

PRADIS

The description of programs for calculation of output variables

**THE SOFTWARE FOR SIMULATION OF NON-STATIONARY
PROCESSES IN MECHANICAL SYSTEMS AND SYSTEMS OF
OTHER PHYSICAL NATURE**

VERSION 4.2

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The calculation program of scaled values of acceleration of node A

Type of indexes on interior variables transmitted in the program:

1 - the node number, which acceleration is required to be computed.

Parameters:

1 – a scale.

Output variables:

1 - the acceleration of the specified node increased by a scale.

The certificate OVP A

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

**The program of calculation of criteria of a injury from deceleration
(duration of act of deceleration of the set level and deceleration
level on 3 mc an interval) taking into account the cumulative
effect **ACSCUM****

Type of indexes on interior variables transmitted in the program:

Machining from 1 to 3 indexes on making accelerations on axes of co-ordinates is possible.
Criterion HIC is reconed for result accelerations.

Parameters:

- 1 - the deceleration level, which duration is necessary for tracing.
- 2 - a scale for conversion of accelerations in units G:
= 1, if dimensions of a quantity of transmitted accelerations G;
= 0.102, if dimensions of a quantity of transmitted accelerations of m / (cek²)

Output variables:

- 1 - level of deceleration duration 3 mc;
- 2 - an initial instant of act of deceleration (3 mc);
- 3 - a final instant of act of the set deceleration (3 mc).
- 4 - duration of the set level of deceleration;

Note

It is recommended to carry out calculation with an integration step no more than 0.0001 mc

The certificate OVP ACSCUM

SYS = 1, OUT = 4, PAR = 2, WRK = ***,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program of calculation of the approximated value of the function set in the form of the table "a time - value of function". APRF

The description:

Approach (approximation) is table a prescribed function is carried out with this program generally in two stages:

1. Local smoothing of function by polynomials P-th of extent for the purpose of compensation of random errors of measurements if the table is gained by practical consideration.
2. Interpolation by cubic splines of the smoothed values of function taking into account boundary conditions for initial and final points of the table. In the capacity of boundary conditions there can be a preset value first or a function flexon.

Type of indexes on interior variables transmitted in the program:

Are not required.

Parameters:

- 1 - extent of the polynomials used for preliminary local smoothing of table values ($P \leq 5$);
- 2 - amount of the points used for construction of smoothing polynomials (L);
- 3 - type of set boundary conditions for a table index point: (TYPE1);
= 1-> value of 1st derivative is set
= 2-> value of 2nd derivative is set
= Any another-> is accepted, that 2nd derivative is equal in a point 0;
- 4 - magnitude of a boundary value for a table index point (at TYPE1 = 1 or 2) (GU1);
- 5 - type of set boundary conditions for a table finite point (possible values - it is analogous TYPE1) (TYPE2);
- 6 - magnitude of a boundary value for a table finite point (at TYPE2 = 1 or 2) (GU2);
- 7 - an indication, whether to capture at smoothing the first and last points of the table, or the resultant function should pass precisely through initial extreme points, (FLAG)
Possible values:
=> 0 to capture smoothing extreme points,
<0 not to smooth extreme points;
- 8 - a scale factor on which will be multiply the values of function set in the table (SCALE);
- 9... $2 \cdot N + 8$ - the table of values of a function, contains N the points, everyone j-я a table point is defined by parameters:

$2 \cdot j$ - an instant (T_j),

$2 \cdot j + 1$ - value of function (F_j).

Output variables:

- 1 - the approximated value of function;
- 2 - 1st rate of change of a function;
- 3 - 2 rate of change of a function.

Remarks.

1. For any two next points of the table condition $T(j) < T(j+1)$ should be satisfied. For first point $T(1) > 0$.
2. 3 points of the table should be set at least.

3. If the current modelling time exceeds last instant set in the table or less first current value of function is accepted equal to null.
4. If preliminary smoothing is not required, it is necessary to set $P < 1$.
5. The maximum extent of a smoothing polynomial cannot exceed value $P_{\max} = \text{MAX}(5, N-1)$.
If it is set $P > P_{\max}$ the program by default accepts $P = P_{\max}$
6. Smoothing polynomials are under construction on L points a method of least squares. If it is set $P > 0$, a $L < P+1$ the program by default accepts $L = P+1$.
7. If the program for any reasons did not manage to approximate function in the capacity of an error flag in output variables number 9.9999 E19 will contain.

The certificate OVP APRE

SYS = 0, OUT = 3, PAR = 14, WRK = 70,
VPS = 0, VPR = 21, WRS = 0, WRP = 3

**The calculation program of scaled values of the set variable
(migration, a velocity, acceleration, force, a component of a
working vector of model of an element). BUKA**

Type of indexes on interior variables transmitted in the program:

1 - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 - the transmitted interior variable increased by a scale.

The certificate OVP BUKA

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of direction cosines of axes of the local basis linked with an angular degree of freedom of the space point. COS3E

Type of indexes on interior variables transmitted in the program:

1 - the index on the first element of a working vector of model SPCW3D - the sensing transducer connected to a degree of freedom of the observed space point.

Parameters:

1, 2, 3 - co-ordinates of the origin of the center of local basis (point A) on X-axes, Y, Z;
4, 5, 6 - co-ordinates of the origin of the auxiliary point B defining (together with point A) an initial rule of a Z-axis ' local basis;
7, 8, 9 - co-ordinates of the origin of the auxiliary point C defining (together with points A and B) a plane of an initial disposition of a X-axis ' local basis.

Output variables:

1, 2, 3 - current values of direction cosines local X-axes ';
4, 5, 6 - current values of direction cosines local Y-axes ';
7, 8, 9 - current values of direction cosines local Z-axes '.

Remarks:

1. For program operation presence in structure of installation of element SPCW3D linked with a degree of freedom of point A is required.
2. If points A, B, and C lay on one straight line, the initial rule of local basis is defined by default.

