Hydraulic Conveyance of an Open Channel using Visual Studio

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ABSTRACT-
In this rapidly developing, there are a lot of technological advances. All the sectors are rapidly modernizing and are using digitalization wherever possible. The same should apply to agriculture. Some solution must be found to solve the problem of making heavy calculations every time a person is designing any structure. So, to solve this problem use of different software to make this design procedure easy is proposed. The proposed solution is use of Visual Studio 2022 to make the calculations and overall the design procedure easy. In the proposed research, formulas relating to the Hydraulic Conveyance of an Open Channel is being used to be brought Visual Studio programming to make it's designing easy.
Key Words: Visual Studio, Technology, Agriculture, Irrigation, Open Channel.

I.   INTRODUCTION

Open-channel flow, a branch of fluid mechanics and mechanics, may be a variety of liquid flow at intervals a passage or in channel with a free surface, referred to as a channel. the opposite variety of flow at intervals a passage is pipe flow. These 2 kinds of flow square measure similar in many ways however dissent in one vital respect: the free surface. Open-channel flow features a free surface, whereas pipe flow doesn't.

Open-channel flow may be classified and delineate in varied ways in which supported the modification in flow depth with relevance time and area.[3] the elemental kinds of flow treated in open-channel fluid mechanics are:

❖   **Time because the criterion**

➢   Steady flow
▪   The depth of flow doesn't modification over time, or if it may be assumed to be constant throughout the quantity into consideration.
➢   Unsteady flow
▪   The depth of flow will modification with time.
❖   **Space because the criterion**
➢   Uniform flow
▪   The depth of flow is that the same at each section of the channel. Uniform flow may be steady or unsteady, reckoning on whether or not or not the depth changes with time, (although unsteady uniform flow is rare).
•   Varied flow
♦   The depth of flow changes on the length of the channel. Varied flow technically could also be either steady or unsteady. Varied flow may be more classified as either apace or gradually-varied:
•   Rapidly-varied flow
♦   The depth changes short over a relatively short distance. Apace varied flow is understood as a neighborhood development. Examples square measure the hydraulic jump and also the hydraulic drop.
•   Gradually-varied flow
♦   The depth changes over an extended distance.
•   Continuous flow
♦   The discharge is constant throughout the reach of the channel into consideration. usually|this can be} often the case with a gentle flow. This flow is taken into account continuous and thus may be delineate exploitation the continuity equation for continuous steady flow.
•   Spatially-varied flow

♦ The discharge of a gentle flow is non-uniform on a channel. This happens once water enters and/or leaves the channel on the course of flow. associate degree example of flow getting into a channel would be a road aspect gutter. associate degree example of flow departure a channel would be associate degree irrigation channel. This flow may be delineate exploitation the continuity equation for continuous unsteady flow needs the thought of the time impact and includes a time component as a variable.

II.   EXISTING SYSTEM

The Existing system is totally manual. The soil part relationship calculation contains totally different formulas calculate the assorted values of soil. These formulas area unit terribly complicated to calculate with the utilization of calculators. it's strictly paper primarily based to store the records of the past calculated values of these formulas. The calculations area unit through with calculator by coming into every price of formula manually within the calculator.

2.1. Limitations in present System

Bound limitations in system, that areas follow:-
1. In area unit numerous steps or formulae concerned in to see hydraulic conveyance, thus it's troublesome to handle manually.
2. Manually calculations area unit troublesome to estimating numerous parameters during this soil part relationship and conjointly longer needed.
3. For recording purpose, it ought to be publish in some paper, so possibilities of losing the info area unit will increase.
4. It is troublesome to look the previous record of information.
5. Manually calculations embody a lot of errors with less accuracy.
6. To need the person power for calculation on the sphere and create it secure.

III.   PROPOSED SYSTEM

The planned system is deals with the practicality of calculations of soil part relationship. To remove the complexities, errors and difficulties the planned system is developed. These difficulties will takes place at the time of managing the roles at establishment. these days the medical care is directly comes with cybernation, therefore the students, researchers area unit coming back below the one roof to find out regarding medical care and cybernation. Calculate soil part relationship formulas manually on the paper area unit terribly complicated technique to seek out the correct price of the precise element. Since these works will manually so it takes longer and there area unit possibilities of errors like wrong details, wrong price at wrong place etc.

