# Operation Method of Wave's Diffusion Problem Solving in Elastic Environment under the Influence of Cylindrical Overlap 

Valiolla Davari<br>Department of civil engineering, Hidaj-Branch, Islamic Azad University, Hidaj, Iran


#### Abstract

Nowadays, due to the advances in science and technology in different industries of the world, to pay attention which has diverse factors looks to be essential. One of these factors includes different kinds of rocks on which the building structure will be based. In this paper, the factors of deceasing liquid or sticking environment to make connections between similar structures in the direction of decreasing the reactions of the earthquake in the time its occurrence is recommended. Referring the previous papers regarding the movement of the wide and connected structure that have been analyzed using elastic analysis and by studying the analysis of Macdonalds and Duhamel method, and using numeral discovering method by the influence of different factors including the soil kind and density, and by using Laplas Correlation and the related boundary condition leads to a special numerical analysis method which by considering the reaction of structure movement in the described environment results in the amount of shear displacement of the building.


KEY WORDS: Wave's diffusion model, Numerical solution and analyzing, Seismic waves.

## INTRODUCTION

The motion of rigid connected cylinder material which is shown in paper [1], are also analyzed as the motion in elastic environment.

In paper [2] in the reference, the related subjects have been discussed and solved by the function of discovering principle method. In this paper a specific method is represented briefly and in the following way, that illustrates the possibility using analytical methods for the structures that may be analyzed by numerical methods.

Attention to the motion of rigid cylinder material in the described environment for shear displacement of building and its development in elastic environment has been conducted by Voigt model.

Two dimension problems related to wave's diffusion in elastic environment can draw attention not only from theoretical, but also from operational aspect. (4-1) they can be called two dimensions especially with considering the dissipation of Seismic waves besides attention to their depth. Firm cylinder motion has been discussed at the final part in an elastic unrestricted environment. Adaptation of Duhamel method in next steps draws attention, to make connection or to speed time, in the frame of sudden increase of performed efforts together with next measures in ' boundary situation' related to solving this problem. Solving such these problems is related to topic examination and problem analysis. It is not very hard to gain the analytical solution of the problem in the frame of vibratory or oscillatory with the help of sudden increase of parameters in boundary regions or with wasting waves in the next step. All these problems have been discussed at this part of paper.
1.1 State of posing the issue and correlation recognition techniques

Two dimension problems can be consider in the form of two dimension waves diffusion discussion in an elastic environment without cross section spaces in the form of cylindrical connections. (1.1)

$$
\begin{aligned}
& a^{2} \Delta \varphi-\frac{\partial^{2} \varphi}{\partial t^{2}}=0 \\
& b^{2} \Delta \psi-\frac{\partial^{2} \psi}{\partial t^{2}}=0
\end{aligned}
$$

(1.1)

Where: establishing imagination of those waves which their potentially operation were not circulation and they
had resistance in comparison with pressure development. Its operation; Ekvivaly minal waves circulation.
Quantities,

$$
\begin{aligned}
& a=\sqrt{\frac{\lambda+2 \mu}{\rho}} \\
& b=\sqrt{\frac{\mu}{\rho}}
\end{aligned}
$$

[^0]As a result, circulatory waves diffusion velocity and developing waves can be determined.

| Lama stability | $\mu, \lambda$ |
| :--- | :---: |
| Environmental pressure | $\rho$ |
| Lapas operator | $\Delta$ |

displacement of $U$ and $U$ in coordinates polar system:

$$
\begin{align*}
u & =\frac{\partial \varphi}{\partial r}-\frac{1}{r} \frac{\partial \psi}{\partial \theta} \\
v & =\frac{\partial \psi}{\partial r}+\frac{1}{r} \frac{\partial \varphi}{\partial \theta} \tag{1.2}
\end{align*}
$$

here, $\theta$ and $r$ are polar coordinates.

$$
\begin{equation*}
u_{1 t} / r=r_{0}=H(t) V_{0} \tag{1.3}
\end{equation*}
$$

With consideration to the state of determining relations in 'boundary situation' in (1.1) cylindrical connection levels can gain to the equation solution in $\theta$ and $\quad r$ polar coordinates.
While permanent velocity of cylindrical connections can be determined with the following formula:
$V_{0--}$ Permanent velocity of cylindrical system
$r_{0--}$ Radius

$$
H(t)= \begin{cases}1, & \mathrm{t}>0 \\ 0, & \mathrm{t}<0\end{cases}
$$

This has Hiusad operation.
1.2 non stable waves diffusion problem solving under the influence of cylindrical overlap in elastic environment Solving equation (1.1) of waves which are in the form of Lapas- Karson and is similar to cylindrical connection motion can be shown in the following formula:

$$
\begin{align*}
& \overline{\varphi_{1}}=C K_{1}\left(\frac{p r}{a}\right) \\
& \bar{\psi}_{1}=D K_{1}\left(\frac{p r}{b}\right) \tag{1.4}
\end{align*}
$$