The certificate OVP COS3E

SYS = 1, OUT = 9, PAR = 9, WRK = 6,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of a variance of migrations since that moment when the absolute value of a controllable variable (the contact indicator) becomes more or equal to the set threshold value. **DEFORM**

Type of indexes on interior variables transmitted in the program:

1, 2 - indexes on migrations of 1st and 2nd skew fields;
3 - the index on the contact indicator.

Parameters:

1 - threshold value of the indicator of contact at which reaching there will be begun strain reference (≥ 0).

Output variables:

1 - the magnitude, which value to a variance between migrations of the first and second skew fields, attained from an instant when the indicator of contact has attained the set threshold value.

The certificate OVP DEFORM

SYS = 3, OUT = 1, PAR = 1, WRK = 3,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of a modification of distance between two points, moving in a plane or space. DELR

Type of indexes on interior variables transmitted in the program:

1,2 (or 1,2,3) - numbers of a degree of freedom of the first point on X, Y (or on X, Y, Z);
3,4 (or 4,5,6) - numbers of a degree of freedom of the second point on X, Y (or on X, Y, Z).

Parameters:

1,2 (or 1,2,3) - co-ordinates of the origin of the first point on X, Y (or on X, Y, Z);
3,4 (or 4,5,6) - co-ordinates of the origin of the second point on X, Y (or on X, Y, Z).
5 (or 7) - a scale.

Output variables:

1 - magnitude of a modification of distance between the first and second points, increased by a scale.

Remarks:

1. Without brackets the order of the job of input values for a case of flat driving of points, in brackets - for a case of the space driving is resulted.
2. At a positive scale magnification of initial distance between points matches to a modification of distance with (+ sign, a diminution - to a modification of distance with the sign (-).

The certificate OVP DELR

SYS = 4, OUT = 1, PAR = 5, WRK = 1,
VPS = 21, VPR = 11, WRS = 0, WRP = 0

The program of calculation of an angle between two flat vectors, each of which is set by two points. DFIA

Type of indexes on interior variables transmitted in the program:

Numbers of a degree of freedom of a translation on X-axes, Y:

- 1, 2 - an index point of 1st vector (point A);
- 3, 4 - a finite point of 1st vector (point B);
- 5, 6 - an index point of 2nd vector (point C);
- 7, 8 - a finite point of 2nd vector (point D).

Parameters:

- 1, 2 - co-ordinates of the origin of point A on X-axes, Y;
- 3, 4 - co-ordinates of the origin of point B on X-axes, Y;
- 5, 6 - co-ordinates of the origin of point C on X-axes, Y;
- 7, 8 - co-ordinates of the origin of point D on X-axes, Y;
- 9 - a scale.

Output variables:

1 - magnitude of an angle between first and second vectors (in grades), increased by a scale.

Remarks:

1. Value of an angle does not depend on an order of the job of vectors; the range of possible values of an angle (without a scale) is restricted by an interval 0... 180 grad.
2. If the second vector is motionless (for example, characterises a direction of one of co-ordinate axes), numbers of its degree of freedom (with 5th under 8th indexes in the list on transmitted interior variables) can to be set. Thus and D, defining a vector direction, it is necessary to set co-ordinates of points C in any case.
3. If in the course of calculation the distance between points A, B or C, D becomes equal to null, i.e. angular orientation of one of vectors to define it will be impossible, in the capacity of an error flag in an output variable number 9.9999 E19 will contain.

The certificate OVP DFIA

SYS = 4, OUT = 1, PAR = 9, WRK = 0,
VPS = 21, VPR = 0, WRS = 0, WRP = 0

The program of calculation of an angle between two space vectors, each of which is set by two points. DFIB

Type of indexes on interior variables transmitted in the program:

Numbers of a degree of freedom of a translation on X-axes, Y, Z:

- 1, 2, 3 - an index point of 1st vector (point A);
- 4, 5, 6 - a finite point of 1st vector (point B);
- 7, 8, 9 - an index point of 2nd vector (point C);
- 10,11,12 - a finite point of 2nd vector (point D).

Parameters:

- 1, 2, 3 - co-ordinates of the origin of point A on X-axes, Y, Z;
- 4, 5, 6 - co-ordinates of the origin of point B on X-axes, Y, Z;
- 7, 8, 9 - co-ordinates of the origin of point C on X-axes, Y, Z;
- 10,11,12 - co-ordinates of the origin of point D on X-axes, Y, Z;
- 13 - a scale.

Output variables:

1 - magnitude of an angle between first and second vectors (in grades), increased by a scale.

Remarks:

1. Value of an angle does not depend on an order of the job of vectors; the range of possible values of an angle (without a scale) is restricted by an interval 0... 180 grad.

2. If the second vector is motionless (for example, characterises a direction of one of co-ordinate axes), numbers of its degree of freedom (with 7th under 12th indexes in the list on transmitted interior variables) can to be set.

Thus and D, defining a vector direction, it is necessary to set co-ordinates of points C in any case.

3. If in the course of calculation the distance between points A, B or C, D becomes equal to null, i.e. angular orientation of one of vectors to define it will be impossible, in the capacity of an error flag in an output variable number 9.9999 E19 will contain.

The certificate OVP DFIB

SYS = 6, OUT = 1, PAR = 13, WRK = 0,
VPS = 21, VPR = 0, WRS = 0, WRP = 0

The program of calculation of the energy gained by N-nodal element DIS

Type of indexes on interior variables transmitted in the program:

- 1 - node number to which 1st branch of an element is connected;
- 2 - the index on force which acts on 1st branch of an element;
- ...
- 2*j-1 - node number to which it is connected j-я an element branch;
- 2*j - the index on force which acts on j-й element branches, (j = 2, N).

Parameters:

- 1 - a scale.

Output variables:

- 1 - the magnitude of the energy gained by an element increased by a scale.

