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CERTIFICATE

This is to certify that Dr./~~Mr./Ms.~~ Ahila Jeyanthi Assistant Professor Mathematics Muslim Arts College Thiruvithancode *has participated in the International Conference on Emerging Trends in Mathematical Sciences and Applications (ICETMSA-2023) organised by the Department of Mathematics, Noorul Islam Centre for Higher Education, Kumaracoil, sponsored by Tamilnadu State Council for Science and Technology on 26-04-2023 and presented a paper entitled* Edge Version of Forgotten Polynomial of Certain Graphs

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PROCEEDINGS OF
INTERNATIONAL CONFERENCE
ON
EMERGING TRENDS IN MATHEMATICAL SCIENCES AND APPLICATIONS

26 April 2023

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Contents

Edge Version of Forgotten Polynomial of Certain Graphs

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Abstract

In this paper the edge rendition of forgotten polynomial of a graph G is characterized. Also express recipes for the edge variant of forgotten polynomial of numerous notable classes of graphs were figured.

AMS Mathematics Subject Classification : 05C07, 05C90.
Key words : Topological indices, line graph.

1 Introduction

Let G be a simple graph, with vertex set V (G) and edge set E(G). The degree dv of a vertex v is the number of vertices joining to v and the degree of an edge e $\in$E(G), de is the number of its adjacent vertices in V (L(G)), where L(G) is the line graph of a graph G which is defined as the graph whose vertices are the edges of G, with two vertices are adjacent if the corresponding edges have one vertex basic in G.

Line graphs are extremely valuable in primary science, yet as of late they were viewed as almost no in substance graph hypothesis. In 1981, Bertz presented the main topological file based on the line graph in [1], when he was chipping away at sub-atomic fanning. After that numerous topological indices dependent on line graphs were presented (see [4, 5]). For additional insights regarding the applications of line graphs in science, we allude the articles (see [2, 5,7 8,9]). In science, sub-atomic construction descriptors are utilized to demonstrate data of molecules, which are known as topological indices. They are invariant under graph isomorphisms. There are numerous topological indices characterized on the premise of the vertex-degrees of graphs. In 2015 Furtula and Gutman introduced another topological index called forgotten index or F index F(G)=$\Sigma_{uv\epsilon G}x^{[d_u^2+d_v^2]}$. The Forgotten polynomial [10]of a graph G is defined as F(G,x)=, $\Sigma_{uv\epsilon G}x^{[d_u^2+d_v^2]}$. The relation between forgotten index and forgotten polynomial is established as $\int_0^1 F(G,x)dx$.

lemma 1. *Let G be a graph with* $u, v \in V(G)$ *and* $e = uv \in E(G)$. *Then* $d_e = d_u + d_v - 2$.

In order to calculate the number of edges of an arbitrary graph, the following lemma is significant for us.

Lemma 2. Let G be a graph. Then $\sum_{v\in V(G)} d_u = 2|E(G)|$.

This is also known as handshaking Lemma.

2 Main Result

Proposition 1. *Let G be a k-regular graph of n vertices, then*
$F_e(G,x) = \frac{kn}{2}(k-1)x^{8k^2-16k+8}$.

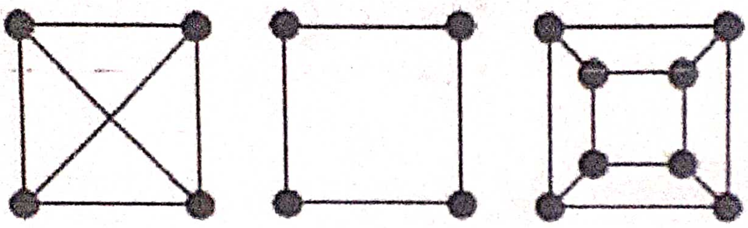

Figure 1:

Proof. Since G is a k- regular graph, then each vertex of G has degree k and by Lemma 2 we have $\frac{kn}{2}$ edges. Therefore in L(G) we have $\frac{kn}{2}$ vertices and by using Lemma 1, all the vertices have degree $2k-2$. Lemma 2 implies that we have $\frac{kn(k-1)}{2}$ edges in $L(G)$. Consequently we get $F_e(G,x) = \frac{kn}{2}(k-1)x^{8k^2-16k+8}$. □

Let K_n, C_n and Πn denotes the complete graph on n vertices, the cycle on n vertices and the n-sided prism as shown in Figure 1.

