5	**B999-110**	110	54945	***0.9736***	*111-clique*	9 disconnected partial 111-cliques	***+2.111.6105***
6	**B999-888**	888	443556		*9-clique*	9 111-elementic parts ***111-nona-clique***	**?**
7	**B999-332**	332	165832	***0.9515***	*333-clique*	3 disconnected partial 333-cliques	***+2.333.55278***
8	**B999-666**	666	332667		*3-clique*	3 333-elementic parts ***333-tri-clique***	**?**

<u>Comments:</u> **a)** Strongly regular are there only ***n-m***-cliques. **b)** The names of ***n-m***-cliques can be for any no please, but others I cannot find.

<u>Proposition 3.7.</u> Semiotic approach discovers some new strongly- and clique regular structures.

<u>Summary</u>

So it is recognized 39 bisymmetric-strongly regular structures with 4 to 20 vertices, mainly on the ground of disconnected partial cliques induced structures. The results of J. Petersen (B10-15**),** A.Titov (B13-39), B. Weisfeiler (B15-45) et al, Greenwood-Gleason (or Clebish B16-40) in the realm of bisymmetry are random coincides, because the first be interested on valence-regularity, other on self-complementary, third on strong regularity, fourth on color-conjecture, others on isomorphism testing etc.

In the "most complete" list of strongly regular graphs are showed all the to 20 vertices ***bi-cliques***, as *complete bipartite graphs*, whereby bi-clique with 4 vertices called *square* and with 6 vertices called *unity*. There are also showed all the ***2-m-cliques***, that have title ***r****-cocktail party graphs*, whereby with 6 vertices called *octahedral graph* and with 8 vertices *16-cell graph.* Other ***n-m-cliques*** called mostly *circular graphs*. There lack five ***n-m-cliques*** and the complement of a known strongly regular graph

It is touch with partial coincide the bisymmetry and strong regularity. Bisymmetry cover also disconnected structures and strong regularity can be exists also by mono-, poly- and partial symmetry. But the lasts no exist among the structures with to 20 vertices. Semiotic approach was fill the "white blotch" of lists the strongly regular graphs, was pick out the essence of so far ignored clique regularity, and this that the complement of strongly regular graph is also strongly regular.

2. SYMMETRY PROBLEM: THE ORBITS

Symmetry is a more essential attribute of graph structure. It is there treated on its **B**-meaning [6], that expressed as existence *elements of the same kind*, specifically elements on the ***equal positions*** in structure.

2.1. Orbits: equal positions in the structure

Wherein appear the equal positions of structural elements? It appears in the ***equal remain structures*** that obtained after removal the equal elements. By different elements obtain different remain structures.

Propositions 2.1. The relationships between ***equal positions*** and ***remain graphs.*** Let vertex ***i*** has adjacent vertices ***j*, j**, …*** and vertex ***j*** adjacent vertices ***i*, i**, … .***

P2.1.1. Vertices ***i, j, …*** have in graph ***G*** *the same* or *equal positions* iff the *remain graphs are isomorphic* $(G_i=G\backslash v_i)\cong(G_j=G\backslash v_j)\cong....$ and the remain graphs of their incident edges ***ij*, ji*, …*** are also isomorphic $(G_{ij*}=G\backslash e_{ij*})\cong(G_{ji*}=G\backslash e_{ji*})\cong....$.

P2.1.2. Edges ***ij*, ji*, …*** have in graph ***G*** *the same* or *equal positions* iff the *remain graphs are isomorphic* $(G_{ij*}=G\backslash eij*)\cong(G_{ji*}=G\backslash e_{ji*})\cong....$ and the remain graphs of their incident vertices ***i, j, …*** are also isomorphic $(G_i=G\backslash v_i)\cong(G_j=G\backslash v_j)\cong....$.

Comment: These conditions show how the vertices and vertex pairs are mutually related.