The certificate OVP DIS

SYS = 2, OUT = 1, PAR = 1, WRK = 3,
VPS = 21, VPR = 0, WRS = 0, WRP = 0

The program of calculation of magnitude of a ratio of two interior variables. DOLYA

Type of indexes on interior variables transmitted in the program:

- 1 - on 1st interior variable, which share about the second variable it is necessary to compute the index (fraction numerator);
- 2 - the index on 2nd interior variable (common denominator).

Parameters:

- 1 - a scale.

Output variables:

- 1 - current value of otnoshenija1 th variable to 2nd, increased by a scale;
- 2 - an instant in which the ratio of 1st variable to 2nd had the maximum value.

Remarks:

- 1. If current value of 2nd variable becomes equal 0 value of a ratio is accepted equal 0.

The certificate OVP DOLYA

SYS = 2, OUT = 2, PAR = 1, WRK = 1,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The calculation program смасштабированного values of a difference of velocities of two nodes. DV

Type of indexes on interior variables transmitted in the program:

1, 2 - numbers of the nodes which difference of velocities is required to be computed.

Parameters:

1 - a scale.

Output variables:

1 - a difference of velocities between first and second the nodes, increased by a scale.

The certificate OVP DV

SYS = 2, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The calculation program смасштабированного values of a difference of two set variables. DX

Type of indexes on interior variables transmitted in the program:

1,2 - indexes on any two interior variables (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 - a difference between the first and second interior variables, increased by a scale.

The certificate OVP DX

SYS = 2, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of an angle of rotation of the flat vector, set by two points. FIA

Type of indexes on interior variables transmitted in the program:

1,2 - numbers of a degree of freedom of the first point of a vector on X-axes, Y;
3,4 - numbers of a degree of freedom of the second point of a vector on X-axes, Y.

Parameters:

1,2 - co-ordinates of the origin of the first point of a vector on X-axes, Y;
3,4 - co-ordinates of the origin of the second point of a vector on X-axes, Y;
5 - a scale.

Output variables:

1 - magnitude of an angle of rotation of a vector (in grades), increased by a scale.

Remarks:

1. Value of an angle of rotation represents the full angular migration of a vector which are read off from its initial rule, i.e. the range of possible values of an angle is not restricted to an interval 0... 360 grad.

2. In case in the course of calculation the distance between the set points becomes equal to null, i.e. angular orientation of a vector to define it will be impossible, in the capacity of an error flag in an output variable number 9.9999 E19 will contain.

The certificate OVP FIA

SYS = 4, OUT = 1, PAR = 5, WRK = 3,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The filter of low frequency meeting demands ISO 6487 (j211). **FILTR**

AREA OF APPLICATION: Mechanics.

Type of indexes on interior variables transmitted in the program:

1 - the index on an interior variable which is necessary for filtrating;

Parameters:

1 - a filter resonance frequency, Hz ($f_h > 0$);

2 - pass band boundary line, Hz ($f_n > f_h$);

3 - a scale factor.

Output variables:

1 - the filtered off interior variable increased by a scale factor.

Note

Standard, defined by demands to trials on safety filters:

The frequency class-room of the filter (CFR) f_h f_n

60 60 100

180 180 300

600 600 1000

1000 1000 1800

The certificate OVP FILTR

SYS = 1, OUT = 1, PAR = 3, WRK = 12,

VPS = 0, VPR = 0, WRS = 0, WRP = 0

The filter of low frequency meeting demands ISO (the explicit circuit design is realised). **FILTRY**

AREA OF APPLICATION: Mechanics.

Type of indexes on interior variables transmitted in the program:

1 - the index on an interior variable which is necessary for filtrating;

Parameters:

- 1 - an accelerometer resonance frequency, Hz ($f_h > 0$);
- 2 - pass band boundary line, Hz ($f_n > f_h$);
- 3 - an initial velocity of the accelerometer;
- 4 - a scale factor.

Output variables:

1 - the filtered off interior variable increased by a scale factor.

The certificate OVP FILTRY

SYS = 1, OUT = 1, PAR = 4, WRK = 9,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of criterion HIC injury heads. **HIC**

Type of indexes on interior variables transmitted in the program:

Machining from 1 to 3 indexes on making accelerations on axes of co-ordinates is possible. Criterion HIC is reconed for результирующего accelerations.

Parameters:

- 1 - duration (in milliseconds) an interval of scaling HIG (usually = 36, limitation > 0.1);
- 2 - a scale for conversion of accelerations in units G:
 - = 1, if dimensions of a quantity of transmitted accelerations G;
 - = 0.102, if dimensions of a quantity of transmitted accelerations of m / (сек²)

Output variables:

- 1 - the magnitude of current value HIC computed of on the interval set duration, a time previous a present situation;
- 2 - an initial instant for an interval maximum HIC;
- 3 - a final instant for an interval maximum HIC.

The certificate OVP HIC

SYS = 1, OUT = 3, PAR = 2, WRK = 366,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program of calculation of criterion HIC injury heads with sampling maximum from values of on the interval set duration. HICMAX

Type of indexes on interior variables transmitted in the program:

Machining from 1 to 3 indexes on making accelerations on axes of co-ordinates is possible.
Criterion HIC is reconed for результирующего accelerations.

Parameters:

1 - the greatest duration (in milliseconds) an interval of scaling of maximum value HIG
(limitation > 0.1);

2 - a scale for conversion of accelerations in units G:

= 1, if dimensions of a quantity of transmitted accelerations G;

= 0.102, if dimensions of a quantity of transmitted accelerations of m / (сек²)

Output variables:

1 - magnitude of current maximum value HIC for an interval previous a present situation
of a time;

2 - an initial instant for an interval maximum HIC;

3 - a final instant for an interval maximum HIC.

