ABSTRACT

Physics education research has devoted a great deal of energy and attention to the question of how to help students learn/construct the concepts of physics faster/better and the difficulties that students have in changing their prior conceptions.

In this project, a novel approach to analysing of the role of language in learning physics is carried out.

The one of the physics lab experiment is chooser and it is explained as a graphical representation by using Computer programming like C-Program and Visual Basic.

In this present work, the following physics experiments are selected.

1. Youngs Modulus – Uniform bending (Pin and Microscope)
2. Youngs Modulus – Non-Uniform Bending (Single optic lever)
3. Surface Tension Capillary Rise Method

In this present work, the following computer languages are selected.

1. C-Programming
2. Visual Basic

Keywords: Program coding, Graphical representation, Input, Output, Calculation.

CONTENTS

CHAPTER 1

Introduction

1. Introduction

Physics education research has devoted a great deal of energy and attention to the question of how to help students learn/construct the concepts of physics faster/better and the difficulties that students have in changing their prior conceptions. Researchers encounter many different representations of physics ideas: graphs, equations, tables, pictures, diagrams, and words. Physics education researchers have extensively studied student's difficulties with these representations and how to help student's master activities such as reading and interpreting graphs, or connecting equations to physical reality.

Due to Covid-2019, the teaching and learning process are gets so changes.

Our Project outputs can be useful to study the physics experiments in digital class room. Due to Covid -19, the method of teaching process is changed from offline mode to online mode. So, Results from our project is a little bit application for learning process.

1.1 Aim

To develop a graphical representation of physics practical with the support of computer skills.

1.2 Motivation

To learning and understanding of physics by the support of computer program.

In order to make everyone to understand the hardest subject in an easy way (Graphical representations). Because visual images can be easily reached to learners compared than the explanation.

1.3 Project Problem

The graphical representation is developed for the following physics experiments.

1. Youngs Modulus – Uniform bending (Pin and Microscope)
2. Youngs Modulus – Non-Uniform Bending (Single optic lever)
3. Surface Tension Capillary Rise Method

The above mentioned experiments are done in physics laboratory and its explained by using computer programming which are listed below.

1. C-Programming
2. Visual Basic

C was originally developed at Bell Labs by DENNIS RITCHIE between 1972 and 1973 to construct utilities running on Unix. It was applied to re-implementing the kernel of UNIX operating system. During the 1980s, C gradually gained popularity. It has become one of the most widely used programming languages with C compilers from various vendors available for the majority of existing computer architectures and operating systems. C has been standardized by the ANSI since 1989 (ANCI C) and by the International organization for Standardization (ISO). C is an imperative procedural language. It was designed to be compiled to provide low-level access to memory and language constructs that map efficiently to machine instructions, all with minimum runtime support.

Visual basic is a third-generation event-driven programming language from Microsoft known for its Component Object Model (COM) programming model first released in 1991 and declared legacy during 2008. Microsoft intended Visual Basic to be relatively easy to learn and use, Visual basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or Activex Data objects, and creation of Activex controls and objects. Visual Basic 6.0 extended support ended in March 2008; however, primary components of the Visual Basic 6.0 development environment run in all 32-bit versions of Windows up to and including Windows 10.

CHAPTER 2

Literature Review

1. Literature Review

- Scientific Programming in C by Susi Lehtola.

  The aim of the above course is to approach C programming with practical applications. Because of this the course requires proficiency in mathematics at the level of Mathematical Methods for Physics (MAPU)

- Introduction to Numerical Programming: A Practical Guide for Scientists and Engineers Using Phython and C/C++ by Titus A. Beu

  The material presented includes many topics treated in a numerical analysis course and contains a lot of coding examples in Phython, and C/C++. This text introduces platform-independent numerical programming using Phython and C/C++, and appeals to advanced undergraduate and postgraduate students in natural sciences and engineering, researchers involved in scientific computing, and engineers carrying out applicative calculations.

CHAPTER 3

System 1 - Youngs Modulus – Uniform Bending-I (Pin and Microscope)

3. System 1 - Youngs Modulus – Uniform Bending-I (Pin and Microscope)

3.1Experimental Work

3.1.1 Aim

To determine Young's modulus of elasticity of the material of the beam, subjecting it to uniform bending.

3.1.2 Apparatus

Long rectangular beam, two knife edges, two weight hangers with equal dead weights, two sets of slotted weights, Vernier microscope, pin, etc.

3.1.3 Procedure

The rectangular, uniform beam AB is placed symmetrically on the knife edges K1 and K2.

