

## Jesús R. Artalejo 1963–2013

A. Gómez-Corral

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On June 12, 2013, Jesús R. Artalejo passed away unexpectedly while he was attending the Annual Meeting and Conference of the Society for Mathematical Biology in Tempe, Arizona. At the time of his disappearance, he was one of the Editors-in-Chief of *TOP*, jointly with Miguel A. Goberna.

Jesús led an extremely active mathematical life producing more than one hundred papers and one book, serving a wide variety of journals in various editorial roles, coordinating the scientific activities of the *Stochastic Modelling Group* at the Complutense University of Madrid (UCM), and supervising a few masters and Ph.D. students. He seemed to spend a sizeable fraction of every year traveling to conferences and meetings around the world. These lines touch on his outstanding personality and his contribution to Queuing Theory, which has been internationally renowned.

*Biographical data and scientific contributions* Jesús was born in Madrid, Spain, on January 29, 1963, and pursued a relevant and intense career as a mathematician. In the fall of 1981, he started his studies at UCM, where he got his Bachelor Degree in 1986, and where he also became an assistant. He was then a Ph.D. student with Professor Miguel Martín as advisor, and presented his thesis on April 8, 1991. He was also an assistant at the Carlos III University of Madrid from October 1990 through September 1991. Later he was an associate professor at UCM in the period October 1991–March 2003, and he was appointed full professor at UCM from March 31, 2003.

Jesús became soon known as a promising researcher in queuing theory, where his doctoral thesis [2] was an important starting point with new results in retrial

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A. Gómez-Corral (✉)  
Faculty of Mathematics, Complutense University of Madrid, 28040 Madrid, Spain  
e-mail: [antonio\\_gomez@mat.ucm.es](mailto:antonio_gomez@mat.ucm.es)

queues. In the early 1990s, he and Gennadi Falin, already then a renowned expert in retrial queues, initiated a fruitful exchange program between UCM and the Moscow State University that enriched the Ph.D. students of the Department of Statistics and Operations Research at UCM. He was one of the first people in the department to understand the important role that the scientific exchange with foreign colleagues might have on his own research and that of his collaborators. His list of publications contains, in chronological order, collaborations with Gennadi Falin (Moscow State University, see e.g. [7,10,19,25,52]), Marcel Neuts (The University of Arizona, see [41,46]), Vladimir Anisimov (Bilkent University, see [47,51]), Achyutha Krishnamoorthy (Cochin University of Science and Technology, see [55,73]), Onésimo Hernández-Lerma (CINVESTAV, see [56]), Antonis Economou (University of Athens, see, e.g. [70,77,78,82,88]), Srinivas Chakravarthy (Kettering University, see [74,75,76,81]), Quan-Lin Li (Tsinghua University, see [99]), Jacques Resing (Eindhoven University of Technology, see [101]) and Qi-Ming He (University of Waterloo, see [104]), among others. Jesús always turned every professional collaboration into an enriching personal experience. For that reason, there were strong links between him and his coauthors, who became his friends. His publications have covered a wide range of topics in queuing theory, such as retrial queues (see, e.g. [7,22,52,54,78]), discrete-time queues [68,83,88,99], impatient customers [16], inventory systems with repeated attempts [73], matrix-analytic techniques applied to queueing models (see, e.g. [41,46,74,75,76,77,93,107]), maximum entropy solutions in queuing (see, e.g. [9,13,44,62,66]), mean value analysis [101], negative arrivals [23,34,39,47], optimal control [56,59], optimality of D-, N-, and T-policies [21,43,53], and unreliable servers [8,28,29]. A most recent sphere of activity has been stochastic modeling of biological systems (see, e.g. [86,103,106,111,115,116,117]), and the use of quasi-stationary and ratio of expectations distributions in epidemic models (see [102,112,119]). A list of his publications up to the year 2013, which contains his work in progress, is appended for specific reference; each item on this list is accompanied by keywords that will allow the reader to identify the model under consideration, the techniques used, and those descriptors in study.