Whereas:

$$
\begin{aligned}
& \overline{\varphi_{1}}=\overline{\varphi /} \cos \theta \\
& \overline{\psi_{1}}=\bar{\psi} / \sin \theta
\end{aligned}
$$

$K_{1=\text { Mec Donald opration of fthe ferst pininiple }}$
p = Lapas- Karson changing parameters
${ }_{\text {Determining }} D_{g} C$
And as a result we have:

$$
\begin{equation*}
\frac{\partial \varphi_{1}}{\partial r}-\frac{\psi_{1}}{r}=-\frac{\partial \psi_{1}}{\partial r}+\frac{\varphi_{1}}{r} \tag{1.5}
\end{equation*}
$$

whereas we have $r=r_{0 \text { the result for the solution (1.4) will be like this: }}$

$$
\begin{align*}
C & =-f(p)\left[\frac{p}{b} K_{0}\left(\frac{p r_{0}}{b}\right)+\frac{2}{r_{0}} K_{1}\left(\frac{p r_{0}}{b}\right)\right]  \tag{1.6}\\
D & =f(p)\left[\frac{p}{a} K_{0}\left(\frac{p r_{0}}{a}\right)+\frac{2}{r_{0}} K_{1}\left(\frac{p r_{0}}{a}\right)\right]
\end{align*}
$$

While $f(p)_{\text {operation should be determined on the basis of 'boundary situation'. }}$ With assigning (1.6) constituents in (1.4) and then (1.2) we will gain to this:

$$
\begin{equation*}
\bar{u}_{1}=\bar{u} / \cos \theta=f(p) L \tag{1.7}
\end{equation*}
$$

In following forms:

$$
\begin{aligned}
& L=\frac{p^{2}}{a b} K_{0}\left(\frac{p r_{0}}{b}\right) K_{0}\left(\frac{p r}{a}\right)+\frac{p}{b r} K_{0}\left(\frac{p r_{0}}{b}\right) k_{1}\left(\frac{p r}{a}\right)+ \\
& +\frac{2 p}{a r_{0}} K_{1}\left(\frac{p r_{0}}{b}\right) K_{0}\left(\frac{p r}{a}\right)+\frac{2}{r_{0} r} K_{1}\left(\frac{p r_{0}}{b}\right) K_{1}\left(\frac{p r}{a}\right)- \\
& -\frac{p}{a r} K_{0}\left(\frac{p r_{0}}{a}\right) K_{1}\left(\frac{p r}{b}\right)-\frac{2}{r_{0} r} K_{1}\left(\frac{p r_{0}}{a}\right) K_{1}\left(\frac{p r}{b}\right)
\end{aligned}
$$

Between (1.7) and $r=r_{0}$ boundary regions. we will arrive at this result:

$$
\begin{align*}
& \bar{u}_{1}=p f(p)\left(\frac{p}{a b} K_{0}\left(\frac{p r_{0}}{a}\right) K_{0}\left(\frac{p r_{0}}{b}\right)+\frac{1}{b r_{0}} K_{0}\left(\frac{p r_{0}}{b}\right) K_{1}\left(\frac{p r_{0}}{a}\right)+\right. \\
& \left.+\frac{1}{a r_{0}} K_{0}\left(\frac{p r_{0}}{a}\right) K_{1}\left(\frac{p r_{0}}{b}\right)\right) \tag{1.8}
\end{align*}
$$

For finding the problem solution all possible ways including 'physical technical and mathematical science' are used that in the rest of discussion the necessity of using lateral formulas will explain in details. Describing 'boundary situation' for determining F can be done with considering Mac Donald operation lateral closeness. Solving problems related to environment motion and permanent wave diffusion is exactly the precise equation solving. If we cut its solution from (1.8):

$$
\begin{aligned}
& p \rightarrow \infty \\
& K_{0}(z) \approx \sqrt{\frac{\pi}{2 z}} \cdot e^{-z} \\
& K_{1}(z) \approx \sqrt{\frac{\pi}{2 z}} \cdot e^{-z}
\end{aligned}
$$