The certificate OVP HICMAX

SYS = 1, OUT = 3, PAR = 2, WRK = ***,

VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program of calculation of a definite integral from one interior variable on other interior variable on a set interval of integration on a time. INTGRL

Type of indexes on interior variables transmitted in the program:

- 1 - the index on an interior variable which is necessary for integrating;
- 2 - the index on an interior variable which serves an integration explanatory variable. If this index is not set, in the capacity of the explanatory variable uses a time.

Parameters:

- 1 - an initial time of integration;
- 2 - a final time of integration;
- 3 - a scale factor;
- 4 - an integration constant.

Output variables:

- 1 - the definite integral computed on the set interval of time, increased by a scale factor and combined with the set integration constant.

The certificate OVP INTGRL

SYS = 1, OUT = 1, PAR = 4, WRK = 3,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The calculation program middle integral values of the set interior variable on other interior variable on a set interval of integration on a time. INTSR

Type of indexes on interior variables transmitted in the program:

- 1 - the index on an interior variable which is necessary for integrating;
- 2 - the index on an interior variable which serves an integration explanatory variable. If this index is not set, in the capacity of the explanatory variable uses a time.

Parameters:

- 1 - a scale factor;
- 2 - an integration constant.

Output variables:

- 1 - the definite integral computed on a rated slice of time, increased by the scale factor referred to variable of integration and combined from the set integration constant.

The certificate OVP INTSR

SYS = 1, OUT = 1, PAR = 2, WRK = 3,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program allows to emulate direction key pressure through the set slice of times. KEY

Type of indexes on interior variables transmitted in the program:

Are not required.

Parameters:

- 1 - a period through which it is required to make emulation of pressure of a key;
- 2 - the key code, which pressure is emulated.

Admissible codes:

- 1 - <F1> 5 - <Alt-R>
- 2 - <F2> 6 - <Alt-C>
- 3 - <F3> 7 - <PageUp>
- 4 - <ENTER> 8 - <PageDown>

Output variables:

No.

Note

The program emulates pressure of the specified key in an initial instant and further reproduces this pressure through the specified periods.

The certificate OVP KEY

SYS = 0, OUT = 0, PAR = 2, WRK = 1,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of running co-ordinates of a point, moving in a plane. KOORD2

Type of indexes on interior variables transmitted in the program:

1,2 - numbers of a degree of freedom of a translation of a point on X-axes, Y.

Parameters:

1,2 - point co-ordinates of the origin on X-axes, Y.

Output variables:

1,2 - point running co-ordinates on X-axes, Y.

The certificate OVP KOORD2

SYS = 2, OUT = 2, PAR = 2, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of running co-ordinates of the space point. KOORD3

Type of indexes on interior variables transmitted in the program:

1,2,3 - numbers of a degree of freedom of a translation of a point on X-axes, Y, Z.

Parameters:

1,2,3 - point co-ordinates of the origin on X-axes, Y, Z.

Output variables:

1,2,3 - point running co-ordinates on X-axes, Y, Z.

The certificate OVP KOORD3

SYS = 3, OUT = 3, PAR = 3, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of linear combination N of interior variables. LKOMBI

Type of indexes on interior variables transmitted in the program:

1..., N - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1..., N - a multiplier at a matching interior variable.

Output variables:

1 - value of a linear combination of the transmitted interior variables (the sum of products of each of variables on a matching multiplier).

Remarks:

For this program the amount of parametres should be equal to amount of transmitted interior variables.

The certificate OVP LKOMBI

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 1, VPR = 1, WRS = 0, WRP = 0

The program of calculation of current maximum value from absolute values N of interior variables. **MAXA**

Type of indexes on interior variables transmitted in the program:

1..., N - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 - current maximum value from absolute values of the transmitted interior variables, increased by a scale;

2 - a serial number of an interior variable, a current which absolute value it is maximum.

Remarks:

1. The absolute value is fathomed as value of a variable modulo. At definition of the maximum value the variable sign is not considered.

2. The serial number of an interior variable is fathomed as variable number under the score in the list of interior variables transmitted in the program.

The certificate OVP MAXA

SYS = 1, OUT = 2, PAR = 1, WRK = 0,

VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program of calculation of current maximum value from algebraic values N of interior variables. **MAXI**

Type of indexes on interior variables transmitted in the program:

1..., N - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 – the current maximum value of the transmitted interior variables increased by a scale;
2 – a serial number of an interior variable, current which algebraic value it is maximum.

Remarks:

1. Algebraic value is fathomed as value of a variable with the sign. At definition of the maximum value the variable sign is considered.

2. The serial number of an interior variable is fathomed as variable number under the score in the list of interior variables transmitted in the program.

The certificate OVP MAXI

SYS = 1, OUT = 2, PAR = 1, WRK = 0,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program of calculation of current minimum value from absolute values N of interior variables. MINA

Type of indexes on interior variables transmitted in the program:

1..., N - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 - current minimum value from absolute values of the transmitted interior variables, increased by a scale;

2 - a serial number of an interior variable, a current which absolute value it is minimum.

Remarks:

1. The absolute value is fathomed as value of a variable modulo. At definition of minimum value the variable sign is not considered.

2. The serial number of an interior variable is fathomed as variable number under the score in the list of interior variables transmitted in the program.

The certificate OVP MINA

SYS = 1, OUT = 2, PAR = 1, WRK = 0,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program of calculation of current minimum value from algebraic values N of interior variables. **MINI**

Type of indexes on interior variables transmitted in the program:

1..., N - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 - the current minimum value of the transmitted interior variables increased by a scale;
2 - a serial number of an interior variable, current which algebraic value it is minimum.

Remarks:

1. Algebraic value is fathomed as value of a variable with the sign. At definition of minimum value the variable sign is considered.

2. The serial number of an interior variable is fathomed as variable number under the score in the list of interior variables transmitted in the program.

The certificate OVP MINI

SYS = 1, OUT = 2, PAR = 1, WRK = 0,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The calculation program scaled values of power of force affecting. N

Type of indexes on interior variables transmitted in the program:

- 1 - node number to which force affecting is affixed;
- 2 - the index on the force (moment), which power of affecting on the specified node is required to be computed.