Starting in October 1997, Jesús served during three years as the coordinator of the European project entitled “*Advances in Retrial Queueing Theory*,” funded by INTAS.<sup>1</sup> The work program was built on the topic *retrial queues*, and was the result of arduous but rewarding negotiations between him and Maria Fernanda Ramalhoto (IST–Technical University of Lisbon), Henk Tijms (Vrije University of Amsterdam), Vladimir Anisimov (Kiev National University), Pavel Bocharov (Peoples’ Friendship University of Russia), Alexander Dudin (Belarus State University), and Gennadi Falin (Moscow State University). Later they welcomed Christos Langaris and his team (University of Ioannina). To facilitate the exchange of information between researchers, three technical meetings were organized in Madrid (September 1998), Minsk (June 1999), and Amsterdam (March 2000), known as “*International Workshops on Retrial Queues*” (WRQ). An important part of the research developed within the INTAS project was published in his monograph on “*Retrial Queueing*

<sup>1</sup>INTAS: International Association for the promotion of cooperation with scientists from the New Independent States of the former Soviet Union.

*Systems: A Computational Approach*” (Springer-Verlag, 2008), written jointly with A. Gómez-Corral, which appropriately complements the analytical treatment of the book by G.I. Falin and J.G.C. Templeton entitled “*Retrial Queues*” (Chapmann & Hall, 1997). His professional interaction with colleagues within the INTAS project resulted in a sincere friendship with some of them, especially with Rein Nobel and Henk Tijms, which transcended even their families.

After completing the INTAS project, Jesús took the initiative to continue organizing the subsequent WRQ editions in Cochin (December 2002, jointly with A. Krishnamoorthy), Seoul (September 2004, jointly with B.D. Choi), Miraflores de la Sierra (July 2006, jointly with A. Gómez-Corral), Athens (July 2008, jointly with A. Economou), Beijing (July 2010, jointly with Q.L. Li) and Seville (July 2012, jointly with P. Moreno). The next WRQ edition is planned to take place in Tokyo and his chairman, Tuan Phung-Duc, will dedicate the workshop to the memory of Jesús. Jesús has received well-merited recognition for the organization of the series of conferences known as *Madrid Conferences on Queueing Theory* (MCQT). He was particularly proud to bring together internationally recognized researchers and promising researchers, regardless of their countries of origin, and he always did his best to get financial support for those most disadvantaged participants. He felt that the success of the MCQT editions of 2002, 2006, and 2010 depended primarily on the plenary and invited speakers, whom he sincerely thanked them for their contributions.

Jesús has labored mightily in the editorial vineyard. He served as one of the Editors-in-Chief of *TOP*, jointly with Miguel A. Goberna, since 2013. He was the Area Editor responsible for Stochastic Models and Simulation of the *Asia-Pacific Journal of Operational Research* in 2005–2006, and the Editor of the *European Journal of Operational Research* responsible for Stochastic and Statistics, Queuing and Simulation in 2007–2010. He was Associate Editor of *Applied Mathematical Modelling* since 2012, *Asia-Pacific Journal of Operational Research* in 2000–2004, *Computers & Operations Research* since 2003, *European Journal on Computational Optimization* since 2012, *Journal of Applied Mathematics and Stochastic Analysis* in 2000–2009, *Operational Research* since 2008, *Opsearch* in 2001–2002, *Quality Technology & Quantitative Management* in 2003–2009, *Queueing Systems* in 2003–2009, *Revista Matemática Complutense* in 1999–2004, *Statistics and Operations Research Transactions* since 2003, and *TOP* in 1995–2012. In addition, he was a Guest Editor of *Annals of Operations Research* (Volumes 112–113, 2002; Volume 141, 2006; Volume 162, 2008), *Computers & Operations Research* (Volume 35, Issue 8, 2008), *European Journal of Operational Research* (Volume 189, Issue 3, 2008, jointly with A. Gómez-Corral), *Mathematical and Computer Modelling* (Volume 30, Issues 3–4, 1999), *Quality Technology & Quantitative Management* (Volume 5, Issues 1–2, 2008, jointly with A. Economou), *Queueing Systems* (Volume 56, Issues 3–4, 2007), and *TOP* (Volume 7, No. 2, 1999; Volume 19, No. 2, 2011). At the time of his death, he and Pilar Moreno were concluding a special issue for *Asia-Pacific Journal of Operational Research*, associated with the last WRQ edition held in Seville. He also co-edited the book entitled *Advances in Stochastic Modelling* (Notable Publications, Inc., 2002) with A. Krishnamoorthy. His high standards, efficiency and integrity as editor have always been greatly respected by his professional colleagues.