Structural recognition of equal positions or symmetry take place by orbits in sign matrix ***W.*** Confuse term ***orbit*** is a concept of group theory and need here clarification. A permutation the vertices or vertex pairs that retain the structure called ***automorphism*** α**.** It is be expressed as an ***inner-*** or ***local isomorphism*** *(isomorphism with itself)*. Automorphisms form an automorphism group of graph *Aut****G.*** The group divides to certain *transitivity domains* or *orbits* Ω, whereof elements take for *the same kind* or to *equivalent*. Usually be interested mainly on vertex orbits. Useful to begin at orbits of vertex pairs or ***pair orbits.***

Propositions 2.2. The relationships between ***automorphisms, local isomorphisms, pair orbits*** and ***pair signs***:

P2.2.1. As an *automorphism* α or a permutation that retain the structure be expressed in the form of a *local isomorphism* $G_{ij}\cong G_{i*j*}$ then constitute a *transitivity domain of automorphisms* or ***pair orbit*** ΩR_n an *isomorphism class of remain graphs* $\{G_{ij1}\cong G_{ij2}\cong...\cong G_{ijq}\}_n\subseteq\Gamma^G{}_n$.

Comment: A pair orbit ΩR_n, as *isomorphism class* Γ_n can be interpretable also as an "isomorphism clique", where all the element pairs are mutually isomorphic.

P2.2.2. Isomorphism class of remain graphs $\Gamma^G{}_n$ *is replaceable* with corresponding *isomorphism class of pair graphs* $\{g_{ij1}\cong g_{ij2}\cong...\cong g_{ijq}\}_n\subseteq\Gamma^g{}_n$. Identification the elements of orbit ΩR_n take place by *pair signs* $\pm d.n.q._{ij}$ as the identifiers of isomorphism class Γ_n.

Comment: The classes of vertices and vertex pairs on the Examples 1.1 and 2.1 are in fact vertex-ΩV_k and pair orbits ΩR_n correspondingly.

P2.2.3. In the decomposed sign matrix ***S*** must be each pair orbit ΩR_n directly connected with the orbit ΩV_k of their incident vertices. Herewith are replete also the conditions P2.1.

Comment: **a)** The orbits, recognized by group theoretic and structural ways, ***coincide!*** **b)** Graphs with different structures can be have one and same group ***AutG***, but have different sign matrices ***S.*** **d)** In case group theoretic treatment the recognitions of vertex and edge orbits takes place separately and the "non-edge" orbits are unknown. In case structural treatment the recognitions of vertex-, pair(+)- and pair(-)orbits take place completely, where sign matrix ***S*** express these in a complex.

In case group theoretic treatment the number of permutations of completely symmetric graphs can be increase up to factorial. In case semiotic treatment it no happens. Up to present thinks, that orbit recognition belongs to periphery of graph theory. On the semiotic aspect it is a central problem.

Propositions 2.3. ***Orbit presentations*** in the sign matrix ***S.***

P2.3.1. Vertices v_i, that belong to partial matrix S_k of decomposed sign matrix ***S*** form the vertex orbit $\Omega V_k=\Omega\{v_{i1},…,v_{iz}\}_k$, $k\in[1, K]$.

P2.3.2. Vertex pairs v_i, v_j with the same pair signs, that belong to partial matrix $S_{kk^*} \subseteq S_k \cap S_{k^*}$ of decomposed sign matrix S form the pair orbit $\Omega R_n = \Omega\{(v_i v_j)_1, \ldots, (v_i v_j)_q\}_n$, $n \in [1, N]$.

Comments: **a)** See Examples 1.1 and 2.1. **b)** Vertices (and/or vertex pairs) of one and the same orbit have the *same structural position*, these are amongst commutable.

2.2. Symmetry kinds and measuring

Symmetry of graph structure directly depends on its ***vertex- and pair orbits*:**

Propositions 2.4. The ***symmetry kinds*** of graph structure:

P2.4.1. Graph G, that has only one vertex orbit ΩV_k is a ***vertex symmetric graph*** whatever also *transitive* called.

P2.4.2. Vertex symmetric graph that has only one pair orbit ΩR_n is a ***completely symmetric graph.***

Comment: ***Complete graph*** has only one edge- or pair(+)orbit and ***empty graph*** only one "non-edge" or pair(–)orbit – these are completely- or 100% symmetric.