Parameters:

- 1 - a scale.

Output variables:

- 1 - power of force affecting (force product on a velocity), increased by a scale.

The certificate OVP N

SYS = 2, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of magnitude of displacement of a tooth contact of a sprocket of the car on co-ordinates of three points laying in a plane of a sprocket. PATNO

Type of indexes on interior variables transmitted in the program:

Numbers of a degree of freedom of a translation on X-axes, Y, Z three points laying in a plane of a sprocket:

- 1,2,3 - for the first point - the sprocket centre;
- 4,5,6 - for the second point;
- 7,8,9 - for the third point.

Parameters:

1... 9 - co-ordinates of the origin on X-axes, Y, Z three points which numbers of a degree of freedom are transmitted in the program:

- 1,2,3 - for the first point (the sprocket centre);
- 4,5,6 - for the second point;
- 7,8,9 - for the third point;
- 10 - sprocket radius;
- 11 - a scale of a leading-out of output variables.

Output variables:

- 1... 3 - tooth contact displacement on X-axes, Y, Z.

Remarks:

1. The sprocket plane of support considers plane XY, an axis of yaw - a Z-axis.
2. The order of the job of points (sense of rotation) should be such that the normal to a sprocket plane looked in the car. The positive direction of a normal is that, that from an extreme point of a vector of a normal turn from the first point to the second is looked by turn counter-clockwise.
3. It is considered, that value of angles of disorder and a sprocket convergence do not get out for a range from -90 to 90 grades.
4. In case in the course of calculation three set points will appear on one straight line, i.e. a plane of their disposition to define it will be impossible, in the capacity of an error flag in output variables number 9.9999 E19 will contain.

The certificate OVP PATNO

SYS = 9, OUT = 3, PAR = 11, WRK = 3,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of a projection of a flat vector on the loose axle. **PROXL**

The description:

The program is intended for calculation of a projection of some flat vector set by the components on global X-axes and Y, on a X-axis ' mobile local axes (LCS). In the capacity of a vector force, migration, a velocity, acceleration or other vector variable can appear.

The angular rule of a X-axis ' is defined by a current rule of two flat points A, B for which numbers of a degree of freedom of their translations are set both co-ordinates of the origin, and. The current direction of a X-axis ' is computed as a direction of axis AB plus the set fixed angular displacement of a X-axis ' concerning axis AB (in particular if this angle is set equal to null the X-axis ' coincides with a direction of axis AB).

Type of indexes on interior variables transmitted in the program:

- 1,2 - indexes on components of an initial vector on X-axes, Y global axes;
- 3,4 - numbers of a degree of freedom of a translation of point A on X-axes, Y;
- 5,6 - numbers of a degree of freedom of a translation of point B on X-axes, Y.

Parameters:

- 1,2 - co-ordinates of the origin of point A on X-axes, Y;
- 3,4 - co-ordinates of the origin of point B on X-axes, Y;
- 5 - magnitude of an angle (in grades) between a X-axis ' local axes and a direction of axis AB.

Output variables:

- 1 - current value of a projection of a vector on the set axis.

Remarks:

1. If in the course of calculation the distance between points A and B becomes equal to null, i.e. current angular orientation of axis AB to define it will be impossible, in the capacity of an error flag in an output variable number 9.9999 E19 will contain.

The certificate OVP PROXL

SYS = 6, OUT = 1, PAR = 5, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The calculation program scaled values of the set variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element) and its printings in a file with set number. PRTABL

Type of indexes on interior variables transmitted in the program:

- 1 - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element);
- 2 - file number.

Parameters:

- 1 - a scale.

Output variables:

- 1 - the transmitted interior variable increased by a scale.

The certificate OVP PRTABL

SYS = 1, OUT = 1, PAR = 2, WRK = 1,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of an angle of disorder of a sprocket of the car on co-ordinates of three points laying in a plane of a sprocket. RAZVAL

Type of indexes on interior variables transmitted in the program:

Numbers of a degree of freedom of a translation on X-axes, Y, Z three points laying in a plane of a sprocket:

- 1,2,3 – for the first point;
- 4,5,6 – for the second point;
- 7,8,9 – for the third point.

Parameters:

Co-ordinates of the origin on X-axes, Y, Z three points which numbers of a degree of freedom are transmitted in the program:

- 1,2,3 – for the first point;
- 4,5,6 – for the second point;
- 7,8,9 – for the third point.

Output variables:

- 1 - an angle of disorder of the sprocket, expressed in radians;
- 2 - an angle of disorder of the sprocket, expressed in grades;
- 3 - an angle of disorder of the sprocket, expressed in minutes.

Remarks:

1. The sprocket plane of support considers plane XY, an axis of yaw - a Z-axis.
2. The order of the job of points (sense of rotation) should be such that the normal to a sprocket plane looked in the car. The positive direction of a normal is that, that from an extreme point of a vector of a normal turn from the first point to the second is looked by turn counter-clockwise.
3. Values of an angle of disorder are inferred over the range from -90 to 90 grades.
4. In case in the course of calculation three set points will appear on one straight line, i.e. a plane of their disposition to define it will be impossible, in the capacity of an error flag in output variables will contain number 9.9999 E19.

The certificate OVP RAZVAL

SYS =9, OUT =3, PAR =9, WRK =0,
VPS =0, VPR =0, WRS =0, WRP =0

The program of calculation of an absolute value of a vector variable (migration, a velocity, acceleration, force). ROUT

Type of indexes on interior variables transmitted in the program:

1..., N - indexes on components of the vector variable, which absolute value are required to be computed.

Parameters:

1 - a scale.

Output variables:

1 - a square root from the sum of squares of the transmitted values a component of a vector increased by a scale.

The certificate OVP ROUT

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program of calculation of equivalent value of a vector variable.

ROUTC

Type of interior variables transmitted in the program:

1... N - components of a vector variable (r1, r2..., rN) which equivalent value is required to count.