So to cut back these faults "To verify the Hydraulic Conveyance of Open Channel using Visual Studio" has been developed. The planned system deals with all the activities that area unit done by the farmer for calculation of hydraulic conveyance. This paper is all regarding however will info communication technology scale back the manual work load and provides the correct results of the right formulas.

3.1. Benefits of planned System:-

Calculations area unit done in no time and it saves the time.
1. No ought to knowledge publish on the paper as a result of it stores digitally in pc.
2. Changed the info as per demand.
3. System ought to be window primarily based, easy and economical.
4. Accuracy are often maintained.

IV.   MATERIAL

This chapter deals with the methodology won't to calculate hydraulic conveyance exploitation Visual Studio. It includes totally different formulae and theoretical issues those area unit used for calculation. It conjointly encapsulates the configuration of the system and knowledge to style the system.

V.   SYSTEM REQUIREMENTS

- Windows 7 ultimate
- Installed memory (RAM): 4.00 GB (3.39 GB usable)
- System type: 32 – bit Operating System

5.1. About the platform

- Visual Studio 2022
- Copyright (c) 1990, 1992 by Borland International, Inc.

VI.   FORMULAS TO FIND OUT HYDRAULIC COVEYANCE

I. The Continuity equation is
$$Q = A \times V$$

Where, Q= Discharge of the open channel, A = Area of Cross Section of the open channel, V = Velocity of flow in the open channel.

II. The Mannings Equation is

$$V = \frac{R^{\frac{2}{3}} \times S^{\frac{1}{2}}}{n}$$

Where, V – Velocity of Flow, R = Hydraulic Radius, S= Slope of the channel, n= Manning's Coefficient

III. The Chezy Equation is

$$V = C \times (R \times S)^{\frac{1}{2}}$$

Where, C= Chezy's Constant

IV. Hydraulic Radius

$$R = \frac{A}{P}$$

Where R= Hydraulic Radius, A= Cross Sectional Area , P= Wetted Perimeter

V. Cross Sectional Area of Channel

a) Trapeziod

$$A = bd + zd^2$$

b) Triangular

$$A = zd^2$$

c) Parabolic

$$A = \frac{2}{3} + t \cdot d$$

Where A= Cross Sectional Area of the Channel, b=bottom width of the channel, d= depth of the channel, z= slant height of the channel, t= top width of the channel

VI. Wetted Perimeter

a)   Trapeziod

$$P = b + 2\,dz$$

b)   Triangular

$$P = 2\,d(z^2 + 1)$$

VII.   SOURCE CODE FOR CALCULATION OF FLOW RATE

Home Page
```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }

        private void button1_Click(object sender, EventArgs e)
        {
            Form2 frm2 = new Form2();
            frm2.Show();
        }

        private void button2_Click(object sender, EventArgs e)
        {
            Form3 frm3 = new Form3();
            frm3.Show();
        }

        private void button3_Click(object sender, EventArgs e)
        {
            Form4 frm4 = new Form4();
            frm4.Show();
        }

        private void button4_Click(object sender, EventArgs e)
        {
            Form5 frm5 = new Form5();
            frm5.Show();
        }

        private void button5_Click(object sender, EventArgs e)
        {
            Form6 frm6 = new Form6();
            frm6.Show();
        }

        private void button6_Click(object sender, EventArgs e)
        {
            Form7 frm7 = new Form7();
            frm7.Show();
        }

        private void button7_Click(object sender, EventArgs e)
        {
            Form8 frm8 = new Form8();
            frm8.Show();
        }
```

```
    private  void  button8_Click(object  sender,
EventArgs e)
    {
        Form9 frm9 = new Form9();
        frm9.Show();
    }


    private  void  button9_Click(object  sender,
EventArgs e)
    {
        Form10 frm10 = new Form10();
        frm10.Show();
    }

    private  void  button10_Click(object  sender,
EventArgs e)
    {
        Form11 frm11 = new Form11();
        frm11.Show();
    }

    }
}
```

Continuity Equation

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
   public partial class Form2 : Form
   {
     public Form2()
     {
       InitializeComponent();
     }
     private  void  groupBox1_Enter(object  sender,
EventArgs e)
     {