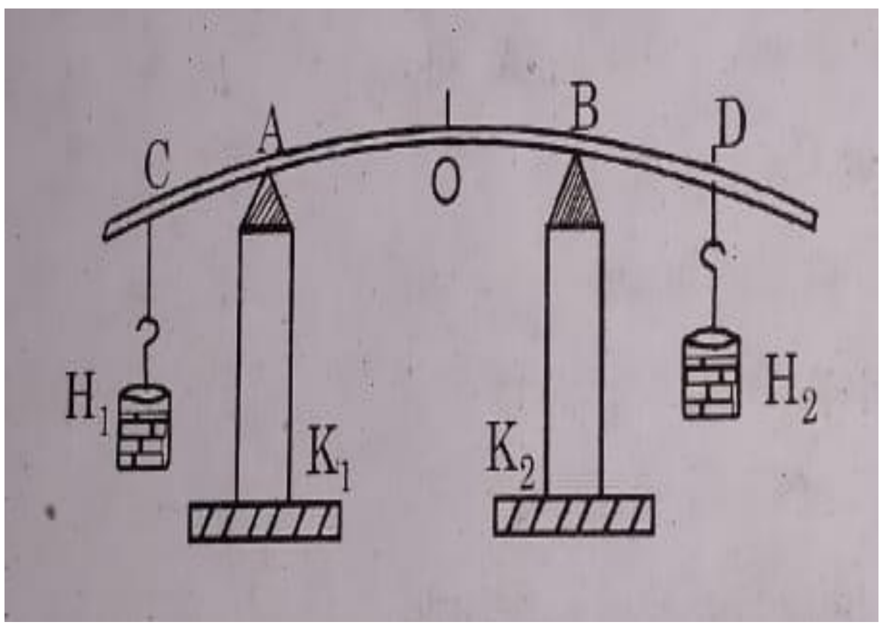

Figure.1

The weight hangers H1 and H2 with dead weight W are suspended at C and D with equal distance from A and B respectively as shown in Figure.1. A pin is attached vertically at the midpoint O of the beam, with its tip pointing upward. Vernier microscope is placed nearer to the pin in horizontal position and is adjusted to focus the tip of the pin. The horizontal cross wire of the eyepiece is made to coincide with the tip of the pin. The vertical main scale reading, together with coinciding Vernier scale divisions are noted. This is the first reading with only the dead weight W on both the weight hangers. Now the loads are added to the hangers equally in the steps of m (equal to, say, 50g). Readings are taken in each case, after making the horizontal cross wire to coincide with the tip of the pin. Experiment is again performed by removing equal weights from both the hangers and readings are record as in Table 1. To reduce error, the shift for 4m is calculated first as shown in Table 1. To length l of the beam between knife edges, the distance a of each weight hanger from the nearest knife edge are measured.

Table.1

To determine the Elevation(x):-

Load	Microscope Reading								Mean 10^{-2} m	Elevation (x)
	Loading				Unloading					
	MSR 10^{-2}m	VSC div	VSR 10^{-2}m	TR 10^{-2}m	MSR 10^{-2}m	VSC div	VSR 10^{-2}m	TR 10^{-2}m		
W=50	9.55	10	0.1	9.65	9.6	25	0.25	9.85	9.75	
W+m	9.6	14	0.14	9.74	9.7	18	0.18	9.88	9.81	0.475
W+2m	9.75	20	0.2	9.95	9.85	20	0.2	10.5	10.225	0.235
W+3m	9.85	24	0.24	10.09	9.9	10	0.1	10	10.045	0.39
W+4m	10.15	28	0.28	10.43	10.15	30	0.3	10.8	10.615	

Mean: $0.3667*10^{-2}$m

Using vernier calipers and screw gauge, the breadth b and thickness d of the beam are respectively found out. The experiments may be repeated either for different length of beam between the knife edges or for different symmetric points of suspension of the hangers.