Fixed parameters:

1... N - factors at matching components of a vector variable (c1, c2..., cN).

Output variables:

1 - the equivalent value computed by formula:

$R_{\text{э}} = \sqrt{c_1 * c_1 * r_1 * r_1 + \dots + c_N * c_N * r_N * r_N}$.

The certificate OVP ROUTC

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 1, VPR = 1, WRS = 0, WRP = 0

The calculation program scaled values of migration of a node. S

Type of indexes on interior variables transmitted in the program:

1 - the node number, which migration is required to be computed.

Parameters:

1 - a scale.

Output variables:

1 - the migration of the specified node increased by a scale.

The certificate OVP S

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of magnitude of the maximum direct stresses from curving and extension-compression in the chosen cross-section flat балочного an element. SGMBLK

Type of indexes on interior variables transmitted in the program:

- 1 - the index on a bending moment in the set cross-section балочного an element;
- 2 - the index on the longitudinal force operating on an axis балочного of an element.

Parameters:

- 1 - a cross-section moment of resistance at curving (≥ 0);
- 2 - cross-sectional area (≥ 0);
- 3 - a scale.

Output variables:

- 1 - an absolute value of the maximum direct stress in cross-section балочного an element, increased by a scale.

Remarks:

If in program parameters the zero moment of resistance to curving or zero cross-sectional area is set, matching voltage (from curving or from extension-compression) will be accepted equal to null.

The certificate OVP SGMBLK

SYS = 2, OUT = 1, PAR = 3, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of intensity of voltage (equivalent voltage von Mises) for a case when each of six components of tensor of voltage is considered linearly 3 points depending on migrations.
SGMI3T

The description:

The program is join of program SPA3L computing migration of a point concerning local axes, and program SGMILV computing intensity of voltage depending on these migrations.

Labels of points (A, B, C, P) are illustrated in the description of program SPA3L. The sequence of the job of factors for calculation of components of tensor of voltage is resulted in the description of program SGMILV.

Type of indexes on interior variables transmitted in the program:

1 - the index on the first element of a working vector of model SPCW3D - the sensing transducer connected to a degree of freedom of point A;

2 - the index on the first element of a working vector of model SPCW3D - the sensing transducer connected to a degree of freedom of point E.

Parameters:

1, 2, 3 - co-ordinates of the origin of the center of local basis (point A) on X-axes, Y, Z;

4, 5, 6 - co-ordinates of the origin of the auxiliary point B defining (together with point A) an initial rule of a Z-axis ' local basis;

7, 8, 9 - co-ordinates of the origin of the auxiliary point C defining (together with points A and B) a plane of an initial disposition of a X-axis ' local basis;

10,11,12 co-ordinates of the origin of point E;

13,14,15 co-ordinates of the origin of point P1;

16,17,18 co-ordinates of the origin of point P2;

19,20,21 co-ordinates of the origin of point P3;

22., 75 factors of linear dependences of components of tensor of voltage from migrations of 3 points;

76 scale;

Output variables:

1 - the equivalent voltage computed by formula of Mises, and increased by a scale.

The certificate OVP SGMI3T

SYS = 2, OUT = 1, PAR = 76, WRK = 18,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of intensity of voltage (equivalent voltage on Mises) for a case when each of six components of tensor of voltage linearly depends on transmitted interior variables.
SGMILV

The description:

Each of six components of tensor of voltage is considered linearly depending from interior variables transmitted in the program, i.e.:

$$\text{SIGM}(1) = k(1,1) * R(1) + k(1,2) * R(2) + \dots + k(1,N) * R(N),$$

$$\text{SIGM}(2) = k(2,1) * R(1) + k(2,2) * R(2) + \dots + k(2,N) * R(N),$$

...

$$\text{SIGM}(6) = k(6,1) * R(1) + k(6,2) * R(2) + \dots + k(6,N) * R(N),$$

Where N - amount of interior variables transmitted in the program,

R(j) - current value j-th a variable,

k(i,j) - factor at j-th a variable for calculation i-th components of tensor of voltage,

SIGM(1)... SIGM(6) - components of tensor of voltage in the following (!) sequence (at first - normal, then - tangents): Sxx, Syy, Szz, Sxy, Syz, Sxz.

Type of indexes on interior variables transmitted in the program:

1..., N - indexes on variables (migrations, force) on which each of components of tensor of voltage linearly depends.

Parameters:

1..., N*6 - factors of linear dependences which should be enumerated in the following (!) sequence ("on columns"):

$$k(1,1), k(2,1), k(3,1), k(4,1), k(5,1), k(6,1),$$

$$k(1,2), k(2,2), k(3,2), k(4,2), k(5,2), k(6,2),$$

...

$$k(1,N), k(2,N), k(3,N), k(4,N), k(5,N), k(6,N).$$

Output variables:

1 - intensity of voltage (equivalent voltage on Mises).

The certificate OVP SGMILV

$$\text{SYS} = 1, \text{OUT} = 1, \text{PAR} = 6, \text{WRK} = 0,$$

$$\text{VPS} = 1, \text{VPR} = 21, \text{WRS} = 0, \text{WRP} = 0$$

The program of calculation of an angle of a convergence of a sprocket of the car on co-ordinates of three points laying in a plane of a sprocket. SHOD

Type of indexes on interior variables transmitted in the program:

Numbers of a degree of freedom of a translation on X-axes, Y, Z three points laying in a plane of a sprocket:

- 1,2,3 - for the first point;
- 4,5,6 - for the second point;
- 7,8,9 - for the third point.

Parameters:

Co-ordinates of the origin on X-axes, Y, Z three points which numbers of a degree of freedom are transmitted in the program:

- 1,2,3 - for the first point;
- 4,5,6 - for the second point;
- 7,8,9 - for the third point.