Proposition 2.

1. $F_e(K_n,x) = \frac{n(n-1)}{2}x^{2[(n-1)^2]}$

2. $F_e(C_n,x) = nx^8$

3. $F_e(\Pi_n,x) = 3nx^{18}$

Proof. This proof can be obtained by using Proposition 1. □

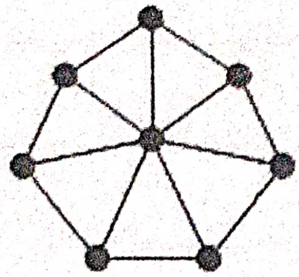

Figure 2:

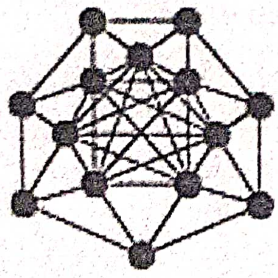

Figure 3:

Proposition 3. *Let W_n be a graph of wheel, then $F_e(W_n, x) = nx^{16} + \frac{n(n-1)}{2}x^{2n^2+4n+2} + 2nx^{n^2+2n+17}$.*

Proof. In the wheel graph W_n, the total number of vertices and edges are n + 1 and 2n respectively (see Fig. 2). Therefore in $L(W_n)$, the total number of vertices are $2n$, out of which n vertices of degree 4 and remaining n vertices of degree n+ 1 (see Fig. 3). It is easily seen from Lemma 2 that the total number of edges in $L(W_n)$ are $n(n+5)$ The edge partition of $E(L(W_n))$ based on the degree of the vertices is shown in Table 1.

Table 1: Edge Partition of $L(W_n)$

$(d_u, d_v) \in E(L(G))$	$(4,4)$	$(n+1, n+1)$	$(4, n+1)$
Number of edges	n	$\frac{n(n-1)}{2}$	2n

Hence we get $F_e(W_n, x) = nx^{16} + \frac{n(n-1)}{2}x^{2n^2+4n+2} + 2nx^{n^2+2n+17}$. □

Proposition 4. *Let H_n be a graph of helm, then $F_e(H_n, x) = 2nx^{45} + 2nx^{n^2+4n+40} + \frac{n(n-1)}{2}x^{2n^2+8n+80} + nx^{n^2+4n+13} + nx^{72}$.*

Proof. In the helm graph H_n, the total number of vertices and edges are 2n + 1 and 3n respectively (see Fig. 4). Therefore in $L(H_n)$, the total number of vertices are 3n, out of which n vertices of degree 3, n vertices of degree 6 and n vertices of degree n + 2 (see [illegible] seen from Lemma 2 that the total number of edges in $L(H_n)$ are [illegible] partition of $E(L(H_n))$ based on the degree of the vertices is shown in

Table 2: The Edge Partition of $L(H_n)$

[illegible] $\in E(L(G))$	$(3,6)$	$(6,n+2)$	$(n+2,n+2)$	$(3,n+2)$	$(6,6)$
[illegible] of edges	2n	2n	$\frac{n(n-1)}{2}$	n	n

[illegible] $(H_n, x) = 2nx^{45} + 2nx^{n^2+4n+40} + \frac{n(n-1)}{2}x^{2n^2+8n+80} + nx^{n^2+4n+13} + nx^{72}$. □