P2.4.3. Vertex symmetric graph that has only one edge orbit (i.e. pair(+)orbit) ΩR_n^+ and only one "non-edge" orbit (i.e. pair(–)orbit) ΩR_n^- is a ***bisymmetric graph.***

Comments: **a)** All the bisymmetric graph are also *strongly regular*. **b)** For example, Petersen graph is bisymmetric and strongly regular (see Example 1.2).

P2.4.4. Vertex symmetric graph that has one pair(+)orbit ΩR_n^+ and several pair(–)orbits ΩR_n^- is an ***edge symmetric*** or (+)***symmetric graph***.

Comments: **a)** Edge symmetric graph was called also simply *symmetric* or *rather symmetric*. **b)** Can be exist also (+)symmetric *bipartite* structures that no are vertex symmetric. **c)** Edge symmetric are, for example, Hamilton's, Coxeter's, Folkman's and Heawood's graphs, their number of different pair signs equal to the number of pair orbits. **d)** Complement of an *edge symmetric* graph is a ***"non-edge"-*** or (–)***symmetric graph***. Jointly we call these ***mono symmetric graphs.***

P2.4.5. Vertex symmetric graph that has several pair(+)orbits ΩR_n^+ and several pair(–)orbits ΩR_n^- is a ***poly-symmetric graph.***.

Comments: **a)** For example, a poly-symmetric graph showed on Example 2.2. **b)** Vertex symmetric structures exist rarely. For example, among 156 of 6-elements structures exists only 8 symmetric. Also among the regular and strongly regular exist symmetric rarely.

P2.4.6. Graph G, that has more than one vertex orbit ΩV_k, whereby at least to one ΩV_k belong at least two elements we call ***partially symmetric graph***.

Comments: **a)** For example, partially symmetric graph showed on Examples 1.1 and 2.1. **b)** Partial symmetry is a broad form of transition at symmetry to **a**symmetry. For example, among 156 of 6-elements structures are 140 partially symmetric.

P2.4.7. Graph G, whereof number K of vertex orbits ΩV_k equal to the number $|V|$ of vertices is a ***0-symmetric*** or *(completely)****asymmetric graph.***

Comment: *0*-symmetry is also an exceptional phenomenon. For example, among 156 of 6-elements structures are 0-symmetric only 8.

We were demonstrated, that symmetry of the structure be founded on the orbits. How to represent the symmetry?

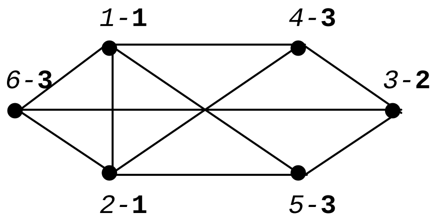
Propositions 2.5. The ***symmetry signs*** of structure:

P2.5.1. Vector with elements $|\Omega V|^m$, where $|\Omega V|$ is the power of vertex orbit and m is the number of orbits with corresponding power, constitute a ***vector of vertex symmetry SVV***.

P2.5.2. Vector with elements $|\Omega R|^m$, where $|\Omega R|$ is the power of pair orbit and m is the number of orbits with corresponding power, constitute a ***vector of pair symmetry SRV***.

Example 2.1. A graph, its sign matrix ***S*** and symmetry vectors:

A:-2.5.7; B:-2.5.6; ***C:+2.3.3; D:+2.5.7; E:+3.6.10.***



DEG=3⁴4²

1	**1**	**2**	**3**	**3**	**3**		u_i	k	s_i
1	*2*	*3*	*4*	*5*	*6*	***i***	*AB**CDE***		123
0	**D**	*-B*	**C**	**C**	**C**	*1*	*01**310***	**1**	103
	0	*-B*	**C**	**C**	**C**	*2*	*01**310***	**1**	103
		0	**E**	**E**	**E**	*3*	*02**003***	**2**	003
			0	*-A*	*-A*	*4*	*20**201***	**3**	210
				0	*-A*	*5*	*20**201***	**3**	210
					0	*6*	*20**201***	**3**	210

Comments: **a)** In present case it is *partial symmetry*. **b)** Vertex orbits: one orbit with one element, one with two and one with three elements. Thus, *vector of vertex symmetry* ***SVV*= $1^1 2^1 3^1$. c)** *Vector of pair symmetry* ***SRV*=$1^1 2^1 3^2 6^1$**, among this *vector of edge symmetry* ***SEV*=$1^1 3^1 6^1$**.

