List of delegates reading contributed papers:

1. **Fouzul Atik**, *Distance spectral radius of 2-partite distance regular graphs*, Research Scholar, Department of Mathematics, Indian Institute of Technology Kharagpur, Kharagpur, 721302. India.

2. **Sasmita Barik**, *Algebraic Connectivity and the Characteristic Set of Product Graphs*, School of Basic Science, IIT Bhubaneswar, Bhubaneswar INDIA.

3. **Arathi Bhat**, *Some matrix equations of graphs*, Manipal Institute of Technology, Manipal INDIA.


5. **Anjan Kumar Bhuniya**, *On inner product spaces over idempotent semirings*, Asst. Professor, Visva-Bharati, Santiniketan, West Bengal, India.


7. **Arpita Das**, *The normalized Laplacian spectrum of corona, edge corona and neighborhood corona of two regular graphs*, Research Scholar, Department of Mathematics, Indian Institute of Technology Kharagpur, Kharagpur, 721302. India.


9. **B. Elavarasan**, *Poset properties with respect to semi - ideal - based zero-divisor graph*, Department of Mathematics, School of Science and Humanities, Karunya University, Coimbatore - 641 114, Tamilnadu, India.

10. **Yogeshri Gaidhani**, *Linear Code using Incidence Matrix of Semigraph*, Asst. Professor, Department of Mathematics, M.E.S. Abasaheb Garware College, Karve Road, Pune, India. 411 004.


16. Debasis Mishra, *Some more comparison results of proper nonnegative splittings*, Assistant Professor Dept. of Mathematics NIT Raipur, GE Road Raipur-492 010, CG.


29. Piyush Kumar Tripathi, *Applications of Linear algebra in Engineering*, Department of Mathematics, Amity University Lucknow Campus, India.

Distance spectral radius of 2-partite distance regular graphs

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Abstract
The distance matrix of a simple graph $G$ is $D(G) = (d_{i,j})$, where $d_{i,j}$ is the distance between the $i$th and $j$th vertices of $G$. The greatest eigenvalue $\lambda_1$ of $D(G)$ is called the distance spectral radius of the graph $G$ and is denoted by $\lambda_1(G)$. A simple connected graph $G$ is called a 2-partite distance regular graph if there exists a partition $V_1 \cup V_2$ of the vertex set of $G$ such that for $i = 1, 2$ and any vertex $x \in V_i$, $\sum_{y \in V_i} d(x, y)$ and $\sum_{y \in V_c^i} d(x, y)$ are constants, where $V_c^i$ is the set complement of $V_i$. In this paper we find the exact value of the distance spectral radius of 2-partite distance regular graphs. Applying this result we find the distance spectral radius of the wheel graph $W_n$ and the generalized Petersen graphs $P(n, k)$ with $k = 2$ and $3$.

Keywords
Distance matrix, Distance eigenvalue, Distance spectral radius, 2-partite distance regular graph, Generalized Petersen graphs.

References


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Algebraic connectivity and the characteristic set of product graphs

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Abstract

Let \( G \) be a simple graph and \( Y \) be a Fiedler vector. A vertex \( u \) is called a characteristic vertex (with respect to \( Y \)) if \( Y(u) = 0 \) and there is a vertex \( w \) adjacent to \( u \) satisfying \( Y(w) \neq 0 \). An edge \( \{u, v\} \) is called a characteristic edge (with respect to \( Y \)) if \( Y(u)Y(v) < 0 \). The characteristic set \( C(G, Y) \) is the collection of all characteristic vertices and characteristic edges of \( G \) with respect to \( Y \). Graph products and their structural properties have been studied extensively by many researchers. A complete characterization of Laplacian spectrum of the Cartesian product of two graphs has been done by Merris. We give an explicit complete characterization of the Laplacian spectrum of the lexicographic product of two graphs using the Laplacian spectra of the factors. We supply some new results relating to the algebraic connectivity of the product graphs. We describe the characteristic sets for the Cartesian product and for the lexicographic product of two graphs.

Keywords

Product graphs; Laplacian matrix; Laplacian eigenvalues; Algebraic connectivity; Characteristic set.

References

Some matrix equations of graphs

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Abstract

In this paper, we try to find solutions to some equations which involve matrices related to graphs, so are called matrix equation of graphs. They involve either adjacency matrix or incidence matrix or both. We also consider the realizability as graph, of product of adjacency matrices of graph G and $G^P_k$, where $G^P_k$ is the k-complement of the graph G with reference to a partition P of the vertex set $V(G)$, of size k.