Table. 2

To determine the breadth of the beam using vernier caliper (b)

Least Count = 0.01 cm

S.No	**MSR (10^{-2}m)**	**VSC (div)**	**VSR=VSC*LC (10^{-}m)**	**TR=MSR+VSR (10^{-2}m)**
1	2.7	2	0.02	2.72
2	2.7	6	0.06	2.76
3	2.7	8	0.08	2.78
4	2.7	7	0.07	2.77
5	2.7	10	0.1	2.8

Mean: $2.766*10^{-2}$m

Table. 3

To determine the thickness of the beam using screw gauge (d)

Least Count = 0.01mm

Zero Correction = ± Zero Error*Least Count

Zero Correction = -8*0.01 = - 0.08

S.No	**PSR (10^{-3}m)**	**HSC (div)**	**HSR=HSC*LC (10^{-3}m)**	**TR=PSR+HSR (10^{-3}m)**	**CR=TR±ZC (10^{-3}m)**
1	5	24	0.24	5.24	5.16
2	5	31	0.31	5.31	5.23
3	5	35	0.35	5.35	5.27
4	5	40	0.40	5.40	5.32
5	5	41	0.41	5.41	5.33

Mean: $5.262*10^{-3}$m

3.1.4 Formula

A uniform rectangular beam of width b and thickness d, placed symmetrically on two knife edge separated by a distance l , is subjected to uniform bending by a constant bending couple at all points of the beam. Thus, in uniform bending the elevation of the midpoint of the beam due to load of mass m applied on both the ends at a distance a from the nearest knife edge is given by

$$\mathrm{x} = \frac{3}{2}\left(\frac{\mathrm{g}\mathrm{a}l^2}{\mathrm{b}d^3}\right)\left(\frac{\mathrm{m}}{\mathrm{E}}\right)$$

And hence the Young's Modulus of the material of the beam

$$E = \frac{3}{2}\left(\frac{gal^2}{bd^3}\right)\left(\frac{m}{x}\right) \quad \mathrm{Nm^{-2}}$$

By measuring mean elevation s for load m, the Young's Modulus is determined.

3.1.5 Observation:

Distance between knife edges	a = 0.1 m
Distance between weight hanger and adjacent knife edge	l= 0.6 m
Breadth of the beam	b = 0.02766 m
Thickness of the beam	d = 0.00526 m
Acceleration due to gravity	g = 9.81 ms^{-2}
Mean	(m/x) = $\frac{0.05}{0.00367}$ Kgm^{-1}

3.1.6 Calculation:

g = 9.81; a = 0.1; l = 0.6; b = 0.02766; d = 0.00526; m = 0.05; x = 0.00367

$$\mathrm{E} = \frac{3}{2}\left(\frac{9.8*0.1*(0.6)^2}{0.02766*(0.00526)^3}\right)\left(\frac{0.05}{0.00367}\right)$$

E= $1.7901*10^{10}$ Nm^{-2}

Young's Modulus by calculation = $1.7901*10^{10}$ Nm^{-2}

3.2C-PROGRAM

3.2.1 Input:

C –Program coding for the Young’s modulus experiment (uniform bending).

```
#include<stdio.h>

#include<conio.h>

void main()

{

	printf("YOUNG'S MODULUS BY UNIFORM BENDING METHOD\n\n");

	printf("E=3/2*(g*a*l*l/b*d*d*d)*(m/x)N/M*M\n");

	float a,l,b,d,x;

	float const g=9.81;

	float const m=0.05;

	double E;

	printf("\n\n g -- Acceleration due to gravity(m/s^2)=9.81\n\n");

	printf("\n\n m -- Load producing the depression(mg)=0.05\n\n ");

	printf("\n\n a -- Distance between the knife edges and load applied(cm)\n\n");

	printf("\t a = ");

	scanf("%f",&a);

	printf("\n\n l -- Distance between the two knife edges(cm)\n\n");

	printf("\t l = ");

	scanf("%f",&l);

	printf("\n\n b -- Breadth of the beam(cm)\n\n");

	printf("\t b = ");

	scanf("%f",&b);

	printf("\n\n d -- Thickness of the beam(mm)\n\n");
```

```
	printf("\t d = ");
	scanf("%f",&d);
	printf("\n\n x -- Elevation\n\n");
	printf("\t x = ");
	scanf("%f", &x);
	E=((3/2)*((g*a*l*l)/(b*d*d*d))*(m/x));
	printf("\n\n The Young's modules (E) = %f",E);
	getchar();
}
```

3.2.2 Output format:

```
YOUNG'S MODULUS BY UNIFORM BENDING METHOD

E=3/2*(g*a*l*l/b*d*d*d)*(m/x)N/M*M

 g -- Acceleration due to gravity(m/s^2)=9.81
 m -- Load producing the depression(mg)=0.05
 a -- Distance between the knife edges and load applied(cm)
                  a = 0.1
 l -- Distance between the two knife edges(cm)
      l = 0.6
b -- Breadth of the beam(cm)
                   b = 0.02766
 d -- Thickness of the beam(mm)
      d = 0.00526
 x -- Elevation
         x = 0.00367
 The Young's modules (E) = 1792905380.377628
[Process completed (code 10) - press Enter]
```