*Farewell to a friend* I want to take this opportunity to say something about Jesús as a person. Many persons have testified to his positive view of life, his sarcastic humor, and to his genuine interest in people he met. Many of us knew Jesús through his passions: his love for his family, his love of travel, and his commitment to excellence in all things. At the center of all these passions was a deeply caring person. This is what I think of first when I think of my friend.

For his friends and colleagues around the world, his disappearance is a severe loss. For me personally, his unexpected departure seems unreal. I shall remember him with joy and gratitude as long as I live.

## Publications of Jesús R. Artalejo

### 1989

- [1] Políticas de control para el sistema  $M^{[g]}/G/1$ . In: *Actas de la XVIII Reunión Nacional de Estadística, Investigación Operativa e Informática*, pp. 417–421. (In Spanish)  
*Keywords:* bulk arrivals;  $M^{[X]}/G/1$  queue; optimality of T-policy.

### 1991

- [2] *Contribuciones al Análisis de los Sistemas de Colas con Reintentos*. Doctoral thesis. Department of Statistics and Operations Research, Complutense University of Madrid. (In Spanish)  
*Keywords:* breakdown of the server; busy period; convolutive equations; maximum entropy;  $M/G/1$  and  $M/M/c$  retrial queues; steady-state.
- [3] Métodos convolutivos en sistemas de colas con reintentos. In: *Actas de las XV Jornadas Luso-Espanholas de Matemática*, Vol. IV, pp. 67–72. (In Spanish)  
*Keywords:* busy period; convolutive equations;  $M/M/2$  retrial queue; quasi-random input.

### 1992

- [4] A unified cost function for  $M/G/1$  queueing systems with removable server. *Trabajos de Investigación Operativa* **7**, 95–104.  
*Keywords:*  $M/G/1$  queue; optimality of D-, N- and T-policies.
- [5] Information theoretic approximations for retrial queueing systems. In: *Transactions of the 11th Prague Conference*, Kubik S. and Vísek J.A. eds., Kluwer Academic Publishers, pp. 263–270.  
*Keywords:*  $M/G/1$  retrial queue; maximum entropy; steady state.

### 1993

- [6] Explicit formulae for the characteristics of the  $M/H_2/1$  retrial queue. *Journal of the Operational Research Society* **44**, 309–313.  
*Keywords:* busy period; convolutive equations;  $M/H_2/1$  retrial queue; steady state.
- [7] (WITH G.I. FALIN AND M. MARTÍN) On the single server retrial queue with priority customers. *Queueing Systems* **14**, 439–455.  
*Keywords:* head-of-the-line priority; heavy traffic; high and low rates of retrials;  $M_2/G_2/1$  retrial queue; steady state; stochastic decomposition.

**1994**

- [8] New results in retrial queueing systems with breakdown of the servers. *Statistica Neerlandica* **48**, 23–36.  
*Keywords:* breakdown of the server; high rate of retrials;  $M/G/1$  and  $M/M/c$  retrial queues; persistence function; preemptive priority; steady state.
- [9] (WITH G.I. FALIN AND M. MARTÍN) Information theoretic approximations for the  $M/G/1$  retrial queue. *Acta Informatica* **31**, 559–571.  
*Keywords:*  $M/G/1$  retrial queue; maximum entropy; steady state.
- [10] (WITH G.I. FALIN) Stochastic decomposition for retrial queues. *Top* **2**, 329–342.  
*Keywords:* high rate of retrials;  $M/G/1$  retrial queue; stochastic decomposition.
- [11] (WITH A. GÓMEZ-CORRAL) Analysis of the modes of the stationary distribution in single server retrial queues with quasi-random input. In: *Transactions of the 12th Prague Conference*, Lachout P. and Vísek J.A. eds., pp. 24–27.  
*Keywords:*  $M/M/1$  retrial queue; quasi-random input; steady state.
- [12] (WITH M. MARTÍN) A maximum entropy analysis of the  $M/G/1$  queue with constant repeated attempts. In: *Selected Topics on Stochastic Modelling*, Gutiérrez R. and Valderrama M. eds., World Scientific, pp. 181–190.  
*Keywords:* constant retrial policy;  $M/G/1$  retrial queue; maximum entropy; number of retrials.