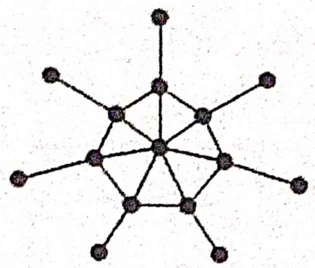

Figure 4:

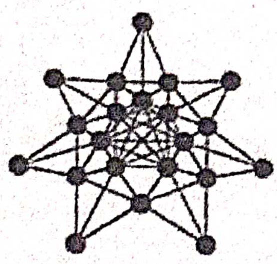

Figure 5:

[illegible] 5. *Let L_n be a graph of ladder, then*

$$F_e(L_n, x) = \begin{cases} 4x^{13} + 2x^{18} + 4x^{25}, & if n > 2 \\ (6n-14)x^{32} + 8x^{25} + 4x^{13}, & n=2 \end{cases}$$

[illegible] ladder graph L_n for $n = 1$ is a cycle C_4 which is known from Proposition [illegible] have the edge partition of $E(L(L_2))$ based on the degreeof the vertices is [illegible] Table 3.

Table 3: The Edge Partition of $L(L_2)$

$(d_u, d_v) \in E(L(G))$	$(2,3)$	$(3,3)$	$(3,4)$
Number of edges	4	2	4

In the ladder graph L_n for $n > 2$, the total number of vertices and edges are 2n and 3n+ 1 respectively (see Fig. 6). Therefore in $L(L_n)$, the total number of vert are 3n + 1, out of which 2 vertices of degree 2, 4 vertices of degree 3 and 3n-5 vertice degree 4 (see Fig. 7). It is easily seen from Lemma 2 that the total number of edge $L(L_n)$ are 6n-2. The edge partition of $E(L(L_n))$ based on the degree of the vertice shown in Table 4.

Table 4: The Edge Partition of $L(L_n)$

$(d_u, d_v) \in E(L(G))$	(2,3)	(3,4)	(4,4)
Number of edges	4	8	6n-14

Consequently, we get $F_e(L_n, x) = (6n-14)x^{32} + 8x^{25} + 4x^{13}$.

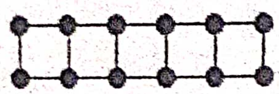

Figure 6:

Figure 7:

In chemistry, the pentacene compound is a hydrocarbon consists of five benzene rin It is purple powder organic semiconductor and gradually degrades when exposed to li and air. The linear [n]-Pentacene P_n for n = 2 is shown in Fig. 8.

Proposition 6. *Let P_n be a graph of linear [n]-pentacene, then* $F_e(P_n, x) = 4x^{\text{[illegible]}}$ $(18n-4)x^{18} + (24n-8)x^{25} + 4(n-1)x^{32}$.

Proof. In the pentacene graph P_n the total number of vertices and edges are $22n$ a $28n-2$ respectively (see Fig. 8). Therefore in line graph $L(P_n)$, the total numbe vertices are $28n-2$ out of which 6 vertices are of degree 2, $20n-4$ vertices are of deg 3 and $8n-4$ vertices are of degree 4 (see Fig. 9). It is easily seen from Lemma 2 t the total number of edges in $L(P_n)$ are $46n-8$. The edge partition of $E(L(P_n))$ ba on the degree of the vertices in shown in Table 5.

Table 5: The Edge Partition of $L(P_n)$

$(d_u, d_v) \in E(L(G))$	(2,2)	(2,3)	(3,3)	(3,4)	(4,4)
Number of edges	4	4	18n-4	24n-8	$4(n-1)$

... we get $F_e(P_n, x) = 4x^8 + (18n-4)x^{18} + (24n-8)x^{25} + 4(n-1)x32.$ □

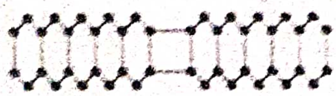

Figure 8:

Figure 9:

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