Symmetry vectors give a good possibility for *measuring* the symmetry. The ***measure of symmetry*** has founded on Shannon's classical formula of information capacity that is practically a *measure of asymmetry or inner diversity*. Information arises on the ground of set of diversities.

Propositions 2.6. The ***information capacity*** of a structure:

P2.6.1. ***Vertex information capacity HV*** calculates by the number of vertices $|V|$ and the power of vertex orbits $|\Omega V_k|$:

$$HV = -\sum_{k=1}^{K} PV_k \log PV_k,$$

where $0 \le PV_k = |\Omega V_k| : |V| \le 1$.

Comment: $minHV = 0 \le HV \le \log|V| = maxHV$, where, if $K=1$, then $HV=0$ and if $K=|V|$, then $HV=\log|V|$.

P2.6.2. ***Pair information capacity HR*** calculates by the number of vertex pairs $|R|$ and the power of pair orbits $card\Omega R_n$:

$$HR = -\sum_{n=1}^{N} PF_n \log PF_n,$$

where $0 \le PF_n = |\Omega R_n| : |R| \le 1$ ja $|R| = [|V|(|V|-1)] : 2$.

Comments: **a)** $minHR = 0 \le HR \le \log|R| = maxHR$, where, if $N=1$, then $HR=0$ and if $N=|R|$, then $HR=\log|R|$. **b)** Edge info capacity HR^+ calculates by the number of edges $|E|$ and the power of edge orbits $|\Omega R_n^+|$. **c)** "Non-edge" info capacity HR^- calculate by the number of "non-edges" $|R^-|$ and the power of corresponding pair orbit $|\Omega R_n^-|$.

There, where differences no exist, arise a certain “domain of the same kinds”, what on the structural aspect mean existence an *orbit* Ω. The great are orbits the smaller is the information capacity ***HR***.

Proposition 2.7. On the ground of information capacities *HV* and *HR* can be recognize the ***symmetry values SV*** and ***SR*** correspondingly:

$$SR=1-HR:\log|R|, \text{ where } 0\leq SR\leq 1.$$

Comments: **a)** The symmetry ***value is 1***, if there exist *only one orbit*; the ***value is 0***, if the *number of orbits equal to the number of elements*. **b)** This raise a possibility to *compare, order and grouping* the graphs with different size by symmetry values **c)** Symmetry value *SR* is officially called as ***regularity.***

The symmetry vectors and symmetry values of the graph on the Example 2.1.

Symmetry	*K*	*N*	*SVV*	*SV*	*SRV*	*HR*	*SR*	*SEV*	*SE*	*aut*	*3003PS*
Partial	3	5	$1^1 2^1 3^1$	*0.478*	$1^1 2^1 3^2 6^1$	*2.106*	*0.461*	$1^1 3^1 6^1$	*0.610*	12	*60*

But, how can be express or represent the orbits? It is very simply! A pair orbit ΩR_n is a part of structure ***GS*** and consist also of vertices and edges. It is presentable as a partial graph.

2.3. Orbit structures

Orbit structure is a structure, whereof edges correspond to the certain pair signs that represent a certain pair orbit. A structure, that correspond to an edge orbit (pair(+)orbit) is a partial structure of initial structure, and this that correspond to an “non-edge” orbit (pair(–)orbit) is a partial structure of the complement. These open the “hidden sides” of structure, that perhaps also “mystical” can be. For example, an orbit structure of Folkman’s graph is Petersen graph, etc.

Proposition 2.8. A graph, whose edges e_{ij} correspond to elements (i.e. to pairs $v_i v_j$) of a certain pair orbit ΩR_n of ***G*** is an ***orbit graph*** G_n of ***G.***

Comments: **a)** Each orbit ΩR_n can be represent as a graph G_n. **b)** Orbit graph is a self-evident attribute of a graph – it is a *representation of its orbit*. **c)** Each *orbit*(+)*graph* of ***G*** coincide with the corresponding *orbit*(–)*graph* of complement $\urcorner G$.