Keywords

Adjacency matrix; Incidence Matrix; Matrix product; Realizability; k-complement.

References

Some characterization on star partial ordering Matrices

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Abstract
Any square matrix $A$ is called an EP matrix if it commutes with its Moore-Penrose Inverse, i.e., $AA^\dagger = A^\dagger A$. The star partial ordering of matrices can be defined by $A \leq^* B \iff A^* A = A^* B$ and $AA^\dagger = BA^\dagger$ where $A$ and $B$ are any Square Matrices.

In this paper, we present some results on Star Partial ordering involving EP Matrices.

Keywords
Star Partial Ordering; EP Matrices; Moore-Penrose Inverse.

On inner product spaces over idempotent semirings

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Abstract
A semiring $I$ is called an idempotent semiring if for all $a, \in I$, $a + a = a = a^2$. A finite subset $B$ is said to be a basis of an idempotent linear space $L$ if every vector in $L$ can be expressed uniquely as a linear combination of the elements in $B$. This is more general than [?]. Using unique representation of every vector as a linear combination of the basis elements, we have endowed every linear space over an idempotent semiring $I$ with a natural inner product having values in $I$, and show that this inner product is independent of the choice of basis. Also any two orthonormal bases of an idempotent inner product space have the same number of elements which we call the rank of the idempotent inner product space. This allow us to consider matrix representations of linear mappings on idempotent inner product spaces. Further, we have developed the theory of permanent of a matrix over idempotent semirings and show that permanent of any two matrix representations of a linear mapping is the same and thus we have the idea of permanent of a linear mapping. Also, several characterizations of the permanent of a linear mapping have been done.

Keywords
Idempotent semirings; Inner product spaces; Linear mapping; Permanent.
References


On adjacency and Laplacian spectrum of power graphs of some finite groups

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Abstract

The power graph $\mathcal{G}(G)$ of a finite group $G$ is the graph whose vertices are the elements of $G$ and two distinct vertices are adjacent if and only if one is an integral power of the other. In [5, 6] we found adjacency and Laplacian characteristic polynomials and some eigenvalues of power graphs of finite cyclic and dihedral groups. Also we have given bounds for spectral radius of these power graphs. Here we find some more eigenvalues of these two classes of graphs. We determine the adjacency characteristic polynomial and give bounds for the spectral radius of the power graphs of generalized quaternion 2-groups. Also we find the full Laplacian spectrum of this power graph.

Keywords

Finite group; Power graph; Adjacency Spectrum; Laplacian Spectrum; Spectral radius.
The normalized Laplacian spectrum of corona, edge corona and neighborhood corona of two regular graphs

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Abstract
We consider simple graphs $G$ and $H$ with $G$ connected. The corona of $G$ and $H$ is the graph which is consists of the graph $G$ and $|V(G)|$ copies of $H$ such that $i$th vertex of $G$ is adjacent to all the vertices of the $i$th copy of $H$. The edge corona of $G$ and $H$ is the graph which is consists of $G$ and $|E(G)|$ copies of $H$ such that both the end vertices of the $i$th edge of $G$ are adjacent to all the vertices of the $i$th copy of $H$. The neighborhood corona of $G$ and $H$ is the graph that is consists of $G$ and $|V(G)|$ copies of $H$ such that every neighbor of $i$th vertex of $G$ is adjacent to
all the vertices of the $i$th copy of $H$. Here we determine the full normalized Laplacian spectrum of the corona, edge corona and neighborhood corona of any two regular graphs in terms of their normalized Laplacian eigenvalues.

**Keywords**

Normalized Laplacian spectrum, Corona, Edge corona, Neighborhood corona, Kronecker product, Hadamard product.

**References**


Loss behavior of an internet router employing partial buffer sharing mechanism under self-similar input traffic-fractal point process

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Abstract

A number of recent studies have addressed the use of partial buffer sharing mechanism under self-similar input traffic of an Internet router. In all the said papers, Markov modulate Poisson process (MMPP) emulating self-similar traffic over different time scale is taken into consideration. However, the time scale where self-similar nature actually begins is not considered. In this paper, we investigate the Internet router employing partial buffer sharing mechanism under self-similar input traffic by modeling it as MMPP/D/1/K queueing system. We fit MMPP for fractal point process (FPP) by equating the variance while taking FOT into consideration and then compute performance measures, namely, packet loss probabilities of high priority packets and low priority packets against system parameters and traffic parameters are examined by means of matrix geometric solutions. This kind of analysis is useful in dimensioning the Internet router under self-similar input traffic to provide quality of service (QoS) guarantee.