If we put it in (1.3), we would gain to:

$$
V_{0}=\frac{p^{2}}{a b} f(p) \sqrt{\frac{\pi b}{2 p r_{0}}} \cdot \sqrt{\frac{\pi a}{2 p r_{0}}}\left(p+\frac{a+b}{r_{0}}\right) e^{-\frac{p r_{0}}{a}} \cdot e^{-\frac{p r_{0}}{b}}
$$

But whereas:

$$
f=\frac{2 r_{0} \sqrt{a b} e^{\frac{p r_{0}}{a}} \cdot e^{\frac{p r_{0}}{b}}}{\pi p\left(p+\frac{a+b}{r_{0}}\right)}
$$

if we put this equation in (1.7), we would gain to $\bar{u}_{1 t}=p \bar{u}_{1}$.

$$
\begin{equation*}
\bar{u}_{1 t}=\frac{2 r_{0} \sqrt{a b}}{\pi\left(p+\frac{a+b}{r_{0}}\right)} \quad V_{0} e^{\frac{p r_{0}}{a}} \cdot e^{\frac{p r_{0}}{b}} L \tag{1.9}
\end{equation*}
$$

In $\quad r=r_{0}$ boundary regions:

$$
\begin{gather*}
\bar{u}_{1 t}=\frac{2 r_{0} \sqrt{a b} \cdot p}{\pi\left(p+\frac{a+b}{r_{0}}\right)} V_{0} e^{\frac{p r_{0}}{a}} \cdot e^{\frac{p r_{0}}{b}}\left(\left(\frac{p}{a b} K_{0}\left(\frac{p r_{0}}{a}\right) K_{0}\left(\frac{p r_{0}}{b}\right)+\right.\right.  \tag{1.10}\\
\left.+\frac{1}{b r_{0}} K_{0}\left(\frac{p r_{0}}{b}\right) K_{1}\left(\frac{p r_{0}}{a}\right)+\frac{1}{a r_{0}} K_{0}\left(\frac{p r_{0}}{a}\right) K_{1}\left(\frac{p r_{0}}{b}\right)\right)
\end{gather*}
$$

Follow this; we have to gain at all six issues real contents in (1.9).

$$
\begin{align*}
& p K_{0}\left(\frac{p r}{c}\right) \longrightarrow \frac{H H\left(t-\frac{r}{c}\right)}{\sqrt{t^{2}-\left(\frac{r}{c}\right)^{2}}} \\
& K_{1}\left(\frac{p r}{c}\right) \longrightarrow \frac{c}{r} \sqrt{t^{2}-\frac{r^{2}}{c^{2}}} \\
& P K_{1}\left(\frac{p r}{c}\right) \longrightarrow \frac{c}{r} \frac{t}{\sqrt{t^{2}-\frac{r^{2}}{c^{2}}}} \\
& P K_{0}\left(\frac{p r_{0}}{b}\right) K_{0}\left(\frac{p r}{a}\right) e^{\frac{\mathrm{pr}_{0}}{a}} e^{\frac{p r_{0}}{b}} \longrightarrow A_{1}(a, b)= \\
& =\int_{\frac{r-r_{0}}{a}}^{r} \frac{d \tau}{\sqrt{\left(\left(t-\tau+\frac{r_{0}}{b}\right)^{2}-\left(\frac{r_{0}}{b}\right)^{2}\right)\left(\left(\tau+\frac{r_{0}}{a}\right)^{2}-\left(\frac{r_{0}}{a}\right)^{2}\right)}}=\frac{2 H\left(t-\frac{r-r_{0}}{a}\right) F(k(a, b))}{m\left(a_{1} b\right)}  \tag{1.11}\\
& \text { If we consider their real contents while } F \text { is the first complete type of oval integral. }
\end{align*}
$$

$$
\begin{gathered}
K(a, b)=\sqrt{\frac{\left(t-\frac{r-r_{0}}{a}\right)\left(t+2 \frac{r_{0}}{b}+\frac{r+r_{0}}{a}\right)}{\left(t+2 \frac{r_{0}}{b}-\frac{r-r_{0}}{a}\right)\left(t+\frac{r+r_{0}}{a}\right)}} \\
m(a, b)=\sqrt{\left(t+2 \frac{r_{0}}{b}-\frac{r-r_{0}}{a}\right)\left(t+\frac{r+r_{0}}{a}\right)}
\end{gathered}
$$