Complete structure is an orbit-structure, what no has other orbit structures. Bisymmetric structure is an orbit-structure, what has a potential orbit-structure in the form of its complement. Mono-symmetric structure is an orbit-structure, what has some potential orbit-structures by its pair(–)orbits in the form of partial structures of its complement. The edges of a poly-symmetric structure belong more than one pair(+)orbit. The complement of mono-symmetric structure is poly-symmetric. The edges of a poly-symmetric structure belong to some pair(+)orbit.

The main problem is there the *graph decomposition to its orbit-structures.* Orbit-graphs of vertex symmetric (bi-, mono- and poly-symmetric) graphs cover all the vertices of the graph. Orbit-graphs of partially symmetric graphs cover only one vertex orbit.

Example 2.2. Poly-symmetric graph ***KOH*** and fragments of its orbit structures G_n.

-A=-2.6.12; -B=-2.4.5; -C=-2.3.2; ***+D=+2.4.5; +E=+2.5.7.***

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	*i*	*ABC**DE***	***deg***
0	***D***	*-C*	*-B*	***D***	***E***	*-A*	*-C*	*-C*	*-A*	***E***	***D***	*-B*	*-C*	***D***	**1**	*224**42***	6
	0	***D***	*-C*	*-B*	***D***	***E***	*-A*	*-C*	*-C*	*-A*	***E***	***D***	*-B*	*–C*	**2**	*224**42***	6
		0	***D***	*-C*	*-B*	***D***	***E***	*-A*	*-C*	*-C*	*-A*	***E***	***D***	*–B*	**3**	*224**42***	6
			0	***D***	*-C*	*-B*	***D***	***E***	*-A*	*-C*	*-C*	*-A*	***E***	***D***	**4**	*224**42***	6
				0	***D***	*-C*	*-B*	***D***	***E***	*-A*	*-C*	*-C*	*-A*	***E***	**5**	*224**42***	6
					0	***D***	*-C*	*-B*	***-D***	***E***	*-A*	*-C*	*-C*	*–A*	**6**	*224**42***	6
						0	***D***	*-C*	*-B*	***D***	***E***	*-A*	*-C*	*–C*	**7**	*224**42***	6
							0	***D***	*-C*	*-B*	***D***	***E***	*-A*	*–C*	**8**	*224**42***	6
								0	***D***	*-C*	*-B*	***D***	***E***	*–A*	**9**	*224**42***	6
									0	***D***	*-C*	*-B*	***D***	***E***	**10**	*224**42***	6
										0	***D***	*-C*	*-B*	***D***	**11**	*224**42***	6
											0	***D***	*-C*	*–B*	**12**	*224**42***	6
												0	***D***	*–C*	**13**	*224**42***	6
													0	***D***	**14**	*224**42***	6
														0	**15**	*224**42***	6

Triangular poly-symmetric structure ***KOH*** has by pair signs *–A: –2.6.12; –-B–-2.4.5; –C: –2.3.2;* ***+D:+2.4.5 ; +E.+2.5.7*** five orbit structures.

Orbit-structure ***KOH***$_{n.+D}$ by pair sign ***+D***:

*-A:-3.10.14; -B:-2.4.4; -C:-2.3.2; +**D:=+3.6.7.***

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	*i*	*ABBC**D***	***Orb***	1
0	***D***	*-C*	*–B1*	***D***	*–B2*	*-A*	*-C*	*-C*	*-A*	*–B2*	***D***	*-B1*	*-C*	***D***	**1**	*2224**4***	1	4
	0	***D***	*-C*	*–B1*	***D***	*-B2*	*-A*	*-C*	*-C*	*-A*	*-B2*	***D***	*-B1*	*-C*	**2**	*2224**4***	1	4
		0	***D***	*-C*	*-B1*	***D***	*-B2*	*-A*	*-C*	*-C*	*-A*	*-B2*	***D***	*-B1*	**3**	*2224**4***	1	4

By pair sign ***D:+3.6.7*** must be orbit-structure ***KOH***$_{n:+D}$ ***partite.*** This means, that the initial structure ***KOH*** is also partite and its complement contains corresponding cliques.