Keywords
Internet router; self-similar; fractal point process; Markov modulated Poisson Process; packet loss probability; partial buffer sharing mechanism.

References


Poset properties with respect to semi-ideal-based zero-divisor graph

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Abstract
In this paper, we study some properties of poset $P$ determined by properties of semi-ideal based zero-divisor graph properties $G_I(P)$, for a semi-ideal $I$ of $P$.

Keywords
Posets; semi-ideals; prime semi-ideals; cycle and neighborhood.

MSC 2000 06D6

References


Li Chen and Tongsuo Wu. On a class of semigroup graphs, (Reprint).


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Linear code using incidence matrix of semigraph

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Abstract
Semigraph was defined by Sampathkumar as a generalization of graph. In this paper incidence matrix which represents semigraph uniquely and characterization of such a matrix is obtained. Some properties of incidence matrix of semigraph are studied. Linear code is generated using this matrix and its properties are studied.

Keywords
Semigraph; incidence matrix of semigraph; i-semigraphical matrix; linear code.
PD observer design for linear descriptor systems with unknown inputs

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Abstract

In the last few decades, many researchers have given a lot of attention on the analysis and design of descriptor systems as these are general enough to provide a solid understanding of the inner dynamics of any physical system [1, 2]. Observer is a mathematical realization which uses input and output of a system and provides information about the states of the original system [3, 4]. In this paper, a method is given to design a proportional derivative (PD) observer for irregular descriptor systems with unknown inputs. Results from basic matrix theory is used to design an observer. In the present work, we consider the linear time invariant descriptor system: $Ex = Ax + Bu + Fv$, $y = Cx$, where $x \in \mathbb{R}^n$, $u \in \mathbb{R}^k$, and $v \in \mathbb{R}^q$ are the state vector, the input vector, the unknown input vector and the output vector, respectively. $E, A \in \mathbb{R}^{n \times n}$, $B \in \mathbb{R}^{n \times k}$, $F \in \mathbb{R}^{n \times q}$ and $C \in \mathbb{R}^{p \times n}$ are known constant matrices, and the rank of $E = n_0 < n$. 

References


Keywords
Observer design; Descriptor systems; Unknown inputs; Proportional derivative.

References

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**Homomorphism and anti-homomorphism of reverse derivations on prime rings**

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**Abstract**

In this paper we show that if a reverse derivation $d$ acts as a homomorphism or an anti-homomorphism on a non-zero right ideal $U$ of a prime ring $R$, then $d = 0$.

**Keywords**
Derivation; Reverse derivation; Prime ring; Center.

**References**
On the structure of absolutely minimum attaining operators

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Abstract

We discuss about a class of operators that are diagonalizable, namely positive absolutely minimum attaining operators of first type and prove a characterization theorem for those operators. Using this we derive a representation theorem for general absolutely minimum attaining operators of first type, which is similar to that of singular value decomposition for compact operators. We also study their spectrum and discuss about several properties of such operators.

Keywords
Diagonalizable operator; Minimum modulus; Absolutely minimum attaining operator; Compact operator; Spectrum.

References

First eigenvectors of nonsingular unicyclic 3-Colored digraphs

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Abstract

In this talk we discuss the smallest Laplacian eigenvalue and the corresponding eigenvectors of 3-colored digraphs containing exactly one nonsingular cycle. We show that the smallest Laplacian eigenvalue of such graphs can be realized as the algebraic connectivity, the second smallest Laplacian eigenvalue of a suitable undirected graph. We describe the monotonicity property on the real and imaginary parts of the eigenvectors corresponding to the smallest Laplacian eigenvalue of such graphs, which is analogous to Fiedler’s monotonicity Theorem.