$$
\begin{align*}
& =\frac{a}{r} \int_{\frac{r-r_{0}}{a}}^{t} \frac{\left(\tau+\frac{r_{0}}{a}\right) d \tau}{\sqrt{\left(\left(t-\tau+\frac{r_{0}}{b}\right)^{2}-\left(\frac{r_{0}}{b}\right)^{2}\right)\left(\left(\tau+\frac{r_{0}}{a}\right)^{2}-\left(\frac{r}{a}\right)^{2}\right)}}= \\
& =\frac{r_{0}}{r} \int_{\frac{r-r_{0}}{a}}^{t} \frac{d \tau}{\sqrt{\left(\left(t-\tau+\frac{r_{0}}{b}\right)^{2}-\left(\frac{r_{0}}{b}\right)^{2}\right)\left(\left(t+\frac{r_{0}}{a}\right)^{2}-\left(\frac{r}{a}\right)^{2}\right)}}+ \\
& \quad+\frac{a}{r} \int_{\frac{r-r_{0}}{a}}^{t} \frac{\tau d \tau}{\sqrt{\left(\left(t-\tau+\frac{r_{0}}{b}\right)^{2}-\left(\frac{r_{0}}{b}\right)^{2}\right)\left(\left(t+\frac{r_{0}}{a}\right)^{2}-\left(\frac{r}{a}\right)^{2}\right)}}= \\
& =\frac{\left.r_{0}\right)}{r} \frac{2 H F(K(a, b))}{m(a, b)}+\frac{2 H a}{r m(a, b)\left(\frac{2 r}{a} \prod(n(a, b), k(a, b))-\frac{r+r_{0}}{a} F(k(a, b))\right)=}  \tag{1.12}\\
& =\frac{2 H\left(t-\frac{r-r_{0}}{a}\right)\left(2 \prod(n(a, b), K(a, b))-F(K(a, b))\right)}{m(a, b)}
\end{align*}
$$

$\Pi$
is also the third complete type of oval integral.

$$
n(a, b)=\frac{t-\frac{r-r_{0}}{a}}{t+\frac{r+r_{0}}{a}}
$$

$$
=\left(\frac{\mathrm{bt}}{\mathrm{r}_{0}}+1\right) \int_{\frac{r-r_{0}}{a}}^{t} \frac{\mathrm{~d} \tau}{\sqrt{\left(\left(t-\tau+\frac{r_{0}}{b}\right)^{2}-\left(\frac{r_{0}}{b}\right)^{2}\right)\left(\left(\tau+\frac{\mathbf{r}_{0}}{a}\right)^{2}-\left(\frac{r_{0}}{a}\right)^{2}\right)}}-
$$

$$
-\frac{b}{r_{0}} \int_{\frac{\mathrm{r}-\mathrm{r}_{0}}{\mathrm{a}}}^{\mathrm{t}} \frac{\tau \mathrm{~d} \tau}{\sqrt{\left(\left(t-\tau+\frac{r_{0}}{b}\right)^{2}-\left(\frac{r_{0}}{b}\right)^{2}\right)\left(\left(\tau+\frac{\mathrm{r}_{0}}{a}\right)^{2}-\left(\frac{r_{0}}{a}\right)^{2}\right)}}=
$$

$$
\begin{aligned}
& P K_{1}\left(\frac{p r_{0}}{b}\right) K_{0}\left(\frac{p r}{a}\right) \mathrm{e}^{\frac{\mathrm{pr}_{0}}{b}} \mathrm{e}^{\frac{\mathrm{pr}_{0}}{a}} \rightarrow \mathrm{~A}_{3}(a, b)= \\
& =\frac{b}{r_{0}} \int_{\frac{\mathrm{r}-\mathrm{r}_{0}}{\mathrm{a}}}^{\mathrm{t}} \frac{\left(\mathrm{t}-\tau+\frac{\mathrm{r}_{0}}{\mathrm{~b}}\right) \mathrm{d} \tau}{\sqrt{\left(\left(t-\tau+\frac{r_{0}}{b}\right)^{2}-\left(\frac{r_{0}}{b}\right)^{2}\right)\left(\left(\tau+\frac{\mathrm{r}_{0}}{a}\right)^{2}-\left(\frac{r_{0}}{a}\right)^{2}\right)}}=
\end{aligned}
$$

