ABSTRACTS

A New Data Envelopment Analysis (DEA) Model to Determine the Most Efficient Decision Making Unit (DMU) with Imprecise Data

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Sohrabi and Nalchigar (2010) proposed a new data envelopment analysis (DEA) model to identify the most efficient decision-making unit (DMU) in presence of imprecise data. In this paper, it is shown that the proposed model is not able to determine the most efficient DMU and is randomly introduced an efficient DMU. In addition, it is shown that this model determines the most efficient DMU in the case of variable return to scale having the same drawback and may be infeasible in some cases. To overcome the drawbacks, some new integrated DEA models are developed. In addition, to find and rank the other most efficient DMUs, an algorithm is proposed. By using the model developed in this paper, the decision maker can find the most efficient DMU by solving only one linear integer programming. The applicability of the proposed model is indicated using imprecise data for 18 suppliers.

Keywords: Data envelopment analysis, Decision-making unit, Imprecise data, Linear integer programming, Supplier selection.

Ranking Zones of Tehran to Add New Emergency Services Using Fuzzy AHP

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This paper presents a multi-attribute decision-making model to rank and select the best zones of the city of Tehran in order to add new emergency services. The purpose of this decision-making problem is to prioritize the zones having a higher need to emergency services, so that the emergency services to people in different zones get optimized. A multi-criteria decision making model is presented on the basis of experts' opinions so that the ranking of the model satisfactorily improves response time to requests of emergency services. A three-level hierarchical structure is proposed and a fuzzy AHP method is used to rank alternatives and the optimal location of emergency services. Also, dependencies between criteria are considered using an ANP method. Paired comparison matrices of decision-making criteria and alternatives are built based on data sets of Traffic and Transportation Studies Organization of Tehran, Geophysics Institute of University of Tehran, and Tehran Municipality Cultural Department.

Keywords: Emergency services, Fuzzy AHP, MADM, Optimal location, ranking zones.

A hybrid Mathematical Programming-Fuzzy Expert Systems Approach for Improving Combined Cycle Power Plants' Operations

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By developing the level of life in societies, the need for new resources of energy becomes more important. In almost all cases, the aim is to convert one form of energy to the electrical form. With advances of technology and use of new electric and electronic devices and gadgets, the need for electrical energy is increasing and providing stable and continuous electric power becomes very important and urgent.

The most common place to convert other forms of energy to electric energy is power plant. To maintain the stability and continuity of delivering the electric energy to costumers, the operation and control of the plant is great important. Advances in power plants' technology have resulted in more reliance on human (i.e. expert-based) decision making. In this way, a mathematical programming-based decision support system could provide a suitable support for human decision making in optimizing power plant operations. In this study, a new approach is presented for optimizing the load distribution among units in a combined cycle (Gas and Steam Turbine) power plant. In the normal operations status, two parameters, i.e. the efficiency and risk are the most important factors for load distribution. Power is demanded by the control center (national electric grid control) and this needed power is often equally distributed by the control center, power market and operators between units. However, this distribution scheme is not economic in terms of efficiency and risk. In the suggested method, online data from units after fuzzification are fed into a fuzzy expert system and according to the unit conditions, two defuzzified scales, i.e. the efficiency scale and risk scale, are calculated for each unit. These scales are then used as coefficients in the proposed bi-objective mathematical programming model by which the best possible load distribution scheme is obtained according to the demanded power and the efficiency and risk of current units which is then displayed to the operator to set in the load control system. Finally, the efficiency and effectiveness of the proposed method is shown by a real case study.

Keywords: Augmented ε-constraint method, Decision support systems, Fuzzy expert systems, Mathematical programming, Power plant operations, Rule-based systems.

Off Grid Photovoltaic System Design Considering Reliability and Cost Indicators (Case Study: Kermanshah, Iran)

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Daily sunshine duration is one of the factors influencing the size of solar panels in a photovoltaic system. When the system is designed and the number of system components is calculated, the average of sunshine hours is usually used. However, sunshine hours are less than average and we are faced to shortage and surplus of electricity in the winter and summer, respectively. In this paper due to sunshine hours in 12 months and their average, 13 plans are provided for the photovoltaic system design. Because of a reliability indicator of access to electricity and economic indicators, we choose a suitable scheme.