Keywords

Laplacian matrix; 3-Colored digraph; First eigenvector.
References


Nonnegative Moore–Penrose inverses of unbounded Gram operators

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Abstract

In this paper we derive necessary and sufficient conditions for the nonnegativity of Moore–Penrose inverses of unbounded Gram operators between real Hilbert spaces. These conditions include statements on acuteness of certain closed convex cones. The main result generalizes the existing result for bounded operators [?, Theorem 3.6].

Keywords

Closed operator, Cone, Gram operator
References


Comparison results for proper nonnegative splittings of matrices

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Abstract

The theory of splittings of matrices is a useful tool in the analysis of iterative methods for solving systems of linear equations. When two splittings are given, it is of interest to compare the spectral radii of the corresponding iteration matrices. The aim of this paper is to bring out few comparison results for the recent matrix splitting called proper nonnegative splitting introduced by Mishra, D. [Computers and Mathematics with Applications 67 (2014) 136-144; MR3141710]. Comparison results for double proper nonnegative splitting are also discussed.

References


Eigenvalues of a digraphs

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Abstract
The skew-adjacency matrix of a directed graph $G$ of order $n$ is the $n \times n$ matrix $S(G) = [s_{ij}]$, where $s_{ij} = 1$, whenever edge from vertex $v_i$ to $v_j$, $s_{ij} = -1$, whenever edge from $v_j$ to $v_i$ and $s_{ij} = 0$, otherwise. Hence $S(G)$ is a skew symmetric matrix of order $n$ and all its eigenvalues are of the form $i\lambda$ where $i = \sqrt{-1}$ and $\lambda \in \mathbb{R}$. The skew energy of $G$ is the sum of the absolute values of the eigenvalues of $S(G)$. In this paper we obtain the eigenvalues of the some class of directed graphs and study the skew energy.

References

On the inverse of a graph on Godsil class

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Abstract

A weighted (undirected) graph $G$ is said to be nonsingular if its adjacency matrix $A(G)$ is nonsingular. In [8], Godsil has given a class $G$ of connected, unweighted, bipartite, nonsingular graphs $G$ with a unique perfect matching, such that $A(G)^{-1}$ is signature similar to a nonnegative matrix, that is, there exists a diagonal matrix $D$ with diagonal entries $±1$ (called a signature matrix) such that $D^{-1} A(G)^{-1} D$ is nonnegative. The graph associated to the matrix $D^{-1} A(G)^{-1} D$ is called the inverse of $G$ and it is denoted by $G^+$. The graph $G^+$ is an undirected, weighted, bipartite graph with a unique perfect matching. Nonsingular unweighted trees are inside the class $G$. We first give a constructive characterization of the class of weighted graphs $H$ which can occur as the inverse of some graph $G \in G$. This generalizes Theorem 2.6 of Neumann and Pati [11], where the authors have characterized graphs that occur as inverses of nonsingular unweighted trees.

A weighted graph is said to have property (R) if for each eigenvalue $\lambda$ of $A(G)$, $1/\lambda$ is also an eigenvalue of $A(G)$. If further, the multiplicity of $\lambda$ and $1/\lambda$ as eigenvalues of $A(G)$ are the same, then $G$ is said to have property (SR). A characterization of the class of nonsingular, weighted trees $T$ with at least 8 vertices that have property (R) was given in [11] under some restriction on the weights. It is natural to ask for such a characterization for the whole of $G$, possibly with some weaker restrictions on the weights. We supply such a characterization. It also settles an open problem raised in [11].

A characterization of unweighted, unicyclic graphs with property (SR) was given by Barik, Nath, Pati and Sarma in [3]. It is natural to ask for a weighted version of the characterization. We first observe that weighted, unicyclic graphs with property (SR) can have more than one perfect matchings, unlike the unweighted case. We show that the weighted, unicyclic graphs which have property (SR), must be bipartite. We then characterize the weighted, bipartite, unicyclic graphs with unique perfect matchings that have property (SR), under some restriction of weights.

References


Applications of linear systems in science and engineering

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Abstract

The aim of this article is to discuss the applications of systems of linear equations in science and various branches of engineering.

Keywords

spring mass system; temperature distribution; mechanics; chemical equations; electrical circuits–loop circuit analysis; nodal voltage analysis.
A new characterization of nonnegativity of Moore–Penrose Inverses of Gram matrices in an indefinite inner product Space

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Abstract
In this paper we obtain a new characterization for the nonnegativity of Moore–Penrose inverses of Gram Matrices defined in an indefinite inner product space using indefinite matrix multiplication.
These conditions include the acuteness of certain closed convex cones.