     }

     private  void  button1_Click(object  sender,
EventArgs e)
     {
        double A, V, Q;
        A = Convert.ToDouble(textBoxA.Text);
        V = Convert.ToDouble(textBoxV.Text);
        Q = A * V;
```

```
        textBoxQ.Text = Q.ToString();
     }
```

Manning's Equation

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
   public partial class Form3 : Form
   {
     public Form3()
     {
        InitializeComponent();
     }

     private  void  button1_Click(object  sender,
EventArgs e)
     {
        double R, S, N, V;
        R = Convert.ToDouble(textBoxR.Text);
        S = Convert.ToDouble(textBoxS.Text);
        N = Convert.ToDouble(textBoxN.Text);
        double z = Math.Pow(R, 0.67);
        double y = Math.Pow(S, 0.5);
        V = z * y / N;
        textBoxV.Text = V.ToString();


     }
   }
}
```

Chezy's Equation

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
   public partial class Form4 : Form
   {
     public Form4()
     {
```

```
        InitializeComponent();
    }

    private  void  button1_Click(object  sender,
EventArgs e)
    {
        double R, S, C, V;
        R = Convert.ToDouble(textBoxR.Text);
        S = Convert.ToDouble(textBoxS.Text);
        C = Convert.ToDouble(textBoxC.Text);
        double y = R * S;
        double z = Math.Pow(y, 0.5);
        V= C * z;
        textBoxV.Text = V.ToString();
    }
  }
}
```

Hydraulic Radius
```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
  public partial class Form5 : Form
  {
    public Form5()
    {
        InitializeComponent();
    }

    private  void  button1_Click(object  sender,
EventArgs e)
    {
        double A, P, R;
        A = Convert.ToDouble(textBoxA.Text);
        P = Convert.ToDouble(textBoxP.Text);
        R = A / P;
        textBoxR.Text = R.ToString();
    }
  }
}
```

Cross-Sectional Area
I.   Trapezoidal Channel
```
using System;
using System.Collections.Generic;
using System.ComponentModel;
```

```
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
  public partial class Form6 : Form
  {
    public Form6()
    {
        InitializeComponent();
    }

    private  void  button1_Click(object  sender,
EventArgs e)
    {
        double b, d, z, A;
        b = Convert.ToDouble(textBoxB.Text);
        d = Convert.ToDouble(textBoxD.Text);
        z = Convert.ToDouble(textBoxZ.Text);
        double y = Math.Pow(d, 2);
        A = b*d + y*z;
        textBoxA.Text = A.ToString();
    }
  }
}a
```

II.   Triangular Channel
```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
  public partial class Form7 : Form
  {
    public Form7()
    {
        InitializeComponent();
    }

    private  void  button1_Click(object  sender,
EventArgs e)
    {
        double d, z, A;
        d = Convert.ToDouble(textBoxD.Text);
```

```
    z = Convert.ToDouble(textBoxZ.Text);
    double y = Math.Pow(d, 2);
    A = z * y;
    textBoxA.Text = A.ToString();
    }
  }
}
```

III. Parabolic Channel

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
  public partial class Form8 : Form
  {
    public Form8()
    {
      InitializeComponent();
    }

    private void button1_Click(object sender,
EventArgs e)
    {
      double t, d, A;
      t = Convert.ToDouble(textBoxT.Text);
      d = Convert.ToDouble(textBoxD.Text);
      A = 2 * t * d / 3;
      textBoxA.Text = A.ToString();
    }
  }
}
```

Wetted Perimeter
I. Trapezoidal Channel

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
  public partial class Form9 : Form
```