3.3 Visual Basic

3.3.1 Input

Visual Basic coding for the Young's modulus experiment (uniform bending).

```
Private Sub Command1_Click()
Text8.Text = (Val(3/2) * (Val(Text1.Text)) * (Val(Text2.Text)) * (Val(Text3.Text)) * (Val(Text3.Text))) / ((Val(Text4.Text)) * (Val(Text5.Text)) * (Val(Text5.Text)) * (Val(Text5.Text))) * ((Val(Text6.Text)) / (Val(Text7.Text)))
End Sub
Private Sub Command2_Click()
Text1.Text = " "
Text2.Text = " "
Text3.Text = " "
Text4.Text = " "
Text5.Text = " "
Text6.Text = " "
Text7.Text = " "
Text8.Text = " "
End Sub
Private Sub Command3_Click()
End
End Sub
```

3.3.2 Output format

After importing the suitable image in Visual Basic, the output format is shown in the Figure.2.

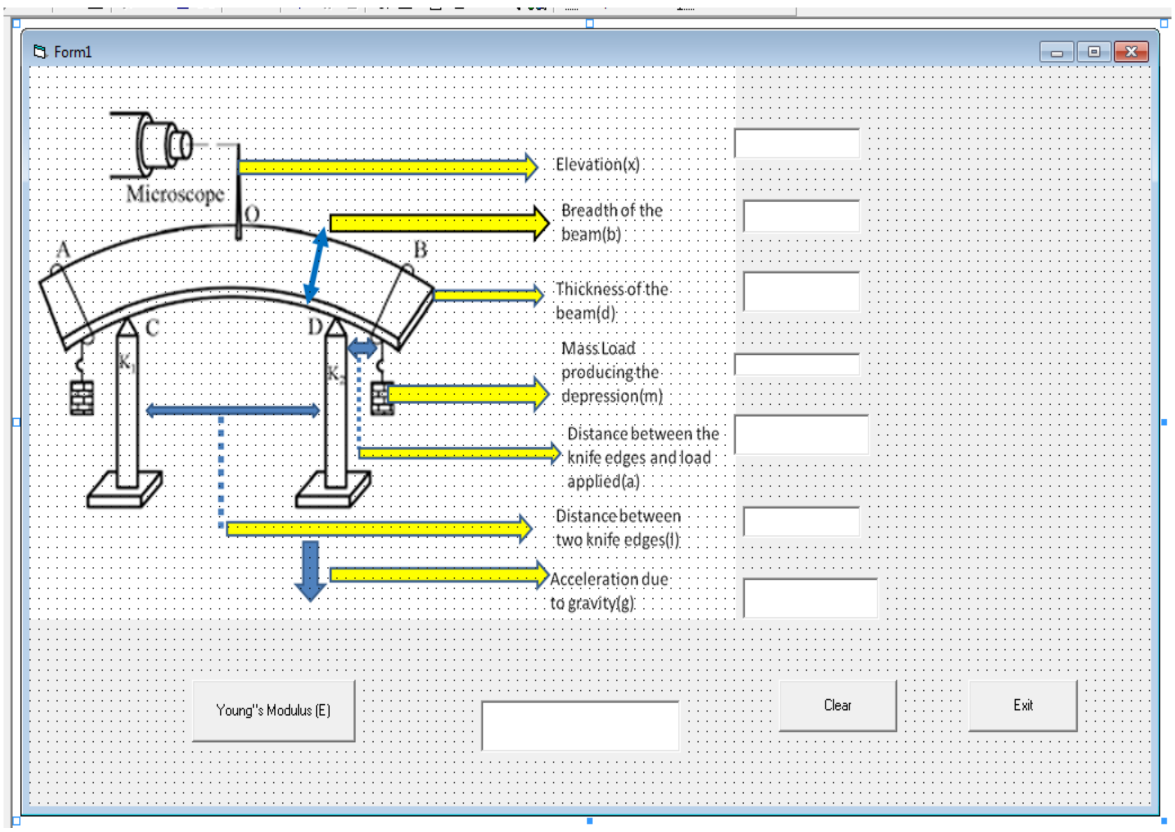

Figure.2

CHAPTER 4

System 2 - Youngs Modulus – Uniform Bending-I (Single optic lever)

System 2- Youngs Modulus – Uniform Bending-I (Single optic lever)

4.1 Experimental Work

4.1.1 Aim

To determine the Young's modulus of elasticity of the material Of a beam, subjecting it to non-uniform bending using single optic lever.