Orbit-structure ***KOH***$_{n:+E}$ by pair sign ***+E***:

-A:-0.2.0; ***B:+2.3.3.***

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	*i*	*A**B***	***Orb***	1
0	*-A*	*-A*	*-A*	*-A*	***B***	*-A*	*-A*	*-A*	*-A*	***B***	*-A*	*-A*	*-A*	*–A*	**1**	*12**2***	1	2
	0	*-A*	*-A*	*-A*	*-A*	***B***	*-A*	*-A*	*-A*	*-A*	***B***	*-A*	*-A*	*–A*	**2**	*12**2***	1	2
		0	*-A*	*-A*	*-A*	*-A*	***B***	*-A*	*-A*	*-A*	*-A*	***B***	*-A*	*–A*	**3**	*12**2***	1	2

It is read between the lines that orbit-structure ***KOH***$_{n:+E}$ consist of ***five componentic 3-cliques*** 1,6,11 and 2,7,12 and 3,8,13, and 4,9,14 and 5,10,15. Thus, ***KOH*** contain the same *3*-cliques.

Orbit-structure ***KOH***$_{n:-A}$ by pair sign *–A*:

*-A:-2.3.2; -B:-0.2.0; +**C:+4.5.5.***

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	*i*	*A B**C***	***Orb***	1
0	*-B*	*-B*	*-A*	*-B*	*-B*	***C***	*-B*	*-B*	***C***	*-B*	*-B*	*-A*	*-B*	*–B*	**1**	*210**2***	1	2
	0	*-B*	*-B*	*-A*	*-B*	*-B*	***C***	*-B*	*-B*	***C***	*-B*	*-B*	*-A*	*–B*	**2**	*210**2***	1	2
		0	*-B*	*-B*	*-A*	*-B*	*-B*	***C***	*-B*	*-B*	***C***	*-B*	*-B*	*–A*	**3**	*210**2***	1	2

Orbit-structure ***KOH***$_{n:-B}$ by pair sign *–B*:

-A:-2.3.2; -B:-0.2.0; ***C:+4.5.5***.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	i	A BC	Orb	1
0	-B	-B	**C**	-B	-B	-A	-B	-B	-A	-B	-B	**C**	-B	-B	**1**	210**2**	1	2
	0	-B	-B	**C**	-B	-B	-A	-B	-B	-A	-B	-B	**C**	-B	**2**	210**2**	1	2
		0	-B	-B	**C**	-B	-B	-A	-B	-B	-A	-B	-B	**C**	**3**	210**2**	1	2

Orbit-structures ***KOH**$_{n:--A}$* and ***KOH**$_{n:-B}$* are ***isomorphic***. It is read between the lines that orbit-structures ***KOH**$_{n:-A}$* and ***KOH**$_{n:-B}$* consist of ***three componentic 5-girths***. It differs only by its ordering. In case of ***KOH**$_{n:--A}$* it is 1-7-13-4-10-1 and 2-8-14-5-11-2 and 3-9-15-6-12-3. In case of ***KOH**$_{n:--B}$* 1-4-7-10-13-1 and 2-5-8-11-14-2 and 3-6-9-12-15-3. The vertices what form these girths coincide with parts of orbit-structure ***KOH**$_{n:+D}$*: 1,4,7,10,13 and 2,5,8,11,14 and 3,6,9,12,15. This fix that initial structure ***KOH*** is ***three-partite***.

Orbit-structure ***KOH**$_{n:-C}$* by pair sign –*C*:

*-A:-3.10.14; -B:-2.4.4; -C:-2.3.2; +**D:+3.6.7.***

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	i	ABBC**D**	Orb	1
0	C	**D**	A	C	B2	B1	**D**	**D**	B1	B2	C	A	**D**	C	**1**	22244	1	4
	0	C	**D**	A	C	B2	B1	**D**	**D**	B1	B2	C	A	**D**	**2**	22244	1	4
		0	C	**D**	A	C	B2	B1	**D**	**D**	B1	B2	C	A	**3**	22244	1	4

Orbit-structure ***KOH**$_{n:-C}$* is ***isomorphic*** with orbit-structure ***KOH**$_{n:+D}$* and is also ***three-partite*** with the parts 1,7,13,4,10 and 2,8,14,5,11 and 3,9,15,6,12.

