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APPLICATION THE BASIC CONCEPTS AND LAWS OF METHAMATICS IN THE FIELD OF MODERN TECHNOLOGY

N.N. Xudoyberdiyev, N.R. Tolipova

Abstract . *This article we will discuss the mathematical formula and basic terms specific to engineering practitioners. Mathematics can solve a given problem quickly and easily in the form of a definition, even if it is used as an integral or matrix. In this article, it can be tried to apply the advanced portion of the mathematics matrix to the generation of electricity, i.e.by adding various additions and notes to the given circuit diagram, we can identify the current matrix.Several physical bodies, such as conical cushioning objects, were used to calculate the kinetic energy produced by rotating axes and to provide precise integrative methods for determining fluid distribution in power plant construction.When addressing various parts of mathematics, such as mechanics, physics and engineering, integrative calculus is called continuously of mathematics. The reasons for integrating the integrated kangi into practice are, first, the opposite of integral differentiation, and second, integral cohesion coefficient and threshold.This article mainly illustrates the ways in which problems can be solved in a very comprehensive way.*

Keywords : *integral, limit, differential equation, circuit, power plant*

The construction of case equations in the form of a matrix in the electrical system

Make the following equations for the matrix representation of the following power supply systems (Figure 1).

To solve the problem: 1. Based on the given condition, we form the case equation of the power supply matrix in the following order: first of all, we draw up the principle scheme of the power supply system.

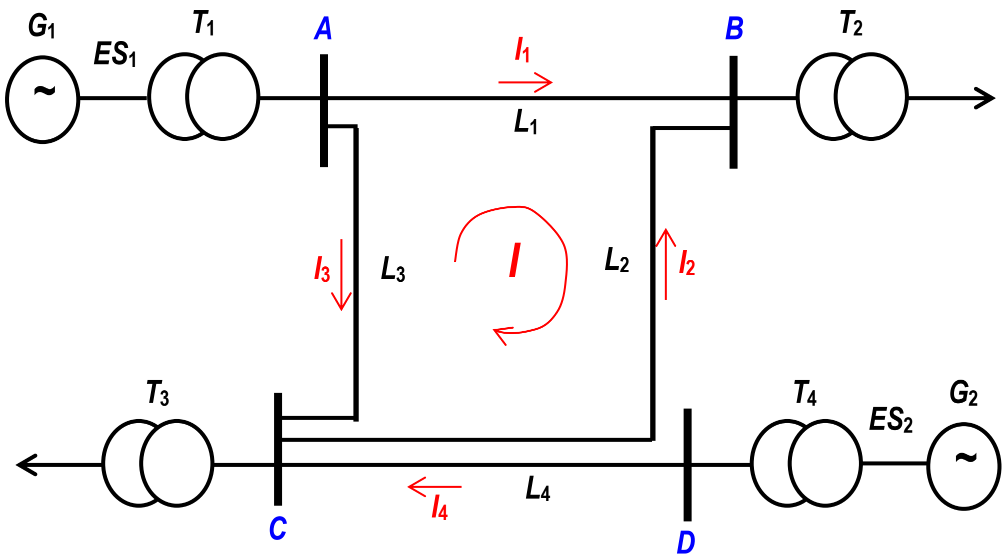

Figure 1. Fundamental scheme of power supply systems.

Based on the power supply scheme shown in Figure 1:

$ЭS_1$, $ЭS_2$ – Power Stations 1 and 2;

G_1, G_2– Generators of Power Stations 1 and 2;

T_1, T_4– Transformer substations of power plants 1 and 2;

T_2, T_3–reducing transformer substations;

L_1, L_2, L_3, L_4–transmission lines.