4.1.2 Apparatus

Rectangular bar, knife edges, optic lever, scale and telescope etc.

4.1.3 Procedure

The depression at the mid point of a beam subjected to non- uniform bending can be measured accurately using single optic lever with scale and telescope arrangement. As described the given beam is placed symmetrically on knife edges. The front leg of single optic lever is resting on the midpoint C of the beam. The other two hind legs are resting on a suitable support kept at same level behind the beam.

The scale and telescope are kept at a distance of about one metre in front of optic lever. The weight hanger H with a dead weight W is suspended at the midpoint C of the bar.

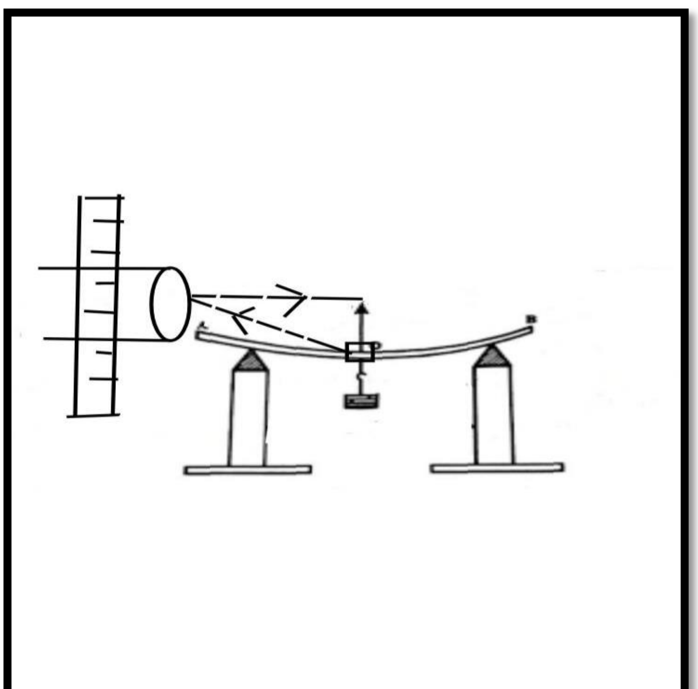

Figure.3

The telescope is properly focused to see the image of the vertical scale reading formed by the plane mirror of the opticlever (Figure.3). The telescope is adjusted to make the horizontal cross wire of the eye piece to coincide with certain scale reading (preferably with the middle zero of the scale). This is the first reading with the initial dead weight W. Then weights are added to hanger in steps of m, say 50g. Each time, the scale reading viewed through telescope is taken. For convenience, including the reading for the dead weight W, eight or ten (even number of) readings can be taken while loading.

The procedure is repeated by unloading the weights in steps of m. The readings are Tabulated Below (Table.4).

Table. 4

Load (10^{-3} kg)	**Telescope Reading (cm)**		**Mean 10^{-2} m**	**Shift far 10^{-2} m**
	Loading	**Unloading**		
W	29.5	29.4	29.4	
W+m	27.1	26.9	27	4.7
W+2m	24.9	24.4	24.7	4.9
W+3m	22.1	22	22.1	5
W+4m	19.7	19.6	19.7	5
W+5m	17.1	17.1	17.1	

Mean= 4.9 $*10^{-2}$m

The distance D of the scale from the mirror and the length l of the beam between the knife edges are measured accurately.

Table. 5

To find the Breath of the beam using vernier caliper (b)

Least Count = 0.01 mm

MSR (10^{-2}m)	**VSC (div)**	**VSR=VSC ×LC (10^{-3}m)**	**TR=MSR± VSR (10^{-2}m)**
2.5	5	0.05	2.55
2.5	15	0.15	2.65
2.5	10	0.1	2.61
2.5	8	0.08	2.58
2.5	9	0.09	2.59

Breath of the beam (b) Mean= 2.594 *10^{-2}m

Table.6

To find the thickness of the beam using screw gauge (d)

Least Count = 0.01mm

Zero Correction = Zero Error× Least Count

Zero Correction = -10 × 0.01 = -0.1

PSR (mm)	**HSC (div)**	**HSR=HSC ×LC (10^{-3} m)**	**TR =PSR+HSR (10^{-3} m)**	**CR=TR± ZC (10^{-3} m)**
5	43	0.43	5.43	5.33
5	45	0.45	5.45	5.35
5	41	0.41	5.41	5.31
5	42	0.47	5.47	5.37
5	50	0.50	5.50	5.40