Keywords
Gram Matrices; Moore–Penrose inverse; acute cones.

References
Left multiplicative generalized derivations acting as homomorphism or anti-homomorphism in prime rings

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Abstract

Let \( R \) be a ring. A map \( F : R \to R \) is called a left multiplicative generalized derivation, if \( F(xy) = g(x)y + F(x)F(y) \) is fulfilled for all \( x, y \) in \( R \), where \( g : R \to R \) is any map (not necessarily derivation or additive map). The main purpose of this paper is to study the following conditions:

Let \( R \) be a 2-torsion free prime ring and \( U \) be a nonzero square closed Lie ideal of \( R \). If \( F : R \to R \) is a left multiplicative generalized derivation associated with the map \( g : R \to R \) such that

1. \( F(uv) = F(u)F(v) \), then \( [F(u), u] = 0 \) for all \( u \in U \),
2. \( F(uv) = F(v)F(u) \), then \( [F(u), u] = 0 \) for all \( u \in U \)

Keywords

Prime ring; Derivation; Generalized derivation; Multiplicative generalized derivation; Left multiplicative generalized derivation; Homomorphism; and Anti-homomorphism.

References


On semipositivity of matrices

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Abstract
An $m \times n$ matrix $A$ with real entries is said to be semipositive if there exists an $x \geq 0$ such that $Ax > 0$, where the inequalities are understood componentwise. $A$ is said to be minimally semipositive if it is semipositive and no proper $m \times p$ submatrix of $A$ is semipositive. The class of matrices that are semipositive consists of two mutually disjoint subclasses: ones that are minimally semipositive and those that are redundantly semipositive (these are ones that are semipositive but not minimally semipositive) [1, 4]. It is known that an $m \times n$ matrix $A$ is minimally semipositive if and only if it has a nonnegative left inverse. My objective is to study linear preservers of semipositivity and I intend to present a few results on this.

Keywords
Minimal semipositivity; Inverse positivity; Linear preserver problems; Full rank preservers.

References
Characterization of $M_\lor$-matrices

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Abstract

In this paper we consider generalized $M$-matrices known as $M_\lor$-matrices, which was introduced in [3]. We show that inverse positivity property of $M$-matrices does not carry over to the entire class of $M_\lor$-matrices, but to a subclass. We extend this property of nonsingular $M_\lor$-matrices to singular $M_\lor$-matrices. Motivated by interesting characterizations of singular $M$-matrices, the concepts of eventually monotonicity and eventually nonnegativity have been introduced. Definitions of eventually nonnegative and eventually monotone matrices on a set are given below.

**Definition:** Let $A \in \mathbb{R}^{n \times n}$ and $S \subseteq \mathbb{R}^n$. Then we say that $A$ is eventually nonnegative on $S$, if $x \in S$ and $X \geq 0$ imply that there exists a positive integer $k_0$, such that $A^k x \geq 0$, for all $k \geq k_0$.

**Definition:** Let $A \in \mathbb{R}^{n \times n}$ and $S \subseteq \mathbb{R}^n$. Then we say that $A$ is eventually monotone on $S$, if there exists a positive integer $k_0$, such that for any $x \in S$; $A^k x \geq 0$, for all $k \geq k_0$, implies $x \geq 0$.

Keywords

Preferred basis; quasi-preferred basis; height characteristic; level characteristic.

References


On the signless Laplacian spectra of product graphs

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Abstract
Graph products and their structural properties have been studied extensively by many researchers. In this article we investigate the signless Laplacian eigenvalues and eigenvectors of product graphs for the four standard products, namely: cartesian product, direct product strong product and lexicographic product. We provide a complete characterization of signless Laplacian spectrum of cartesian product of two graphs. For the other three products, we describe the complete spectrum of product graphs in some particular cases. Using graph products we construct new classes of signless Laplacian integral graphs.

Keywords
Signless Laplacian; Product graphs.

A note on the spectral theorem for compact normal operators on a quaternionic Hilbert space.

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Abstract
In this talk we present the spectral theorem for compact normal operators on quaternionic Hilbert spaces. Though the version of spectral theorem for such operators in quaternionic Hilbert space is appeared in recent literature, we present a different approach, which is similar to the classical setup. It is observed that the whole spherical spectrum of a compact normal operator is determined by the standard eigenvalues and deduce that the spherical spectrum of any $n \times n$ quaternion matrix has exactly $n$ complex eigenvalues. We illustrate our method with an example and compare it with that of the method given by Ghiloni et al [7, Theorem 1.2].