2. We will make a replacement scheme of the power supply system (Figure 2).

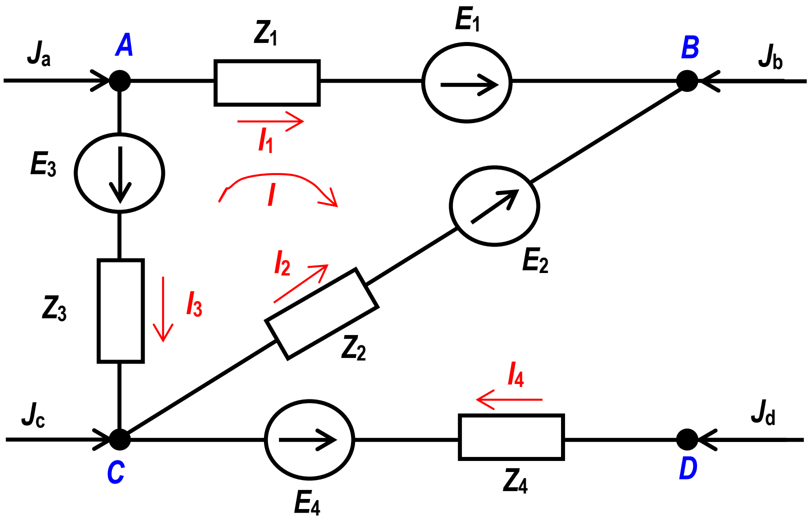

Figure 2. Scheme of power supply system replacement.

3. The configuration of the replacement of the power supply system is illustrated (Figure 3). Because the graph network has certain direction (in the current direction), will be assumed the graph is oriented.

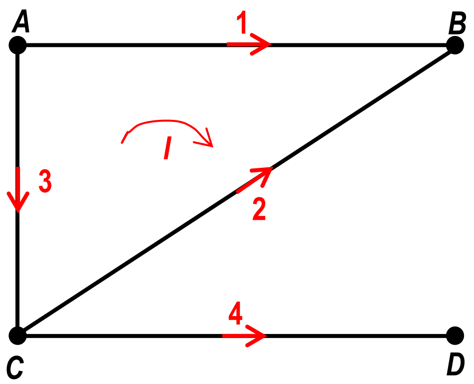

Figure 3. Link-oriented graph of power supply system.

4. The case of matrix #1 for the graph is drawn, that is, the first case matrix showing the connection on the nodes of the electricity network is a rectangular matrix with the number of rows equal to the number of nodes (n) of the power supply system and the number of columns corresponding to the number of power supply networks. (m).

$$M_1 = (M_{ij}),\ i = \overline{1,n},\ j = \overline{1,m}$$

M_1 – The matrix elements receive one-third values and are structured as follows:

M_{ij}=+1, if i-node and j-network are the starting point;

M_{ij}=-1, if i-node and j-network endpoint;

M_{ij}=0, if i-node and j-network do not belong to;

So for a given example:

$$M_1 = \begin{array}{c} \left(\begin{array}{cccc} 1 & 0 & 1 & 0 \\ -1 & -1 & 0 & 0 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 0 & 1 \end{array} \right) \\ \underbrace{1 \quad 2 \quad 3 \quad 4 \qquad\qquad}_{networks} \end{array} \left. \begin{array}{c} a \\ b \\ c \\ d \end{array} \right\} nods$$

The matrix number 2 for the graph is drawn, i.e. the 2nd incision matrix M_2, which shows the connection to the independent circuit of the network, and the number of rows is the number of independent units (k) in the power supply system and the number of columns is the number of power supply networks (m).

$$M_2 = (M_{ij}),\ i = \overline{1,k},\ j = \overline{1,m}$$

The components of the matrix acquire one third of the values and are organized as follows:

M_{ij}=+1, if the j-network enters the k-contour and their directions are the same;

M_{ij}=-1, if the j-network enters the k-contour and their directions are reversed;

M_{ij}=0, if the j-network does not enter the k-outline.

So for a given example:

$$M_1 = \begin{array}{c} \begin{pmatrix} 1 & -1 & 1 & 0 \end{pmatrix} \\ \underbrace{1 \quad 2 \quad 3 \quad 4}_{networks} \end{array} \ 1 \}$$ The number of independent contours (k=1).

5. The main matrix (A) and the main matrix of the parameters and magnitude (F) of the power supply function parameters was generated on the basis of the equation parameters and magnitudes of the power supply system and the 1st and 2nd case matrices.

$$A = \begin{pmatrix} M \\ M_2 * Z \end{pmatrix}, \qquad F = \begin{pmatrix} J \\ E \end{pmatrix}$$

Where, $Z = (Z_i),\ i = \overline{1,m}$ –diagonal matrix of network resistance;

$J = (J_i),\ i = \overline{1,n-1}$ – current transmits to node.

$E = (E_i),\ i = \overline{1,m}$ –network Electromotive forces.

