m), (1+m)^{n-1}, (m+1)^{(n-1)}, 3^{(m-1)(n-1)}, 2^{n-1}\}.$$

Table 4. Degree sequences of S-edge neighbourhood corona for path, complete, cycle, star, complete bipartite and r-regular graphs.

S_n	S_m	$DS(S_n \ominus_{nS} S_m)$
P_n	P_m	$\{(1+m)^2, (2+2m)^{n-2}, 2^{n-1}, 3^{2(n-1)}, 4^{(n-1)(m-2)}\}$
P_n	K_m	$\{(1+m)^2, (2+2m)^{n-2}, 2^{n-1}, (m+1)^{m(n-1)}\}$
P_n	C_m	$\{(1+m)^2, (2+2m)^{n-2}, 2^{n-1}, 4^{m(n-1)}\}$
P_n	S_m	$\{(1+m)^2, (2+2m)^{n-2}, 2^{n-1}, 3^{(n-1)(m-1)}, (m+1)^{n-1}\}$
P_n	$K_{m,o}$	$\{(1+(m+o))^2, (2+2(m+o))^{n-2}, 2^{n-1}, (m+2)^{on}, (o+2)^{mo}\}$
P_n	r-regular graph with m-vertices	$\{(1+m)^2, (2+2m)^{n-2}, 2^{n-1}, (r+2)^{m(n-1)}\}$
K_n	P_m	$\{(n-1+(n-1)m)^n, 2^{n(n-1)/2}, 3^{n(n-1)}, 4^{n(n-1)(m-2)/2}\}$
K_n	K_m	$\{(n-1+(n-1)m)^n, 2^{n(n-1)/2}, (m+1)^{mn(n-1)/2}\}$
K_n	C_m	$\{(n-1+(n-1)m)^n, 2^{n(n-1)/2}, 4^{mn(n-1)/2}\}$
K_n	S_m	$\{(n-1+(n-1)m)^n, 2^{n(n-1)/2}, 3^{n(n-1)(m-1)/2}, (m+1)^{n(n-1)/2}\}$
K_n	$K_{m,o}$	$\{(n-1+(n-1)m)^n, 2^{n(n-1)/2}, (m+2)^{on(n-1)/2}, (o+2)^{mn(n-1)/2}\}$
K_n	r-regular graph with m-vertices	$\{(n-1+(n-1)m)^n, 2^{n(n-1)/2}, (r+2)^{mn(n-1)/2}\}$
C_n	P_m	$\{(2+2m)^n, 2^n, 3^{2n}, 4^{n(m-2)}\}$
C_n	K_m	$\{(2+2m)^n, 2^n, (m+1)^{mn}\}$
C_n	C_m	$\{(2+2m)^n, 2^n, 4^{mn}\}$
C_n	S_m	$\{(2+2m)^n, 2^n, 3^{n(m-1)}, (m+1)^n\}$
C_n	$K_{m,o}$	$\{(2+2(m+o))^n, 2^n, (m+2)^{no}, (o+2)^{mn}\}$
C_n	r-regular graph with m-vertices	$\{(2+2m)^n, 2^n, (r+2)^{mn}\}$
S_n	P_m	$\{(1+m)^{n-1}, (n-1+(n-1)m), 2^{n-1}, 3^{2(n-1)}, 4^{(n-1)(m-2)}\}$
S_n	K_m	$\{(1+m)^{n-1}, (n-1+(n-1)m), 2^{n-1}, (m+1)^{m(n-1)}\}$
S_n	C_m	$\{(1+m)^{n-1}, (n-1+(n-1)m), 2^{n-1}, 4^{m(n-1)}\}$
S_n	S_m	$\{(1+m)^{n-1}, (n-1+(n-1)m), 2^{n-1}, 3^{(m-1)(n-1)}, (m+1)^{n-1}\}$
S_n	$K_{m,o}$	$\{(1+\text{m}+\text{o})^{n-1}, (n-1+(n-1)(m+o)), 2^{n-1}, (\text{m}+2)^{o(n-1)}, (o+2)^{m(n-1)}\}$
S_n	r-regular graph with m-vertices	$\{(1+m)^{n-1}, (n-1+(n-1)m), 2^{n-1}, (r+2)^{m(n-1)}\}$
$K_{m,n}$	P_o	$\{(n(o+1))^m, (m(o+1))^n, 2^{mn}, 3^{2mn}, 4^{mn(o-2)}\}$
$K_{m,n}$	K_o	$\{(n(o+1))^m, (m(o+1))^n, 2^{mn}, ((o+1))^{omn}\}$
$K_{m,n}$	C_o	$\{(n(o+1))^m, (m(o+1))^n, 2^{mn}, 4^{omn}\}$
$K_{m,n}$	S_o	$\{(n(o+1))^m, (m(o+1))^n, 2^{mn}, 3^{(o-1)mn}, (o+1)^{mno}\}$
$K_{m,n}$	$K_{r,s}$	$\{(n+n(r+s))^m, (m+m(r+s))^n, 2^{mn}, (r+2)^{mns}, (s+2)^{mnr}\}$
$K_{m,n}$	r-regular graph with o-vertices	$\{(n(o+1))^m, (m(o+1))^n, 2^{mn}, (r+2)^{mno}\}$
r-regular graph with n-vertices	P_m	$\{(r+rm)^n, 2^{nr/2}, 3^{nr}, 4^{nr(m-2)/2}\}$
r-regular graph with n-vertices	K_m	$\{(r+rm)^n, 2^{nr/2}, (m+1)^{mnr/2}\}$