$$
\begin{gather*}
=\left(\frac{\mathrm{bt}}{\mathrm{r}_{0}}+1\right) \frac{2 \mathrm{HF}(\mathrm{~K}(\mathrm{a}, \mathrm{~b}))}{m(a, b)}-\frac{2 b H}{r_{0} m(a, b)}\left(2 \frac{r}{a} \Pi(n(a, b), K(a, b))-\frac{r+r_{0}}{a} F / K(a, b)\right)= \\
=\frac{2 H\left(\mathrm{t}-\frac{\mathrm{r}-\mathrm{r}_{0}}{\mathrm{a}}\right)\left(\frac{b t}{r_{0}}+\frac{r b}{r_{0} a}+\frac{b}{a}+1\right) \mathrm{F}(\mathrm{~K}(\mathrm{a}, b))-2 \frac{r b}{r_{0} a} \Pi(n(a, b), K(a, b))}{m\left(a_{1} b\right)}  \tag{1.13}\\
\frac{1}{p} K_{1}\left(\frac{p r_{0}}{a}\right) K_{1}\left(\frac{p r}{b}\right) \mathrm{e}^{\frac{\mathrm{pr}}{\mathrm{a}}} \mathrm{e}^{\frac{\mathrm{pr}}{\mathrm{~b}}} \rightarrow \mathrm{~A}_{4}(a, b)= \\
=\frac{a b}{\mathrm{r}_{0} \mathrm{r}} \int_{\frac{\mathrm{r}-\tau_{0}}{\mathrm{a}}}^{\mathrm{t}} \sqrt{\left(\left(t-\tau+\frac{r_{0}}{a}\right)^{2}-\left(\frac{r_{0}}{a}\right)^{2}\right)\left(\left(\tau+\frac{\mathrm{r}_{0}}{\mathrm{~b}}\right)^{2}-\left(\frac{r}{b}\right)^{2}\right)} \tag{1.14}
\end{gather*}
$$

With consideration of:

$$
\begin{gather*}
\frac{p}{p+\frac{a+b}{r_{0}}} \longrightarrow H(t) e^{-\frac{a+b}{r_{0}} t} \\
\frac{p}{p+\frac{a+b}{r_{0}}} \bar{A} \longrightarrow \int_{0}^{t} e^{-\frac{a+b}{r_{0}(t-\tau)}} A(\tau) d \tau \\
\frac{p^{2}}{p+\frac{a+b}{r_{0}}} \bar{A} \longrightarrow A-\frac{a+b}{r_{0}} \int_{0}^{t} e^{-\frac{a+b}{r_{0}}(t-\tau)} A(\tau) d \tau  \tag{1.15}\\
\text { We will gain at this final result, with } e^{-\frac{a+b}{r_{0}} t}=\mu
\end{gather*}
$$

$\left.-\frac{a+b}{r_{0} \mu} \int_{\frac{r-r_{0}}{a}}^{t} A_{4}(a, b) \mu d \tau\right)-\frac{1}{a r \mu} \int_{\frac{r-r_{0}}{b}}^{t} A_{2}(b, a) \mu d \tau-\frac{2}{r_{0} r}\left(A_{4}(b, a)-\right.$ $\left.-\frac{a+b}{r_{0} \mu} \int_{\frac{r-r_{0}}{b}}^{t} A_{4}(b, a) \mu d \tau\right)$

It is necessary to mention that based on $r>r_{0}, \tau_{\text {Argoment amount which is equal to lower level of }}$ pressure integral which is in integral operation outlet will be zero.
Whereas its quantity is at an equal level with upper level of $\tau$ integrals, its pressure with
$r=r_{0}$ will be zero too. In (1.16) integrals, whereas $\tau$ is related to upper level integral, Argoment would change to zero too. As a result integration in (1.11), (1.12), (1.13), (1.14) is done between private quantities of integral operation.

$$
F(a, b)=F(b, a)_{)_{\text {if we gain at }}} r=r_{0}
$$

$$
\begin{align*}
& A_{2}^{0}=(b, a)=\frac{2}{m}(2 \Pi(n(b, a), k)-F(k))=A_{3}^{0}(a, b)= \\
& =\frac{2}{m}\left(\left(\frac{b t}{r_{0}}+2 \frac{b}{a}+1\right) F(k)-2 \frac{b}{a} \Pi(a, b)\right) \tag{1.17}
\end{align*}
$$

with consideration to (1.7), the solution of (1.6) would be like this:

$$
\begin{align*}
& u_{t}=\frac{2 r_{0} V_{0} \sqrt{a b}}{\pi}\left(\frac{1}{a b}\left(A_{1}^{0}-\frac{a+b}{r_{0} \mu} \int_{0}^{t} A_{1}^{0} \mu d \tau\right)\right)+\frac{1}{b r_{0} \mu} \int_{0}^{t} A_{2}^{0}(a, b) \times  \tag{1.18}\\
& \times \mu d \tau+\frac{1}{a r_{0} \mu} \int_{0}^{t} A_{2}^{0}(b, a) \mu d \tau
\end{align*}
$$