Keywords: Loss of load probability, Photovoltaic system, Reliability, Renewable energy.

Pricing and Inventory for a Supply Chain with Perishable and Substitutable Products

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Decentralization allows channel members to make their decisions, independently. In this decentralized channels, members may have different power to make its decisions. Hence, decisions of each member may

influence on the other members' decisions. To model such situations, bi-level programming models are useful. In this study, a supply chain including one manufacturer and multiple competitive retailers are considered. The manufacturer produces several perishable and substitutable products. The problem is formulated as a multi-follower bi-level programming model. Since bi-level models are often NP-Hard, simulated annealing algorithm is applied to solve the proposed model. The numerical results of sensitivity analysis indicate that in the larger markets, even increasing in the prices leads to increase the profit of members. Also, when the consumers are price-sensitive, the manufacturer and the retailers must decrease their prices to attract the consumers and increase their profits, consequently.

Keywords: Bi-level programming, Perishable and substitutable product, Pricing, Simulated annealing, Two-echelon supply chain.

Design Model Innovative Performance Evaluation of Suppliers and Contractors in Construction Supply Chain Management

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This paper aims to present a model for agile supply chain model in construction enterprises with performance evaluation of suppliers and contractors. Management and selection of suppliers and contractors plays an important role in process of constructions, because contractors are as corner stones of construction projects. Also, contractors are the main factor in converting resources to the final products. Traditionally, contractor selection in construction projects is on the basis of the lowest proposed price. However, there are various qualitative and quantitative criteria with different priorities associated in this regard. In this paper, a hybrid method of DEA/AHP/ FDEMATEL (Data Envelopment Analysis/ Analytical Hierarchy Process/ Fuzzy DEMATEL) is used. First, important and effective evaluation criterion are selected through FDEMATEL approach. Then, DEA/ AHP method is implemented in order to evaluate and to prioritize the selected indicators and to incorporate them in supply chain. Furthermore, agility is involved in the considered supply chain model.

Keywords: Agile supply chain, Construction projects, Supply chain management, Suppliers performance evaluation.

Maintenance Activities Planning by Integrating Computer Simulation and Data Envelopment Analysis

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Many serious accidents have happened in the world, in which systems have been large-scale and complex, and caused heavy damage and a social sense of instability. Furthermore, advanced nations have almost finished public infrastructure and rushed into a maintenance period. Since maintenance is more important than production and construction, then more maintenance for environmental considerations and protection of natural resources is required. So, in the past four decades, valuable contributions to maintenance policies in the reliability theory have been made. In this paper, a maintenance planning problem is considered. First, maintenance activities are simulated via Awesim. Production and maintenance functions are estimated using historical data. Then simulation is carried out for different scenarios which are combinations of periodic maintenance, and outputs are computed. Since the problem is multi-criteria decision making, a data

envelopment analysis (DEA) method is used to select the preferred policy. Finally the preferred alternative is selected to optimize the cost, reliability, availability, queue length and machine utilization.

Keywords: Correlation, Data envelopment analysis, Maintenance activities, Planning, Simulation.

A multi-product Inventory control model with Imperfect Production Process and Rework under Delayed Payment Policy

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The traditional economic production quantity (EPQ) model assumes that during the production process no imperfect item is produced. But in the real production system, due to imperfect production process or other factors, imperfect quality items may be produced. Furthermore, it is well-known that the total production-inventory costs can be reduced by reworking the imperfect quality items produced with a smaller additional reworking and holding costs. In addition, the permissible delay in payments offered by the supplier is widely adopted in the businesses. In this study, we explore the effects of both reworking imperfect quality items and trade credit policy on the EPQ model with imperfect production processes and backlogging. A mathematical model considering reworking and shortage costs, interest earned and interest charged in addition to traditional inventory costs is developed. Besides an arithmetic-geometric mean inequality method is employed and an algorithm is developed to find the optimal production policy. Furthermore, some numerical examples and sensitivity analysis are provided to demonstrate the applicability of proposed model.

Keywords: Delay in payment, Inventory control, Rework, Scraped item.