r-regular graph with n-vertices	C_m	$\{(r+rm)^n, 2^{nr/2}, 4^{mnr/2}\}$
r-regular graph with n-vertices	S_m	$\{(r+rm)^n, 2^{nr/2}, 3^{nr(m-1)/2}, (m+1)^{nr/2}\}$
r-regular graph with n-vertices	$K_{m,o}$	$\{(r+r(m+o))^n, 2^{nr/2}, (m+2)^{onr/2}, (o+2)^{nmr/2}\}$
r_1-regular graph with n-vertices	r_2-regular graph with m-vertices	$\{(r_1+r_1m)^n, 2^{nr_1/2}, (r_2+2)^{mnr_1/2}\}$

□

3. Conclusion

In this article, the degree sequences of standard graphs such as path, complete graph, cycle, star, complete bipartite and r-regular graphs are obtained.

4. Acknowledgement

The first author is thankful to National fellowship and scholarship for higher studies of ST students 201718-NFST-KAR-00838.

We thank the anonymous referee for their careful reading of our manuscript and providing throughtful comments.

References

[1] N. Ananda, V. Lokesha, P. S. Ranjini and Sandeep Kumar, *Degree sequence of graph operator for some standard graphs*, Applied Mathematics and Nonlinear Sciences(Accepted), Preprint.

[2] A.R. Bindusree, I. Naci Cangul, V. Lokesha and A. Sinan Cevik, *Zagreb polynomials of three graph operators*, Filomat, 30(7), (2016), 1979-1986.

[3] B. Bollobas, *Degree Sequences of Random Graphs*, Discrete Mathematics, 33, (1981), 1-19.

[4] Chandrashekar Adiga and Rakshith B. R, *Spectra of graph operations based on corona and neighborhood corona of graph G and K1*, Journal of the international mathematical virtual institute, 5(1), (2015), 55-69.

[5] C. K. Gupta, V. Lokesha, S. B. Shetty and P. S. Ranjini, *Graph Operations on Symmetric Division Deg Index of Graphs*, Palestine Journal of Mathematics, 6(1), (2017), 280-286.

[6] V. Lokesha, M. Manjunath, B. Chaluvaraju, K. M. Devendraiah, I. N. Cangul and A. S. Cevik, *Computation of adriatic indices of certain operators of regular and complete bipartite graphs*, Advanced studies in contemporary Mathematics, 28(2), (2018), 231-244.

[7] B. S. Shwetha, V. Lokesha, P. S. Ranjini and K.C. Das, *Computing some topological indices of smart polymer*, Digest Journal of Nanomaterials and Biostructures, 7(3), (2012), 1097-1102.

[8] R. I. Tyshkevich, O. I. Mel'nikov, V. M. Kotov, *On graphs and degree sequences: Canonical decomposition*, Kibernetika, 6(1), (1981), 05-08.

[9] Vishnu Narayan Mishra, Sadik Delen and Ismail Naci Cangul, *Degree sequences of join and corona products of graphs*, Electronic Journal of Mathematical Analysis and Applications, 7(1), (2019), 5-13.

(M. Manjunath and V. Lokesha) Department of Studies in Mathematics, Vijayanagara Sri krishnadevaraya University, Ballari, Karnataka, INDIA.

E-mail address: manju3479@gmail.com and v.lokesha@gmail.com