While:

$$
\begin{gathered}
A_{1}^{0}=\frac{2 F(k)}{m} \\
K=K(a, b)=K(b, a)=\sqrt{\frac{t\left(t+2 \frac{r_{0}}{b}+2 \frac{r_{0}}{a}\right)}{\left(t+2 \frac{r_{0}}{b}\right)\left(t+2 \frac{r_{0}}{a}\right)}} \\
m=m(a, b)=m(b, a)=\sqrt{\left(t+2 \frac{r_{0}}{b}\right)\left(t+2 \frac{r_{0}}{a}\right)} \\
n(a, b)=\frac{t}{t+2 \frac{r_{0}}{a}} \\
n(b, a)=\frac{t}{t+2 \frac{r_{0}}{b}}
\end{gathered}
$$

K and N quantities in performed coordinates can be near to one which will increase oval integral volume. As the result it would be impossible to get use of schedules. Then it is necessary to use lateral formulas. Making an approximant formula is necessary for the third type of oval integral.

$$
\varphi=\frac{\pi}{2} n \rightarrow 1
$$

Whereas this change take place $k^{2} \rightarrow 1$. oval integral divides into two parts.
$\Pi\left(\frac{\pi}{2}, \mathbf{n}, \mathrm{k}\right)=\int_{0}^{\frac{\pi}{2}} \frac{d \varphi}{\left(1-n \sin ^{2} \varphi\right) \sqrt{1-k^{2} \sin ^{2} \varphi}}=$
$=\int_{0}^{\frac{89}{180} \pi} \frac{d \varphi}{\left(1-n \sin ^{2} \varphi\right) \sqrt{1-k^{2} \sin ^{2} \varphi}}+\int_{\frac{8 \rho}{180} \pi}^{\frac{\pi}{2}} \frac{d \varphi}{\left(1-n \sin ^{2} \varphi\right) \sqrt{1-k^{2} \sin ^{2} \varphi}}=$
$=\Pi=\left(\frac{89}{180} \pi, n, k\right)+B$
While

$$
\begin{equation*}
B=\int_{\frac{89}{180} \pi}^{\frac{\pi}{2}} \frac{d \varphi}{\left(1-n \sin ^{2} \varphi\right) \sqrt{1-k^{2} \sin ^{2} \varphi}} \tag{1.19}
\end{equation*}
$$

We have to change parameters in second integral that we call these new parameters with $\varphi$, then we have:

$$
B=\int_{0}^{\frac{\pi}{180}} \frac{d \varphi}{\left(1-n \cos ^{2} \varphi\right) \sqrt{1-k^{2} \cos ^{2} \varphi}}
$$

və $\cos ^{2} \varphi \approx 1-\varphi^{2}$ dəyişsək

$$
\begin{align*}
& B=\int_{0}^{\frac{\pi}{180}} \frac{d \varphi}{\left(1-n\left(1-n \varphi^{2}\right)\right) \sqrt{1-k^{2}\left(1-\varphi^{2}\right)}}=\frac{1}{n \sqrt{k^{2}}} \int_{0}^{\frac{\pi}{180}} \frac{d \varphi}{\left(\varphi^{2}+\frac{1-n}{n}\right) \sqrt{\varphi^{2}+\frac{1-k^{2}}{k^{2}}}}=  \tag{1.20}\\
& =\Phi(n, k)
\end{align*}
$$

At this problem

$$
k=k(a, b)=k(b, a)=\sqrt{\frac{t\left(t+\frac{2 r_{0}}{a}+\frac{2 r_{0}}{b}\right)}{\left(t+\frac{2 r_{0}}{a}\right)\left(t+\frac{2 r_{0}}{b}\right)}}
$$

$$
n=(b, a)_{\text {and or }} n=n(a, b)
$$

It is easy to consider K and N at these amounts

$$
\frac{1-n}{n}>\frac{1-k^{2}}{k^{2}}
$$

Based on these formulas we can measure integral

$$
\begin{align*}
& \Phi(n, k)=\left.\frac{1}{\sqrt{1-n} \sqrt{k^{2}-n}} \ln \frac{\left|\varphi \sqrt{\frac{1-n}{n}-\frac{1-k^{2}}{k^{2}}}+\sqrt{\frac{1-n}{n}} \sqrt{\varphi^{2}+\frac{1-k^{2}}{k^{2}}}\right|}{\sqrt{\varphi^{2}+\frac{1-n}{n}}}\right|_{=} ^{\frac{\pi}{180}}= \\
& =\frac{1}{\sqrt{1-n} \sqrt{k^{2}-n}}\left[\ln \frac{\left|\frac{\pi}{180} \sqrt{\frac{k^{2}-n}{n k^{2}}}+\sqrt{\frac{1-n}{n}\left(\left(\frac{\pi}{180}\right)^{2}+\frac{1-k^{2}}{k^{2}}\right)}\right|}{\sqrt{\left(\frac{\pi}{180}\right)^{2}+\frac{1-n}{n}}}-\ln \sqrt{\frac{1-k^{2}}{k^{2}}}\right] \tag{1.21}
\end{align*}
$$

