IPM 20 - Combinatorics 2009

October 7, 2009

The **Institute for Research in Fundamental Sciences** (**IPM**) was founded in 1989 to promote research in mathematics and theoretical physics in Iran. Now its areas of research include eight schools: Mathematics, Physics, Cognitive Sciences, Computer Sciences, Nano-Sciences, Analytic Philosophy, Astronomy, and Particles and Accelerators. The School of Mathematics of the IPM has played a major role in the development of mathematics in Iran with three research emphases: Combinatorics and Computing, Commutative Algebra, and Mathematical Logic.

To commemorate the 20th anniversary of the IPM, the conference IPM 20 - Combinatorics 2009 was held at the IPM on May 15–21, 2009. The organizing committee consisted of S. Akbari, R.A. Brualdi, S. Hedayat, H. Kharaghani, G.B. Khoshrovshahi (chair), R. Maimani, S. Shahriari, and B. Tayfeh-Rezaie. Unknown to Reza Khoshrovshahi, the other organizers dedicated the conference to Reza on the occasion of his 70th birthday. Reza headed the the IPM cluster group in combinatorics since the inception of the IPM and served as Director of its School of Mathematics from 1996 to 2007. Through his research on designs, latin squares, and graphs, and his administrative work, the School of Mathematics has developed a well-deserved reputation, attracting mathematicians from all over Iran and hosting international conferences.

The invited speakers with the titles of their talks were:

Eiichi Bannai: Spherical designs and association schemes versus Euclidean designs and coherent configurations

Helene Barcelo, k-equal subspace arrangements revisited

Andries Brouwer, Cohomology of root systems

Richard A. Brualdi, Signed domination

Peter Fraenkel, Intersection theorems for finite sets

Willem H. Haemers, Divisible design graphs

Samad Hedayat, Optimal crossover designs for comparing test treatmentswhen subject effects are random

Gyula O.H. Katona, Bounds on the largest families of subsets with forbidden subposets

Hadi Kharaghani, On regularly unbiased Hadamard matrices

Jack Koolen, Geometric distance regular graphs

William J. Martin, An ideal associated to any cometric association scheme

Brendan McKay, Random graphs with specified degrees

Shahriar Shahriari, Chain partitions of normalized matching posets

Jozef Siran, Maps with highest level of symmetry that are even more symmetric than other such maps: Regular maps with largest exponent groups

Richard P. Stanley, A survey of alternating permutations

Robin Thomas, K_2 minors in large t-connected graphs

Qiang (Steven) Wang, Lucas sequences, permutation polynomials, and inverse polynomials

Richard M. Wilson, Spreading blocks and subgraphs

Qing Xiang, Exterior algebras and two conjectures on finite aabelian groups.

Contributed talks with titles were:

G. Aalipour-Hafshejani, On the $\mathcal{D}$-equivalence class of complete bipartite graphs

O. Ahmadi, Graphs with integral spectrum

S. Alikhani, On the zeros of domination polynomials

A.R. Ashrafi, Combinatorial properties of graphs with (K, r)=regular star set

Kh. Bibak, Well-bisective graphs

A. Dolati, On the sphericity of 3-connected digraphs

A.S. Fakhari, Cycles of length 0 modulo l in graphs

C.M. da Fonseca, Counting faces of the tridiagonal Birkhoff polytope

M. Ghanbari, On the dynamic coloring of graphs

M. Ghasemi, Normal Cayley graphs on minimal non-abelian groups of small valency

E. Ghorbani, Graphs with many ± 1 and $\pm\sqrt{2}$ eigenvalues

M. Hasheminezhad, A generalized switching method for combinatorial estimation

N. Jafari Rad, Changing and unchanging in Roman domination

R. Kahkeshani, Codes whose automorphism groups are $S_{11}, PSL_2(11)$ or $PSL_2(11) : 2$

C. Maysoori, On the addressing problem

D. Moazzami, Some results related to teh tenacity parameter in networks

A. Mofidi, Zero sum flows on graphs and designs

M. Mohammad-Noorim, Intersection matrices and the Johnson scheme

M. Reza Oboudi, On the energy of graphs and multigraphs

F. Raee, On uniqueness independence weighted graphs

A. Rahnamai Barghi, Finite groups are determined by a combinatorial property

M.-R. Sadeghi, On cycle-freee lattices

M. Stojakovic, How fast can Maker win?

M. Tahmasbi, Combinatorial aspects in graph drawing.

There were over 200 people registered for the conference generating a lot of discussion and excitement before and after talks. Iranian mathematicians were very eager to learn and discuss mathematics with their international guests, and the international guests learned of recent activity in combinatorics by Iranians. As with previous IPM conferences [1, 2, 3], we were treated with great warmth, hospitality, and generosity. And the organization was impeccable. Those coming from outside Iran were accommodated at the very comfortable IPM Guest House.

The *Daily News*, an IPM tradition well-worth emulating by other conferences, was offered each day with news about the conference, pictures, reports about some of the distinguished invited speakers, and other items of interest. An excursion of Tehran was offered to the participants one afternoon, and it featured the marvelous rug museum and the Sadadad Palace, a place built during the Pahlavi dynasty of Iran. The conference dinner was held one evening on the picturesque IPM grounds. It was a wonderful event

that featured delicious and plentiful Iranian food. Before eating we were treated to a music performance, including Rick Wilson on flutes and Peter Fraenkel on, well, balls, pins, knives, etc. - a juggling street performance in the IPM! (Actually, earlier in the week when Peter gave his lecture, he also treated us to some of his juggling acts.) The highlight of the evening was the recognition of the accomplishments of Reza Koshrovshahi on the occasion of his 70th birthday. The Director of the IPM, M.J.A. Larijani, extolled the accomplishments of Reza and the crucial role he played in the development of the IPM.

The invited participants were taken on an overnight excursion via airplane to the amazing city of Esfahan (Khomeini Square has to be seen to be believed). Those who had been taken there previously, were offered an excursion to the city of Yazd, a historical city in the desert region of Iran.

The proceedings of the previous three combinatorics conferences were published in refereed journals [4, 5, 6]. The American Mathematical Society has given preliminary approval to publish the refereed proceedings of this conference in their series *Contemporary Mathematics*.

After this conference, the IPM's School of Mathematics has formed a Combinatorics Department whose Head is Saieed Akbari. We can look forward to increased combinatorial activity at the IPM.

References

[1] Richard A. Brualdi, Report on the International Workshop on Combinatorics, Linear Algebra, and Graph Coloring, this *Bulletin*, 40 (2004), 122–125.

[2] Richard A. Brualdi, The First IPM Conference on Algebraic Graph Theory, this *Bulletin*, 51 (2007), 103–108.

[3] Jeff Dinitz, IPM Combinatorics II: Design Theory, Graph Theory, and Computational Methods, this *Bulletin*, 49(2007), 115–122.

[4] Special Issue: International Workshop on Combinatorics, Linear Algebra, and Graph Theory, *Discrete Mathematics*, 306, No. 23, (2006)

[5] Special Issue: First IPM Conference on Algebraic Graph Theory, *Linear Algebra and its Applications*, 429, No. 11-12, (2008).

[6] Special Issue: International Workshop on Design Theory, Graph Theory, and Computational Methods, IPM Combinatorics II, *Discrete Mathematics*, 309, No. 3, (2009).

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