**1995**

- [13] (WITH A. GÓMEZ-CORRAL) Information theoretic analysis for queueing systems with quasi-random input. *Mathematical and Computer Modelling* **22**, 65–76.  
*Keywords:*  $M/G/1$  queue;  $M/G/1$  retrial queue; maximum entropy; quasi-random input; steady state.
- [14] A queueing system with returning customers and waiting line. *Operations Research Letters* **17**, 191–199.  
*Keywords:*  $M/M/c$  retrial queue; RTA approximation; steady state.
- [15] (WITH G.I. FALIN) Approximations for multiserver queues with balking/retrial discipline. *OR Spektrum* **17**, 239–244.  
*Keywords:* diffusion approximation;  $M/M/c$  retrial queue; RTA approximation; steady state.
- [16] (WITH M. MARTÍN) Analysis of an  $M/G/1$  queue with two types of impatient units. *Advances in Applied Probability* **27**, 840–861.  
*Keywords:* busy period; constant retrial policy; embedded Markov chain; fundamental period; impatience;  $M_2/G_2/1$  retrial queue; number of blocked repeated attempts; steady state; Takács' equation; waiting time.

**1996**

- [17] (WITH A. GÓMEZ-CORRAL) Stochastic analysis of the departure and quasi-input processes in a versatile single-server queue. *Journal of Applied Mathematics and Stochastic Analysis* **9**, 171–183.  
*Keywords:* departure process; embedded Markov chain; linear retrial policy;  $M/M/1$  retrial queue; negative arrivals; quasi-input process; steady state.

- [18] Stationary analysis of the characteristics of the  $M/M/2$  queue with constant repeated attempts. *Opsearch* **33**, 83–95.  
*Keywords:* constant retrial policy;  $M/M/2$  retrial queue; steady state; waiting time.
- [19] (WITH G.I. FALIN) On the orbit characteristics of the  $M/G/1$  retrial queue. *Naval Research Logistics* **43**, 1147–1161.  
*Keywords:*  $M/G/1$  retrial queue; orbit and idle periods.
- [20] Retrial queues with negative arrivals. In: *Proceedings of the International Conference on Stochastic Processes*, Krishnamoorthy A. ed., pp. 159–167.  
*Keywords:* linear retrial policy;  $M/G/1$  and  $M/M/1$  retrial queues; negative arrivals; steady state.

### 1997

- [21] Analysis of an  $M/G/1$  queue with constant repeated attempts and server vacations. *Computers and Operations Research* **24**, 493–504.  
*Keywords:* embedded Markov chain;  $M/G/1$  retrial queue; optimality of N- and T-policies; PASTA property; server vacations; stochastic decomposition.
- [22] (WITH A. GÓMEZ-CORRAL) Steady state solution of a single-server queue with linear repeated requests. *Journal of Applied Probability* **34**, 223–233.  
*Keywords:* linear retrial policy;  $M/G/1$  retrial queue; steady state.