Keywords
Standard eigenvalue; Slice complex plane; Minimum modulus; Generalized standard eigenvalue.
References


Determining quantum entanglement by using positive but not completely positive maps

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Abstract
We give a matrix theoretic approach for detection of quantum entanglement. Our method uses positive maps which are not completely positive and are not decomposable. Unfortunately there are only a few examples of such maps available in literature and few such states where these maps are applicable. We give new methods for construction of such maps and states to be detected.

We extend the above concept, which is inherently bipartite, to a multipartite settings. In this case, we give a method to generate new witnesses for detecting entanglement. We also give new examples of states detectable by such maps.

Keywords
Quantum entanglement; positive maps; matrix analysis.

References
The $P_0^+$-matrix completion problem

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Abstract

A real $n \times n$ matrix $A$ is a $P_0^+$-matrix, if for each $k \in \{1, 2, \ldots, n\}$, every $k \times k$ principal minor of $A$ is nonnegative and at least one $k \times k$ principal minor is positive. The matrix $A$ is a $Q$-matrix if for every $k \in \{1, 2, \ldots, n\}$, the sum $S_k(A)$ of all the $k \times k$ principal minors of $A$ is positive.

A partial matrix is a rectangular array of numbers in which some entries are specified while others are free to be chosen. For a class $\Pi$ of matrices (e.g., $P$, $P_0$ or $Q$-matrices) a partial $\Pi$-matrix is one whose specified entries satisfy the required properties of a $\Pi$-matrix. Thus, a partial $P_0^+$-matrix $M$ is a partial matrix in which all fully specified principal submatrices are nonnegative and $S_k(M) > 0$ for every $k \in \{1, 2, \ldots, n\}$, whenever all $k \times k$ principal submatrices are fully specified.

A $\Pi$-completion of a partial $\Pi$-matrix is a $\Pi$-matrix obtained by some choices of the unspecified entries. The (combinatorial) $\Pi$-matrix completion problem attempts to study the digraphs $D$ having the property that any partial $\Pi$-matrix specifying $D$ has a $\Pi$-completions. For an exposition in matrix completion problems, one may see the survey articles [1] and [2].

A digraph $D$ is said to have $P_0^+$-completion if every partial $P_0^+$-matrix specifying $D$ can be completed to a $P_0^+$-matrix. In this presentation, some necessary conditions and sufficient conditions for a digraph to have $P_0^+$-completion are discussed and those digraphs of order at most four that have $P_0^+$-completion have been characterized.

Keywords

Partial matrix; Matrix completion; $P_0^+$-matrix; $P_0^+$-completion; Digraph.

References


Matrix product of distance graphs of cycle

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Abstract
In this paper, we characterize circulant graphs $G$ for which there exist a graph $H$ such that $A(G)A(H)$ is graphical. In particular, we consider the class of circulant graphs which are distance graphs of cycles.

Matrix Product of distance Graphs of Cycle

Applications of Linear algebra in Engineering

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Abstract
Linear Algebra is a branch of mathematics that deals with the study of vectors, vector spaces and linear equations. In addition to science, engineering and mathematical sciences, linear algebra has extensive applications in the natural as well as the social sciences. Linear algebra today has been extended to consider n-dimensional space. In linear algebra one studies sets of linear equations and their transformation properties. It is possible to consider the analysis of rotations in space, selected curve fitting techniques, differential equation solutions, as well as many other problems in science and engineering using techniques of linear algebra. Two tools are extensively used in linear algebra are: The Matrix and The Determinant. In this paper we are going to discuss various applications of linear algebra in different engineering branches such as in mechanical engineering electronics and communications, computer science and applications, civil engineering also in social sciences with examples.
On a class of Laplacian integral graphs

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Abstract

A graph whose adjacency (Laplacian) matrix has a spectrum consisting only of integers is called (Laplacian) integral. We observe that a certain class of digraphs is integral as well as Laplacian integral. We then construct a class of Laplacian integral undirected graphs, and discuss the relation between their spectrum and structure.

Keywords

Laplacian matrix; Integral graph; Laplacian integral graph.

References