The supply system under consideration is:

$$J = \begin{pmatrix} J_1 \\ J_2 \\ J_3 \end{pmatrix} = \begin{pmatrix} 3 \\ -3 \\ -1 \end{pmatrix},\quad E = (E_i) = 0,\quad Z = (Z_i) = \begin{pmatrix} Z_1 & 0 & 0 & 0 \\ 0 & Z_2 & 0 & 0 \\ 0 & 0 & Z_3 & 0 \\ 0 & 0 & 0 & Z_4 \end{pmatrix} = \begin{pmatrix} 2 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 2 \end{pmatrix}$$

As a consequence, the basic matrix (F) of the provided parameters and sizes is constructed as follows:

$$F = \begin{pmatrix} J \\ E \end{pmatrix} = \begin{pmatrix} 3 \\ -3 \\ -1 \\ 0 \end{pmatrix}$$

Then, let's build the main matrix (A) of the power supply system replacement parameters: by taking the D node as the balancer (as in the last row remove the last row from the M_1 matrix and establish the M matrix.

$$M = \begin{pmatrix} 1 & 0 & 1 & 0 \\ -1 & -1 & 0 & 0 \\ 0 & 1 & -1 & -1 \end{pmatrix} \; M_2 Z = (1 \quad -1 \quad 1 \quad 0) \cdot \begin{pmatrix} 2 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 2 \end{pmatrix} = (2 \quad -2 \quad -2 \quad 0)$$

So,

6. The general state equation for the power supply system based on the matrices A and F above is as follows: $A \times I = F$

$$\begin{pmatrix} 1 & 0 & 1 & 0 \\ -1 & -1 & 0 & 0 \\ 0 & 1 & -1 & -1 \\ 2 & -2 & -2 & 0 \end{pmatrix} \times \begin{pmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{pmatrix} = \begin{pmatrix} 3 \\ -3 \\ -1 \\ 0 \end{pmatrix} \text{here, } I = \begin{pmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{pmatrix} \text{– networkcurrents}$$

Calculation of fluid pressure power with the help of definite integral

Integrated accounting is an important tool for mathematical analysis in solving various sections of mathematics, as well as mechanics, physics and many engineering issues. Because the definite integral section of integral calculations is widely applied to geometry, physics and mechanics, as well as to special sections of mathematics. The reason for the widespread implementation is that, first, integration is the opposite process of differentiation, and the second is that thedefinite integral is a process of creatingintegral sum and moving to the limit.

In the following, we will look at typical methods for solving fluid pressure problems using a definite integral.

Problem: The vertical dam is in the form of a one-sided trapezoid with the upper base a = 6.4 m, the bottom base b = 4.8 m, the height H = 3 m and the water level equal to the upper base of the dam. Find the pressure of water on the whole dam?

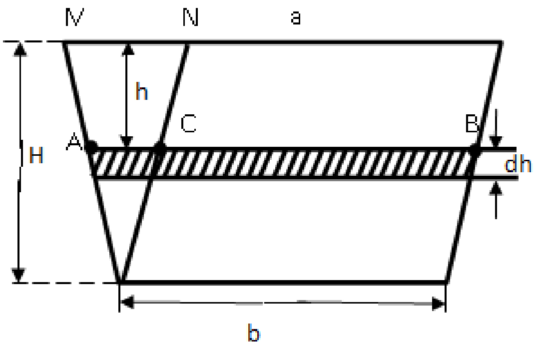

Figure 4. The form which is required for the issue

Solution: Suppose that the bar-section of the trapezoid is located horizontally at h and its sides are AB and dh.Then the pressure of the water on this part would be:

$$dP=9780hABdh=9807h(AC+CB)dh=9807h(AC+b)dh \quad (N)$$

We find AC through similarityof the KAC and KMN triangles:

$$\frac{AC}{MN} = \frac{H-h}{H}, \quad \frac{AC}{a-b} = \frac{H-h}{H}, \quad AC = \frac{a-b}{H}(H-h).$$

According to h, we will integrate this expression from 0 to H and will find the pressure that is affecting on this dam:

$$P = 9807 \cdot \frac{1}{H}\int_0^H h(aH - h(a-b)dh) = 9807 \cdot \frac{1}{H}\int_0^H [aHh - (a-b)h^2]dh =$$

$$= 9807 \cdot \frac{1}{H}\left(\frac{aHh^2}{2} - \frac{(a-b)h^3}{3}\right)\Big|_0^H = 9807 \cdot \frac{1}{H}\left(\frac{aH^3}{2} - \frac{(a-b)H^3}{3}\right) =$$
$$= 9807 \cdot \frac{H^3}{H}\left(\frac{3a-2a+2b}{6}\right) = 9807 \cdot \frac{H^2(a+2b)}{6}$$