### 1998

- [23] (WITH A. GÓMEZ-CORRAL) Generalized birth and death processes with applications to queues with repeated attempts and negative arrivals. *OR Spektrum* **20**, 5–14.  
*Keywords:* birth and death process; busy period; convolutive equations; head-of-the-line priority; linear retrial policy;  $M/M/1$  retrial queue; negative arrivals; steady state; waiting time.
- [24] (WITH A. GÓMEZ-CORRAL) Analysis of a stochastic clearing system with repeated attempts. *Stochastic Models* **14**, 623–645.  
*Keywords:* busy period; catastrophes;  $M/G/1$  retrial queue; steady state; waiting time.
- [25] (WITH G.I. FALIN) A finite source retrial queue. *European Journal of Operational Research* **108**, 409–424.  
*Keywords:* arriving customer's distribution; busy period; discrete transformations; outside observer's distribution; quasi-random input; waiting time.
- [26] Retrial queues with a finite number of sources. *Journal of the Korean Mathematical Society* **35**, 503–525.  
*Keywords:* a survey on finite source retrial queues, concentrating on  $M/M/c//K$  and  $M/G/1//K$  retrial queues with quasi-random input.
- [27] Some results on the  $M/G/1$  with N-policy. *Asia-Pacific Journal of Operational Research* **15**, 147–157.  
*Keywords:*  $M/G/1$  queue; N-policy; stochastic decomposition; waiting time.
- [28] (WITH A. AISSANI) On the single server retrial queue subject to breakdowns. *Queueing Systems* **30**, 309–321.  
*Keywords:* breakdown of the server; fundamental server period;  $M/G/1$  retrial queue; steady state; stochastic decomposition.

- [29] (WITH A. GÓMEZ-CORRAL) Unreliable retrial queues due to service interruptions arising from facsimile networks. *Belgian Journal of Operations Research, Statistics and Computer Science* **38**, 31–41.  
*Keywords:* breakdown of the server; linear retrial policy;  $M/G/1$  retrial queue; steady state.

## 1999

- [30] Accessible bibliography on retrial queues. *Mathematical and Computer Modelling* **30**, 1–6.  
*Keywords:* a bibliography on retrial queues including references (books and papers published in scientific journals) written in English.
- [31] (WITH A. GÓMEZ-CORRAL) Performance analysis of a single-server queue with repeated attempts. *Mathematical and Computer Modelling* **30**, 79–88.  
*Keywords:* busy period; catastrophes; linear retrial policy;  $M/M/1$  retrial queue; steady state.
- [32] (WITH A. GÓMEZ-CORRAL) Computation of the limiting distribution in queueing systems with repeated attempts and disasters. *RAIRO* **33**, 371–382.  
*Keywords:* linear retrial policy;  $M/G/1$  retrial queue; regenerative analysis; state-dependent arrivals; steady state.
- [33] A classified bibliography of research on retrial queues: Progress in 1990–1999. *Top* **7**, 187–211.  
*Keywords:* a classified bibliography of the work on retrial queues performed in the period 1990–1999, which consists of an author classification and a subject classification.
- [34] (WITH A. GÓMEZ-CORRAL) On a single server queue with negative arrivals and request repeated. *Journal of Applied Probability* **36**, 907–918.  
*Keywords:* Fredholm integral equation; linear retrial policy;  $M/G/1$  retrial queue; negative arrivals; regenerative analysis; steady state.
- [35] Numerical investigation of multiserver retrial queues operating under the constant retrial policy. In: *Proceedings of the 15th Belarussian Workshop on Queueing Theory & 2nd International Workshop on Retrial Queues*, pp. 13–16.  
*Keywords:* constant retrial policy;  $M/M/c$  retrial queue; QBD process; steady state.
- [36] (WITH A. RODRIGO). On the single server queue with linear retrial policy and exhaustive vacations. In: *Stochastic Processes and their Applications*, Vijayakumar A. and Sreenivasan M. eds., Narosa Publishing House, pp. 196–205.  
*Keywords:* linear retrial policy;  $M/G/1$  retrial queue; regenerative analysis; server vacations; steady state.

## 2000

- [37] (WITH M.J. LÓPEZ-HERRERO) On the busy period of the  $M/G/1$  retrial queue. *Naval Research Logistics* **47**, 115–127.  
*Keywords:* busy period;  $M/G/1$  retrial queue; second moment.
- [38] (WITH M.J. LÓPEZ-HERRERO) On the single server retrial queue with balking. *Infor* **38**, 33–50.