Mean = 5.352* 10^{-3} m

4.1.4 Formula

The depression s of the midpoint of the beam under non- uniform bending due to a load m, as seen in previous case, is given by

$$E = \left(\frac{gl^3}{4bd^3}\right)\left(\frac{m}{s}\right) \ \ Nm^{-2}$$

Let p be the perpendicular distance from the leg to the line joining the hind legs of the optic lever as shown. It can be shown the depression s in the beam for a load m and the shift x in the scale reading are related by the expression: S/p= x/2D, Substituting the Value of s in terms of x, p and D,

Young's Modules $E = \frac{gl^3 D}{2bd^3 p}\left(\frac{m}{x}\right) \ \ Nm^{-2}$

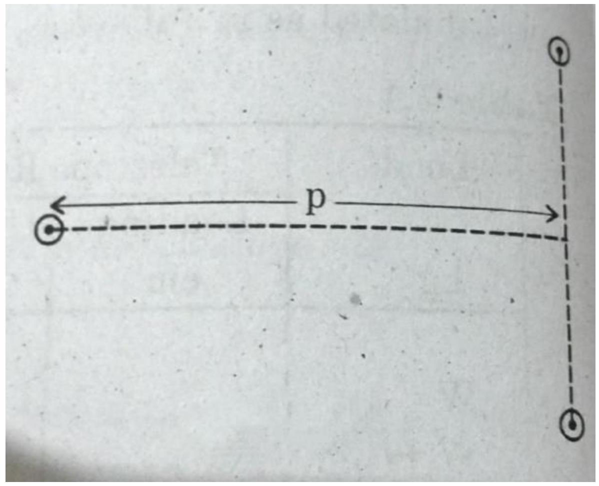

Figure. 4

To find the perpendicular distance p, the three legs of optic lever are pressed gently on a plane paper and the impression of the tips of three legs form vertices of a triangle (Figure.4). The perpendicular distance from the tip of front leg is measured.

4.1.5 Observation

Distance between the knife edges l = 0.7 m

Breadth of beam b = 0.02595 m

Thickness of beam d = 0.005352 m

Acceleration due to gravity. g = 9.81 ms^{-2}

Distance between the mirror and scale D = 0.65 m

Perpendicular distance between front leg and line joining hind legs

P = 0.048 m & m = 0.1 kg, X = 0.049 m

4.1.6 Calculation

L=0.7, b=0.02595, g=9.8, d=0.005352, D=0.65, m=0.1, x=0.049

$$E = \frac{9.8 * (0.7)^3(0.65)}{2 * (0.02595)(0.005352)^3(0.048)}\left(\frac{0.1}{0.049}\right) \quad Nm^{-2}$$

$$E = 1.16756\times10^{10}\ Nm^{-2}$$

Young's Modulus by calculation = 1.16756×10^{10} Nm^{-2}

4.2 C-PROGRAM

4.2.1 Input

C-program coding for the Young’s Modulus experiment (non- uniform bending)

```
#include<stdio.h>

#include<conio.h>

Void main()

{

        printf("YOUNG'S MODULES BY NON-UNIFORM BENDING USING OPTIC
        LEVER\n\n");

        float g,l,D,b,d,p,m,x,E;

        printf("\n\n g--Acceleration due to gravity (m/s^2)n\n");

        printf("\n\n l--Distance between the two knife edges (m)\n\n");

        printf("\t l=");

        scanf("%g",&l);

        printf("\n\n D--Distance between mirror and scale (cm)\n\n");

        printf("\t D=");

        scanf("%g",&D);

        printf("\n\n b--Breadh of the beam (m)\n\n");

        printf("\t b=");

        scanf("%g",&b);

        printf("\n\n d--Thickness of the beam (m)\n\n");

        printf("\t d=");

        scanf("%g",&d);

        printf ("\n\n p--Perpendicular distance between front leg and hind leg (m)\n\n");

        printf("\t p=");

        scanf("%g",&p);

        printf("\n\n m--mass (kg)\n\n");
```

```
	printf("\t m=");
	scanf("%g",&m);
	printf("\n\n x--Elevation (m)\n\n");
	printf("\t x=");
	scanf("%g",&x);
	E=((9.8*l*l*l*D*m)/(2*b*d*d*d*p*x));
	printf("\n\n The Young's modulus (E)=%g",E);
	getchar ();
}
```

4.2.2 Output format

YOUNG'S MODULES BY NON-UNIFORM BENDING USING SINGLE OPTIC LEVER

E=(g*l^3)/(4*b*d^3)(m/s)   Nm-2

g--Acceleration due to gravity (m/s^2)n

L--Distance between the two knife edges (m)