```
  {
    public Form9()
    {
      InitializeComponent();
    }

    private void Form9_Load(object sender,
EventArgs e)
    {

    }

    private void button1_Click(object sender,
EventArgs e)
    {
      double b, d, z, P;
      b = Convert.ToDouble(textBoxB.Text);
      d = Convert.ToDouble(textBoxD.Text);
      z = Convert.ToDouble(textBoxZ.Text);
      double y = Math.Pow(z, 2);
      P = b + 2 * d * (y + 1);
      textBoxP.Text = P.ToString();
    }
  }
}
```

II. Triangular Channel

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
  public partial class Form10 : Form
  {
    public Form10()
    {
      InitializeComponent();
    }

    private void button1_Click(object sender,
EventArgs e)
    {
      double d, z, P;
      d = Convert.ToDouble(textBoxD.Text);
      z = Convert.ToDouble(textBoxZ.Text);
      double y = Math.Pow(z, 2);
      P = 2 * d * (y + 1);
      textBoxP.Text = P.ToString();
```

```
        }
      }
}

III.    Parabolic Channel
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Hydraulic_Conveyence
{
   public partial class Form11 : Form
   {
      public Form11()
      {
         InitializeComponent();
      }

      private void button1_Click(object sender,
EventArgs e)
      {
```

```
         double d, t, P;
         d = Convert.ToDouble(textBoxD.Text);
         t = Convert.ToDouble(textBoxT.Text);
         double z = Math.Pow(d, 2);
         P = t * (8 * z + 2 * t);
         textBoxP.Text = P.ToString();
      }
   }
}
```

VIII.   RESULT AND DISCUSSION
This chapter deals with the results obtained by calculation of the Irrigation and Drainage formulae using Visual Studio. The programme is prepared in the C# language, Windows Form Application, Visual Studio 2022.

8.1 Steps to be followed
1) Enter the option from 1 to 9 serially.
2) Give the input values.
3) After pressing enter, output will be displayed.
4) Again press the enter key to switch over to the main page.
5) Follow the same procedure to design the different parameters.

Fig. 4.1 Main Page

Fig.4.2 Continuity Equation
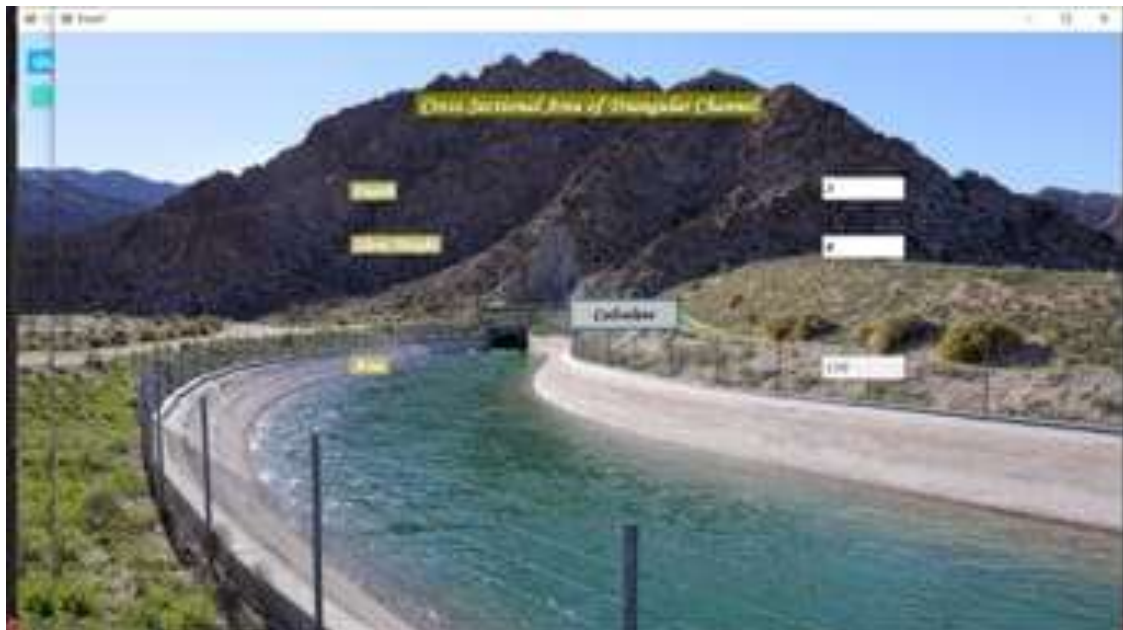

Fig.4.3 Manning's Equation

Fig.4.4 Chezy's Equation

Fig.4.5 Hydraulic Radius

IX. CONCLUSION

The hydraulic conveyance such as continuity equation, manning's equation, chezy's equation, hydraulic radius, cross-sectional area and wetted perimeter were accurately determined. Thus, this is time consuming. So by using the software windows form application, Visual Studio 2022; project work was done accurately and in very less time. Thus software found to be beneficial for determining hydraulic conveyance.

The calculations were done accurately using windows form application.

❖ It is user friendly.
❖ It is time efficient.

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