Output variables:

- 1 - an angle of a convergence of the sprocket, expressed in radians;
- 2 - an angle of a convergence of the sprocket, expressed in grades;
- 3 - an angle of a convergence of the sprocket, expressed in minutes.

Remarks:

1. The sprocket plane of support considers plane XY, an axis of yaw - a Z-axis.
2. The order of the job of points (sense of rotation) should be such that the normal to a sprocket plane looked in the car. The positive direction of a normal is that, that from an extreme point of a vector of a normal turn from the first point to the second is looked by turn counter-clockwise.
3. Values of an angle of a convergence are inferred over the range from -90 to 90 grades.
4. In case in the course of calculation three set points will appear on one straight line, i.e. a plane of their disposition to define it will be impossible, in the capacity of an error flag in output variables number 9.9999 E19 will contain.
5. In case in the course of calculation the projection of a normal to a sprocket plane to a plane of support will appear equal to null (except a case under item 4) the convergence angle is accepted equal to null.

The certificate OVP SHOD

SYS = 9, OUT = 3, PAR = 9, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The calculation program scaled values of the set variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element), increased by the sign of other interior variable. SIGN

Type of indexes on interior variables transmitted in the program:

1 - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element), scaled which value is reconed.

2 - the index on the interior variable, which sign is considered at count of an output variable.

Parameters:

1 - a scale.

Output variables:

1 - the transmitted interior variable increased by a scale and 1 or -1 depending on the sign of the second variable.

The certificate OVP SIGN

SYS = 2, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of migration of the space point P concerning the mobile axes linked with point A. SPA3L

The description:

The mobile local axes are considered linked with point A. Point P, current which migration concerning this LCS is required to discover, is rigidly linked in turn with some point E having 6 degree of freedom of the space migration (point P of the degree of freedom has no, except a case when it coincides with point E). For definition of the initial rule LCS, linked with point A, co-ordinates of two auxiliary points - B (defines an initial rule of a local Z-axis ') and C (defines a plane of an initial disposition of a X-axis ' local basis) are set.

Type of indexes on interior variables transmitted in the program:

- 1 - the first element of a working vector of model SPCW3D - the sensing transducer connected to a degree of freedom of point A;
- 2 - the first element of a working vector of model SPCW3D - the sensing transducer connected to a degree of freedom of point E.

Parameters:

- 1, 2, 3 - co-ordinates of the origin of the center of local basis (point A) on X-axes, Y, Z;
- 4, 5, 6 - co-ordinates of the origin of the auxiliary point B defining (together with point A) an initial rule of a Z-axis ' local basis;
- 7, 8, 9 - co-ordinates of the origin of the auxiliary point C defining (together with points A and B) a plane of an initial disposition of a X-axis ' local basis;
- 10,11,12 co-ordinates of the origin of point E;
- 13,14,15 co-ordinates of the origin of point P.

Output variables:

- 1 - current migration of point P on a local X-axis ';
- 2 - current migration of point P on a local Y-axis ';
- 3 - current migration of point P on a local Z-axis '.

Remarks:

- 1. For program operation presence in structure of installation of two elements SPCW3D linked with a degree of freedom of points A and E is required.
- 2. If points A, B, and C lay on one straight line, the initial rule of local basis is defined by default.

The certificate OVP SPA3L

SYS = 2, OUT = 3, PAR = 15, WRK = 6,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of average arithmetical value from N interior variables. SRA

Type of indexes on interior variables transmitted in the program:

1..., N - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 - the average arithmetical value of the transmitted interior variables increased by a scale.

The certificate OVP SRA

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

Statistics output routine: amount of iterations on a current integration step. STATNI

Type of indexes on interior variables transmitted in the program:

Are not required.

Parameters:

Are not required.

Output variables:

1 - amount of successful iterations on leaking

The certificate OVP STATNI

SYS = 0, OUT = 1, PAR = 0, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

Statistics output routine: number of current integration step **STATNS**

Type of indexes on interior variables transmitted in the program:

Are not required.

Parameters:

Are not required.

Output variables:

1 - number of a current integration step.

The certificate OVP STATNS

SYS = 0, OUT = 1, PAR = 0, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

Statistics output routine: magnitude of the next integration step recommended by models of elements, or its decimal logarithm.
STATSM

Type of indexes on interior variables transmitted in the program:

Are not required.

Parameters:

1 - the number, which value can be:

- 1) it is nonzero, and then magnitude of a recommended integration step is inferred,
- 2) it is equal to null and then the decimal logarithm from magnitude of a recommended integration step is inferred.

Output variables:

1 - magnitude of the next integration step recommended by models of elements, or its decimal logarithm.

The certificate OVP STATSM

SYS = 0, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

Statistics output routine: magnitude of a current complete integration step or its decimal logarithm. STATST

Type of indexes on interior variables transmitted in the program:

Are not required.

Parameters:

1 - the number, which value can be:

- 1) it is nonzero, and then magnitude of an integration step is inferred,
- 2) it is equal to null and then the decimal logarithm from magnitude of an integration step is inferred.

Output variables:

1 - value of a current integration step or decimal logarithm from an integration step.

The certificate OVP STATST

SYS = 0, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of supply of a signal on a calculation stopping while an absolute value of an interior variable becomes more or equal the set limiting value. STOPA

Type of indexes on interior variables transmitted in the program:

1 - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element) which absolute value will be controlled.

Parameters:

1 - limiting value for a controllable variable at which reaching the signal on a calculation stopping (≥ 0) will be given.

Output variables:

1 - current value of a controllable variable.

The certificate OVP STOPA

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of supply of a signal on a calculation stopping at execution of a following condition: the absolute value of a controllable variable in the course of the growth recuts the first threshold value and, after the lapse of a slice of time not less set, is hauled down below the second threshold value. STOPC

Type of indexes on interior variables transmitted in the program:

1 - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element) which absolute value will be controlled.

Parameters:

1 - the first threshold value (≥ 0);
2 - the second threshold value (> 0);
3 - a slice of time between transiting of 1st threshold value and the beginning of the control over transiting of 2nd threshold value (≥ 0).