L=0.7

D=Distance between mirror and scale (cm)

D=0.65

b=Breadth of the beam (m)

b=0.02595

d=Thickness of the beam (m)

d=0.005352

P=Perpendicular distance between front leg and hind leg (m)

P=0.048

M=mass(kg)

m=0.1

X=Elavation (m)

x=0.049

The Young's modulus (E)=1.16756e^+10

[process completed (code 10) -press Enter]

4.3 Visual Basic

4.3.1 Input

Visual Basic coding for the Youngs modulus experiment (Non-uniform bending).

```
Private Sub Command1_Click()

Text9.Text = (Val(Text1.Text))*(Val(Text2.Text))*(Val(Text2.Text))*(Val(Text2.Text))*
(Val(Text3.Text))*(Val(Text4.Text))/(2*(Val(Text5.Text)*(Val(Text6.Text))*(Val(Text6.Text))
*(Val(Text6.Text))*(Val(Text7.Text))*(Val(Text8.Text))

End Sub

Private Sub Command2_Click()

Text1.Text=  " "

Text2.Text=  " "

Text3.Text=  " "

Text4.Text=  " "

Text5.Text=  " "

Text6.Text=  " "

Text7.Text=  " "

Text8.Text=  " "

Text9.Text =  " "

End Sub

Private Sub Command3_click()
```

End

End Sub

4.3.2 Output format

After importing the suitable image in Visual Basic, the output format is shown in the Figure.7.