- Keywords:* balking; linear retrial policy;  $M/G/1$  and  $M/M/1$  retrial queues; regenerative analysis; steady state.
- [39] G-networks: A versatile approach for work removal in queueing networks. *European Journal of Operational Research* **126**, 233–249.  
*Keywords:* a survey on queueing networks with negative arrivals.
- [40] (WITH V. RAJAGOPALAN AND R. SIVASAMY) On finite Markovian queues with repeated attempts. *Investigación Operativa* **9**, 83–94.  
*Keywords:* finite QBD process; state-dependent events; steady state.
- [41] (WITH A. GÓMEZ-CORRAL AND M.F. NEUTS) Numerical analysis of multiserver retrial queues operating under a full access policy. In: *Advances in Algorithmic Methods for Stochastic Models*, Latouche G. and Taylor P.G. eds., Notable Publications Inc., NJ, pp. 1–19.  
*Keywords:* full access policy;  $M/M/c$  retrial queue; QBD process; steady state; successful, vain and ideal retrials.
- [42] (WITH M.J. LÓPEZ-HERRERO) Low retrial analysis of multiserver queues with repeated attempts due to impatience. In: *Proceedings of the 12th European Simulation Symposium*, Möller D.F.P. ed., A Publication of the Society for Computer Simulation International, pp. 535–538.  
*Keywords:* diffusion approximation; impatience; low rate of retrials;  $M/M/c$  retrial queue; RTA approximation.
- 2001**
- [43] The D-policy for the  $M/G/1$  queue: Queue length and optimality. *Electronic Modeling* **23**, 35–43.  
*Keywords:*  $M/G/1$  and  $M/M/1$  queues; optimality of D-, N- and T-policies; regenerative analysis; steady state.
- [44] (WITH M.J. LÓPEZ-HERRERO) Analysis of the busy period for the  $M/M/c$  queue: An algorithmic approach. *Journal of Applied Probability* **38**, 209–222.  
*Keywords:* busy period;  $M/M/c$  queue; maximum entropy; number of customers served.
- [45] (WITH A.N. DUDIN AND V.I. KLIMENOK) Stationary analysis of a retrial queue with preemptive repeated attempts. *Operations Research Letters* **28**, 173–180.  
*Keywords:*  $M/M/1$  retrial queue; preemptive priority; steady state.
- [46] (WITH A. GÓMEZ-CORRAL AND M.F. NEUTS) Analysis of multiserver queues with constant retrial rate. *European Journal of Operational Research* **135**, 569–581.  
*Keywords:* constant retrial policy;  $M/M/c$  retrial queue; optimization of the retrial rate; QBD process; steady state.
- [47] (WITH V.V. ANISIMOV) Analysis of Markov multiserver retrial queues with negative arrivals. *Queueing Systems* **39**, 157–182.  
*Keywords:* averaging principle; constant and linear retrial policies; negative arrivals; overloading case; QBD process; steady state.
- [48] On the  $M/G/1$  queue with D-policy. *Applied Mathematical Modelling* **25**, 1055–1069.  
*Keywords:* D-policy;  $M/G/1$  and  $M/M/1$  queues; regenerative analysis; steady state.

- [49] (WITH M.J. LÓPEZ-HERRERO) On the  $M/G/1$  queue with quadratic repeated attempts. *Statistical Methods* **3**, 60–78.  
*Keywords:*  $M/G/1$  and  $M/M/1$  retrial queues; quadratic retrial policy; regenerative analysis; steady state.