Output variables:

1 - current value of a controllable variable.

The certificate OVP STOPC

SYS = 1, OUT = 1, PAR = 3, WRK = 2,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The calculation program scaled values of sum N of interior variables.

SUM

Type of indexes on interior variables transmitted in the program:

1..., N - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 - the sum of the transmitted interior variables increased by a scale.

The certificate OVP SUM

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 1, VPR = 0, WRS = 0, WRP = 0

The program of calculation of criterion injury shins. **TIBIA**

Type of indexes on interior variables transmitted in the program:

- 1 - the moment round a X-axis
- 2 - the moment round a Y-axis
- 3 - force of compression of a shin

Parameters:

- 1 - critical value of the moment (225 Nanometers)
- 2 - critical value of force (35900)

Output variables:

- 1 - an index injury shins

The certificate OVP TIBIA

SYS = 3, OUT = 1, PAR = 2, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of the period which has passed from the beginning of calculation until when the absolute value of a controllable variable becomes more or equal the set threshold value. **TIMERA**

Type of indexes on interior variables transmitted in the program:

1 - the index on a variable, which absolute value will be controlled.

Parameters:

1 - threshold value for a controllable variable at which reaching time reference (≥ 0) will be completed.

Output variables:

1 - the magnitude, which value:

To equally period from the beginning of calculation to a time present situation if the absolute value of a controllable variable yet has not attained the set threshold value;

To equally period from the beginning of calculation till the moment of reaching of a controllable variable of the set threshold value if the last has already happened.

The certificate OVP TIMERA

SYS = 1, OUT = 1, PAR = 1, WRK = 2,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of the period which has passed since that moment when the absolute value of a controllable variable becomes more or equal the set threshold value. **TIMERB**

Type of indexes on interior variables transmitted in the program:

1 - the index on a variable, which absolute value will be controlled.

Parameters:

1 - threshold value for a controllable variable at which reaching there will be begun time reference (≥ 0).

Output variables:

1 - the period which has passed from the moment of reaching by a controllable variable of set threshold value.

The certificate OVP TIMERB

SYS = 1, OUT = 1, PAR = 1, WRK = 2,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of the period which has passed between the moments of fulfillment of two events: the absolute value of a controllable variable in the course of the growth recuts the first threshold value (the first event) and, after the lapse of a slice of time not less set, is hauled down below the second threshold value (the second event). **TIMER**

Type of indexes on interior variables transmitted in the program:

1 - the index on a variable, which absolute value will be controlled.

Parameters:

1 - the first threshold value after which reaching it is reckoned a time (≥ 0);

2 - the second threshold value (> 0);

3 - a slice of time between transiting of 1st threshold value and the beginning of the control over transiting of 2nd threshold value (≥ 0).

Output variables:

1 - the magnitude, which value:

a) it is equal to null if the first event has not happened yet;

To equally period which has passed since the moment свершения of the first event to a present situation of a time if the first event has already happened, and second - still is not present;

To equally period between the moments the first and second events if both events have happened.

Remarks:

The second event cannot be accomplished, if before it there was no first.

The certificate OVP **TIMER**

SYS = 1, OUT = 1, PAR = 3, WRK = 3,

VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of current magnitude of an angle between two vectors, moving in a plane. UGOL2D

Type of interior variables transmitted in the program:

- 1 - migration of point A on axis OX
- 2 - migration of point A on axis OY
- 3 - migration of point B on axis OX
- 4 - migration of point B on axis OY
- 5 - migration of point C on axis OX
- 6 - migration of point C on axis OY

Fixed parametres:

- 1 - an initial abscissa of point A
- 2 - initial ordinate of point A
- 3 - an initial abscissa of point B
- 4 - initial ordinate of point B
- 5 - an initial abscissa of point C
- 6 - initial ordinate of point C

Output variables:

- 1 - an angle between vectors AB and AC, expressed in radians
- 2 - an angle between vectors AB and AC, expressed in grades

Special situations:

If during scalings the length of one of vectors becomes equal 0, magnitude of an angle is accepted equal 0.

The certificate OVP UGOL2D

SYS = 6, OUT = 2, PAR = 6, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The calculation program scaled values of a velocity of a node. V

Type of indexes on interior variables transmitted in the program:

1 - the node number, which velocity is required to be computed.

Parameters:

1 - a scale.

Output variables:

1 - the velocity of the specified node increased by a scale.

The certificate an OVP V

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The calculation program scaled values of operation of force (moment) on migration of the specified node. W

Type of indexes on interior variables transmitted in the program:

- 1 - node number to which force affecting is affixed;
- 2 - the index on the force (moment), which operation on migration of the specified node is required to be computed.

Parameters:

- 1 - a scale.

Output variables:

- 1 - the operation of force affecting increased by a scale.

The certificate OVP W

SYS = 2, OUT = 1, PAR = 1, WRK = 3,
VPS = 0, VPR = 0, WRS = 0, WRP = 0

The program of calculation of a summarised kinetic energy. **WKIN**

Type of indexes on interior variables transmitted in the program:

1..., N - indexes on velocities of the nodes, which kinetic energies need to be summed up.

Parameters:

1..., N - time lag of a matching node (mass, a moment of inertia).

Output variables:

1 - a summarised kinetic energy.

The certificate OVP WKIN

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 1, VPR = 1, WRS = 0, WRP = 0

The program of calculation from the scaled value of the set variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element). X

Type of indexes on interior variables transmitted in the program:

1 - the index on any interior variable (migration, a velocity, acceleration, force, a component of a working vector of model of an element).

Parameters:

1 - a scale.

Output variables:

1 - the transmitted interior variable increased by a scale.

The certificate an OVP X

SYS = 1, OUT = 1, PAR = 1, WRK = 0,
VPS = 0, VPR = 0, WRS = 0, WRP = 0