Let H = 3 m, a = 6.4 m, b = 4.8 m and then will compute following:

$$P = 9807 \cdot \frac{9(6{,}4 + 4{,}8 \cdot 2)}{6} = 9807 \cdot 24 = 235368 \quad (N)$$

Calculating kinetic energy of the body rotating around its axis with the help of definite integral

From the physics course, it is found that the kinetic energy of a material point with mass m and velocity v is determined by the following formula:

$$K = \frac{mv^2}{2} \tag{1}$$

The kinetic energy of a system of n points whose masses m_1 ,m_2 , ..., $m_n$and their corresponding velocities v_1 ,v_2 , ...,$v_n$are:

$$K = \sum_{i=1}^{n} \frac{m_i {v_i}^2}{2} \tag{2}$$

To find the kinetic energy of a material body, we divide it into parts (which can be viewed as material points) and calculate the kinetic energy of these particles and form an integral sum. The result is a definite integral whose value is equal to the kinetic energy of the body in question.

We can see in the following example how to calculatean implementing integral to the kinetic energy of a body rotating around its axis.

Problem: A straight-round cone-shaped body with a base radius R, height H and mass M which rotates at an angle ω around its axis. Calculate its kinetic energy.

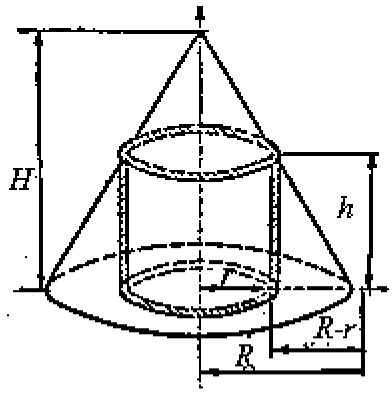

Figure 5. The form which is required for the issue

Solution: We place the hollow cylinder inside the circle cone as shown in the figure. In the dmelement, we obtain the mass of the cylinder as the figure height h, with an inner radius r and the inside hollow with the surface thickness dr. The mass of such a cylinder is equal:

$$dm = 2\pi r h \rho dr \tag{3}$$

Here the density of the right circle cone$\rho = \frac{3M}{\pi R^2 H}$,the linear velocity of mass dm is equal to$v=r\omega$. According to the formula (1), the kinetic energy in the element is:

$$dK = \frac{\upsilon^2 dm}{2} = \frac{v^2 \omega^2}{2} 2\pi r h \rho dr = \pi r^3 \omega^2 h \rho dr \tag{4}$$

Let us define h by the similar triangles in the picture:

$$\frac{h}{H} = \frac{R-r}{R}, h = \frac{H}{R}(R-r) \tag{5}$$

Set the values of h and ρ to (4) and create the following:

$$dK = \pi v^3 \omega^2 \frac{H(R-r)}{R} \frac{3M}{\pi R^2 H} dr = \frac{3M\omega^2 (R-r) r^3}{R^3} dr \tag{6}$$

Integrating this expression with the variable r from r = 0 to r = R, we find the kinetic energy of a cone that rotates at an angle ω around its axis.

$$K = \int_0^R \frac{3M\omega^2 (R-r) r^3}{R^3} dr = \frac{3M\omega^2}{R^3} \int_0^R (R-r) r^3 dr = \frac{3M\omega^2}{R^3} \left[\int_0^R R r^3 dr - \int_0^R r^4 dr \right]$$

$$= \frac{3M\omega^2}{R^3} \left(R \frac{r^4}{4} \Big|_0^R - \frac{r^5}{5} \Big|_0^R \right) = \frac{3M\omega^2}{R^3} \left(\frac{R^5}{4} - \frac{R^5}{5} \right) = \frac{3M\omega^2}{R^3} \frac{R^5}{20} = \frac{3M\omega^2 R^2}{20}$$

Similarly, calculating the definite integral of the axis of a rotating disk around a perpendicular axis with the axis of the rotation of a disc in the form of a parabolic segment of the plate makes it easier to solve and calculate.

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