With considering (1.21) approximate result of (1.19) would be like this:

$$
\prod\left(\frac{\pi}{2}, n, k\right) \approx \prod\left(\frac{89}{180} \pi, n, k\right)+\Phi(n, k)
$$

Or with changing n to 1 and k to 1
Therefore (1.11), (1.12) and (1.13) integrals with their characteristics and under integral have formed the shape of oval integral.

Finally to find $v$ velocity of vector circle we have to displace the amounts of $a$ and $b$. at the frame of solving this problem and with considering time and with attention to velocity variety in future we gain at boundary evolving' situation.

## 1.3 doing numerical calculations

Turbo Pascal 7.0 program has been used to solve the problem through numerical calculation. The scale of elastic waves diffusion velocity has been used t different kinds of lithic and edaphic rocks at the first schedule of following calculations.
Some other calculations have been done with utilizing 1.2 numerical solution program of research and also utilization of (1.16), (1.18) formulas with next measuring amounts.
It should be explained that since $a$ and $b$ are related to each other (part 1.1), if $a=2000 \mathrm{~m} / \mathrm{s}$, the amount of $b$ will be $1400 \mathrm{~m} / \mathrm{s}$

```
a=2000m/San; }\quadb=1400\textrm{m}/\textrm{San}
ro =10 m; r}=100\textrm{m};1000\textrm{m};10000m
```

In the environment of subject on our discussion, non stable elastic waves move with connections. This implies that when they are in touch with connections, as a result some waves have been made with the help of these connections.

We call them two dimensions with consideration to Seismic wave dissipation and with attention to its depth. Sudden increase in boundary regions or with numerical solution and analyzing the problem through next dissipation parameters in oscillatory form are absorbing from empirical and practical aspects.

Time is elapsing in the space between $0 \leq \mathrm{t} \leq 10$ in numerical calculations. In one of the calculation steps, t is showing 0.01 second.

Based on performed numerical calculations, velocity formula related to time and displacements of connection center is prepared in the distance of $\mathrm{r}=100 ; 1000 ; 10000 \mathrm{~m}$.
At the first picture of curve toward up (showed with red) $u_{t}(t)$ bond is agreed with t (while $r=100 \mathrm{~m}$ ), in the curve toward front side, $u_{t}(t)$ bond is agreed with t (while $r=1000 \mathrm{~m}$ ), in the curve toward down $u_{t}(t)$ bond is agreed with t (while $r=10000 \mathrm{~m}$ ).

As you see in the picture, when they are far from center connections, displacement of dissipation waves has increased. Based on present curves at the first picture, numerical calculation information has reflected in schedules. Pressure volume of different kinds of lithic and edaphic rocks, diffusion velocity of elastic waves and evidence information about diffusion velocity of Seismic elastic waves and pressure:

First schedule:

| Vibration intensity |  | Elastic waves velocity V km/san |  |  |  | $\begin{gathered} \text { pressure } \\ p \\ \text { Volume } \\ 1 / \mathrm{Cm}^{3} \end{gathered}$ | Different kinds of rocks |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Vs | Vp | Its width Vs |  | Its length Vp |  |  |  |
| Between | Between | Average | Between | Average | Between |  |  |
| 9,4 | 18,2 | 3,2 | 1,0-4,8 | 5,6 | 2,0-7,0 | 2,8 | First: for lithic rocks Earth's depth Granites |
| 4,5-15,2 | 5-28,6 | 2,8 |  | $\begin{gathered} 3-5,5 \\ 1,2-3,0 \end{gathered}$ |  | $2,5-3,8$ | Basalts and Granites, Gabbros and other lithic rocks <br> 1. in normal humidity without |
| 3,2-1,4 | 1,6-7,75 | 0,5 | 0,2-0,8 | 2,2-3,2 | 1,0-3,3 | 1,6-2,35 | erosion |
| 3,3-1,5 | 2,6-8,25 | -- | -- | 2,8-3,2 | 1,6-3,3 | $1.65-2,50$ | 2. erosions, densities, resistant |
| 2,6-12,0 | 6-21 | 1,4-1,6 | 1,1-4 | 4-8,5 | 2,4-7,0 | 2,35-3,0 | stones against water |
| 4,1-12,2 | 8,3-21 | 1,8-2 | 1,7-4 | 2,5-3,2 | 3,5-7,0 | 2,4-3,05 | 3. penetrable to water |
| 1,6-6 | 2,4-13 | 1,4-1,8 | 1,1-2 | - | 1,4-4,5 | 1,5-2,95 | Dense limes |
|  |  |  |  |  |  |  | Dense edaphic rocks <br> Sand stone and gravel stone |
|  |  |  |  |  |  |  | Second: half stone rock |
| 2,2-7,2 | 4,3-13 | 1,2-1,6 | 1-3 | 2,5-3,2 | 2,0-5,5 | 2,1-2,4 | Plaster stone in normal humidity |
| 0,7-9,5 | 2-16 | 0,5-0,6 | 0,4-3,4 | 2,6-3,5 | 1,1-6,0 | 1,8-2,4 |  |
| 1,6-7,5 | 4,2-12 | 0,7-2 | 0,8-2,8 | $2,4-4,0$ | 1,6-4,7 | 2,6-2,7 | Marble stone in normal humidity |
|  |  |  |  |  |  |  | Muddy stone rocks |

## Conclusion

As you see, the result at the level of $\mathrm{r}=100 \mathrm{~m}$ may cause o make positive amounts. Where we have the level of $t=0.05$ san, $\mathrm{t}=u_{t}(t) 0.318656 \mathrm{~m} / \mathrm{san}$ in $0,0.01,0.02,0.03$ and 0.04 seconds, $u_{t}(t)$ operation will be zero. We would see some delays in time if we have $\mathrm{r}=1000 \mathrm{~m}$ level. The presence of $\mathrm{t}=0.50$ san cause the emergence of $u(t)$ $0.092911 \mathrm{~m} / \mathrm{san} . \mathrm{u}(\mathrm{t})$ Operation would be zero if we have $.0 \leq \mathrm{t} \leq 0.49$ san at $\mathrm{r}=10000 \mathrm{~m}=10 \mathrm{~km}$ distance.

If we have $t 5.00$ san at the result of this operation we would have $U(t)=0.029137 \mathrm{~m} / \mathrm{san}$. We can see a small increase in future to arrive at final permanent prices. It is necessary to mention that length and width of velocity amount which have been used in these calculations is agreed with elastic velocities and stone rock amounts including Granites, Basalts and gabbros with normal humidity amount in an uncovered space. At the mentioned
environment, elastic velocity prices have been calculated without any change (second picture). As you see in this picture, displacement of wave's velocity diffusion has done with delay. The amount of r volume will cause delay in increasing its amount. Despite the first picture if we have $a=2000 \mathrm{~m} / \mathrm{san} ; b=1400 \mathrm{~m} / \mathrm{san} ; r_{0}=90 \mathrm{~m} ; r=100 \mathrm{~m}$; $1000 \mathrm{~m} ; 10000 \mathrm{~m}$, we can increase oval connection radio based on the third picture numbers. Then we can see a small increase in velocity amount of displacement waves. Based on 2.6 picture if we have $r_{0}=10 \mathrm{~m}$ level, agreed curve with price $r=100 \mathrm{~m}$ when we have $r=90 \mathrm{~m}$, against agreed curve with price $r=100 \mathrm{~m}$ of time duration $\mathrm{t}=1$ san would not start $\mathrm{t}=0$ time (third picture) in all t amounts, displacement velocity amount (first picture) is more than the agreed curve amount at the third picture. At different radius of oval connections at the forth picture $\mathrm{r}_{0}=10 \mathrm{~m} ; 50 \mathrm{~m}$; 90 m the relation of diagram curve has shown. All these distances between connection center $\mathrm{r}=100 \mathrm{~m}$ has been formed in calculations. It has been accepted too. As it is clear in the picture, elastic waves diffusion velocity is $a=$ $2000 \mathrm{~m} / \mathrm{san}$; $b=1400 \mathrm{~m} / \mathrm{san}$ which are near each other


Figure 1.


Figure 2.


Figure 3.


Figure 4.

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[^0]:    *Corresponding Author: Valiolla Davari, Department of civil engineering, Hidaj-Branch, Islamic Azad University, Hidaj, Iran, Email: davari_1970@yahoo.com