Propositions 2.9. The properties of ***orbit-structures** G_n*:

P2.9.1. Orbit-structures *open* its basic structure on the various aspects and *present its hidden properties*.

Comments: **a)** If the basic structure is partite or contain components, cliques, girths etc, then emerge the corresponding vertex complexes in the orbit-structures in another form. **b)** It can be assert, that orbit-structures are "kindred" or "genetic derivatives" of their basic structure.

P2.9.2 Poly-symmetric structure is an *union* $\cup G_n$ *of orbit-structures* by edges**.**

P2.9.3. Orbit-structure G_n is edge symmetric, i.e. *bi- or* (+)*symmetric*.

P2.9.4. Different orbit-structures of a graph *can be isomorphic or coincide*.

P2.9.5. To each pair orbit ΩR_n of a structure ***GS*** correspond a pair $\Omega R_n^{\#}$ orbit of its complement ⌉***GS*** whereof the corresponding *orbit-structures coincide*, $G_n \equiv \rceil G_n$.

P2.9.6. Orbit-structures of different graphs *can be isomorphic or coincide.*

P2.9.7. If the pair(+)sign of orbit-graph cover all the vertices and edges, then it is a *complete invariant* of this structure.

We are interested also on orbit-graphs of orbit-graphs, i.e. on *high degree orbit graphs***.**

Propositions 2.10. The properties of ***high degree orbit-structures***:

P2.10.1. In case of high degree orbit-structures begin *recur* the former properties, new properties arise seldom.

P2.10.2 High degree orbit-graph can be isomorphic or coincide with their low degree basic graph.

P2.10.3. A high degree orbit structure can be *reconstruct its basic structure*, if the last is bi- or mono-symmetric.

P2.10.4. Inducing the high degree orbit-structures is a *convergent process*, it close with crop up a low degree graph.

So far we treat orbit structures of vertex symmetric graphs. It has thought to treat also "sign graphs" of *partially*- and *0-symmetric* graphs.

Proposition 2.11. A graph, whose edges $\boldsymbol{e_{ij}}$ correspond to a certain class pair signs ***dnq*** of ***G*** is a ***sign graph*** $\boldsymbol{G_{dnq}}$ of ***G.***.

Comment: The *sign graphs* $\boldsymbol{G_{dnq}}$ can be open the "hidden sides" of partially- and *0*-symmetric graphs.

Symmary The main matter of orbit-structures consist in recognition the hidden properties of a basic structure. By help orbit-structures can be find the same attributes of various structures. For example, Hypercube and Möbius-Kantor graph have some common orbit-structures, an orbit-structure of Folkman graph is Petersen graph, etc.

3. PROBLEMS OF CANONICAL REPRESENTATION AND ISOMORFISM

3.1. Canonical representation the graphs

Canonical representation of a graph means it show in a form which represent its *structure*, recommendatory *with exactness up to isomorphism*. This problem set up presumably Lazlo Babai [11, 12] in year 1977. Canonical representation constitute, for example *3-cube codes* [13]. Unfortunately the no contain data about the structure self.

More deeply can be invade by semiotic invariants.

Proposition 3.1. Sign matrix ***S*** is a ***canonical representation*** of graph with exactness up to its *structure,* i.e. up to *pair signs, orbits* and *isomorphism***.**

Thus, such canonical representation is more than isomorphism recognition. It is recognition of the structure completely, where essential role has orbit recognition.

Example 3.1. A canonical presentation of a *partially symmetric and strongly regular graph* ***WEI*** [14, p 166(1)], its decomposed by ***u***- and ***s***-vectors sign matrix ***S*** and structural properties:

A:-2.8.20; B:-2.8.19; C:-2.8.18;
D:+2.7.13; E:+2.7.14; F:+2.7.15*.*