## 2002

- [50] (WITH G.I. FALIN) Standard and retrial queueing systems: A comparative analysis. *Revista Matemática Complutense* **15**, 101–129.  
*Keywords:* a survey on  $M/G/1$  and  $M/M/c$  retrial queues, with similarities and differences between the retrial models and their standard counterparts.
- [51] (WITH V.V. ANISIMOV) Approximation of multiserver retrial queues by means of generalized truncated models. *Top* **10**, 51–66.  
*Keywords:* convergence; generalized truncated model;  $M/M/c$  retrial queue; steady state; synchronization mechanism.
- [52] (WITH G.I. FALIN AND M.J. LÓPEZ-HERRERO) A second order analysis of the waiting time in the  $M/G/1$  retrial queue. *Asia-Pacific Journal of Operational Research* **19**, 131–148.  
*Keywords:*  $M/G/1$  retrial queue; second moment; waiting time.
- [53] A note on the optimality of the N- and D-policies for the  $M/G/1$  queue. *Operations Research Letters* **30**, 375–376.  
*Keywords:*  $M/G/1$  queue; optimality of D- and N-policies.
- [54] (WITH M. POZO) Numerical calculation of the stationary distribution of the main multiserver retrial queue. *Annals of Operations Research* **116**, 41–56.  
*Keywords:* generalized truncated model;  $M/M/c$  retrial queue; steady state.
- [55] (WITH V.C. JOSHUA AND A. KRISHNAMOORTHY) An  $M/G/1$  retrial queue with orbital search by the server. In: *Advances in Stochastic Modelling*, Artalejo J.R. and Krishnamoorthy A. eds., Notable Publications Inc., NJ, pp. 41–54.  
*Keywords:* linear retrial policy;  $M/G/1$  and  $M/M/1$  retrial queues; orbital search; regenerative analysis.

## 2003

- [56] (WITH O. HERNÁNDEZ-LERMA) Performance analysis and optimal control of the  $Geo/Geo/c$  queue. *Performance Evaluation* **52**, 15–39.  
*Keywords:* discrete-time  $Geo/Geo/c$  queue; late arrival system, delayed access; optimal control; steady state; value function.
- [57] (WITH A. GÓMEZ-CORRAL) Channel idle periods in computer and telecommunication systems with customer retrials. *Telecommunication Systems* **24**, 29–46.  
*Keywords:* channel idle periods;  $M/M/c$  retrial queue; optimal design; random order, and first free first busy assignments.
- [58] (WITH M.J. LÓPEZ-HERRERO) On the  $M/M/m$  queue with removable servers. In: *Stochastic Point Processes*, Srinivasan S.K. and Vijayakumar A. eds., Narosa Publishing House, pp. 124–144.  
*Keywords:*  $M/M/c$  queue; optimal design; removable server; steady state.

**2004**

- [59] (WITH A. ECONOMOU) Optimal control and performance analysis of an  $M^X/M/1$  queue with batches of negative customers. *RAIRO* **38**, 121–151.  
*Keywords:* bulk arrivals;  $M^{[X]}/M/1$  queue; negative arrivals; optimal control; steady state; stochastic domination; threshold type policy; total discounted cost, and average cost criteria.
- [60] (WITH I. ATENCIA) On the single server retrial queue with batch arrivals. *Sankhya* **66**, 140–158.  
*Keywords:* bulk arrivals; linear retrial policy;  $M^{[X]}/G/1$  retrial queue; steady state.
- [61] (WITH G. CHOUDHURY) Steady state analysis of an  $M/G/1$  queue with repeated attempts and two-phase service. *Quality Technology and Quantitative Management* **1**, 189–199.  
*Keywords:* embedded Markov chain;  $M/G/1$  retrial queue; steady state; stochastic decomposition; two-phase service.
- [62] (WITH M.J. LÓPEZ-HERRERO) Entropy maximization and the busy period of some single-server vacation models. *RAIRO* **38**, 195–213.  
*Keywords:* busy period; D-, N- and T-policies;  $M/G/1$  queue; maximum entropy; server vacations.

**2005**

- [63] (WITH D.S. ORLOVSKY AND A.N. DUDIN) Multi-server retrial model with variable number of active servers. *Computers and Industrial Engineering* **48**, 273–288.  
*Keywords:* asymptotically quasi-Toeplitz Markov chain;  $M/M/c$  retrial queue; optimal design; QBD process; steady state; threshold type policy.
- [64] (WITH A. ECONOMOU) On the non-existence of product-form solutions for queueing networks with retrials. *Electronic Modeling* **27**, 13–19.  
*Keywords:* linear retrial policy; product-form solution; queueing network with retrials; steady state.
- [65] (WITH A. GÓMEZ-CORRAL) Waiting time in the  $M/M/c$  queue with finite retrial group. *Bulletin of Kerala Mathematics Association* **2**, 1–17.  
*Keywords:* convergence;  $M/M/c/K$  retrial queue; waiting time.
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