Developing a Mathematical Model for Vendor Managed Inventory Considering Deterioration and Amelioration Items in a Three-Level Supply Chain

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Todays, improving the competitiveness of companies and rapidly responding to diverse customers' demands requires efficient management of the supply chain. Integration is one of the effective indices in a supply chain, and vendor managed inventory (VMI) is one of the innovative approaches in this field. In this paper, an integrated model based on a VMI system for deteriorating and ameliorating items in a three-level supply chain is developed. To coordinate retailers and producers in the supply chain, the common replenishment cycle is used which is a technique of a VMI system. The assumptions of this model consist of a deterministic demand rate for each retailer, certain production and deterioration rates. Furthermore, in this paper the amelioration of items is mentioned that follow the Weibull distribution. First, a mixed-integer nonlinear mathematical model is presented. Then to validate the proposed model, a numerical example is given. To solve the model, a genetic algorithm method is presented.

Keywords*:* Genetic algorithm, Three levels supply chain, Vendor managed inventory deteriorating and ameliorating items.

An Efficient Genetic Algorithm for a Vehicle Routing Problem Considering the Competency of Working Teams

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Abstract
This paper presents a new mathematical model for a combined manpower vehicle routing problem, in which working teams are considered as servers. Having teams with different competency affects the service duration and cost that expands the flexibility of scheduling. A fleet of vehicles with different speed and cost of movement is used to transport these teams to visit the customers before the due date. The goal is to find an efficient schedule for the teams and vehicles movement to serve all the customers in order to minimize the total cost of serving, routing and lateness penalties. A mixed-integer programming model is presented and a number of tests problems are generated. To solve the large-sized problems, two meta-heuristics approaches, namely genetic algorithm (GA) and particle swarm optimization (PSO) are developed, and then the Taguchi experimental design method is applied to set the proper values of the parameters. The obtained results show the higher performance of the proposed GA compared with PSO in terms of solutions quality within comparatively shorter periods of time.

Keywords: Genetic algorithm, Manpower, Particle swarm optimization, Vehicle routing problem, Working team.

Reliability and Safety Modelling in Reliable Systems Supported with Cold Standby Spares by a Markov Model

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Fault tolerance is one of the important issues in industries, such as transportation, military, chemical and nuclear sectors. Reliability and safety are two vital attributes of fault tolerant systems, and redundancy is a common way to improve these parameters. This article studies the impact of including cold standby spares in system architecture. To do this, it uses the Markov model of the system due to its capabilities in incorporating and modeling of priorities, functional dependencies, timing relations, reconfiguration issues and events sequences, existed in the system dynamic. The previous studies in the domain of reliable and fault tolerant systems have not presented general formulas to evaluate the reliability and safety of systems supported with cold spares. This article presents closed formulas for these attributes by which the impact of the number of spares, failure rate of modules, coverage factor, and switch quality can be studied on the system performance.

Keywords: Active redundancy, Cold standby spare, Markov model, Reliability, Safety.

A New Model for Fuzzy Multiple Criteria Decision Making to Rank Suppliers (Case Study: Advertising Company)

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ABSTRACT
One of important issues in designing a supply chain is supplier selection. This issue is complicated, because each supplier should satisfy some criteria from buyer and choosing among them is actually a multi criteria decision making problem. So, there is a need for a structured and systematic approach to solve this problem. In this article, we address supplier selection in an advertising industry and two new criteria are proposed. Also, a new approach combining techniques of modified digital logic and fuzzy TOPSIS is proposed to evaluate the suppliers in the industry.

Keywords: Fuzzy logic, MCDM, MDL, Supplier selection, TOPSIS.

Robust optimization of integrated reverse logistic network design at uncertain conditions

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In this paper, integrated direct and reverse logistics considering production, distribution, customer, devastation, retrieval centers under uncertainty are developed. In this model, cost parameters are not certain, thus the scenario-based robust optimization method is applied. The aim of this model is to minimize the total cost and obtain a robust solution. Finally, a practical case study is presented to verify the proposed model. Moreover an efficient solution algorithm is presented. The computational results illustrate the efficiency of the proposed approach.

Keyword: Direct logistics, Integrated logistics, Reverse logistics, Robust optimization, Simulated annealing algorithm, Supply chain.