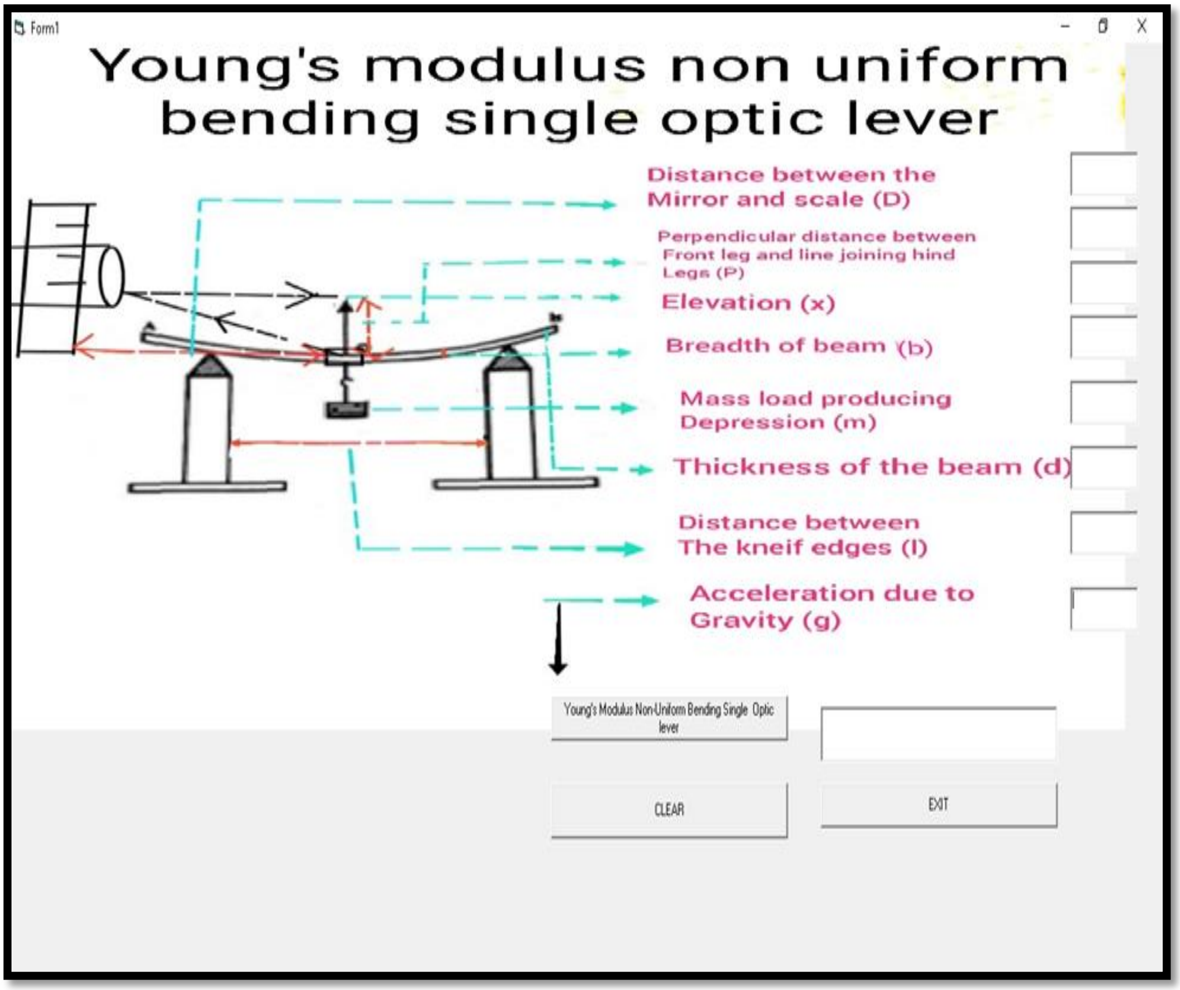

Figure. 7

CHAPTER 5

System 3 - Surface Tension - Capillary Rise

System 3 - Surface Tension - Capillary Rise

5.1 Experimental Work

5.1.1 Aim

To find the surface tension of liquid (Water) by capillary rise method.

5.1.2 Apparatus Required:

Capillary tube of uniform bore, a beaker with given liquid, a pointer, a vernier microscope, etc.

5.1.3 Procedure

A well cleaned, sufficiently long uniform capillary tube is taken and is passed through a cork. The cork is clamped to a rigid support so as to keep the tube vertical. One end of the tube is attached to a rubber tubing. The free end of the tube is dipped in a containing the liquid (Figure.8).

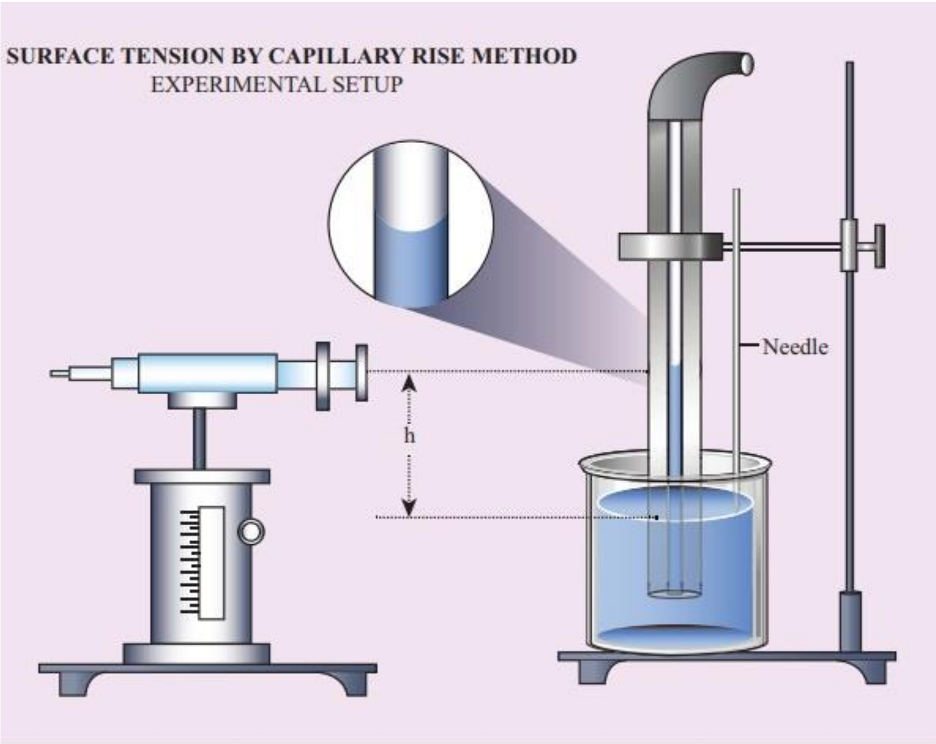

Figure.8

A pointer is fixed through the same cork, close to the capillary tube. The pointer is adjusted so that the tip of it just touches the surface of liquid in the beaker as shown in Figure.8. The liquid rises in the tube due to capillary and by repeatedly pressing and releasing the rubber tube, a continuous liquid column is formed. Care should be taken to remove any air bubbles or breaks along the length of the column. The pointer is checked to make the tip just touching the surface of the liquid.

A microscope in horizontal position is focused to see the meniscus of the liquid. The horizontal cross wire is made tangent to the concave part of the meniscus as shown in diagram. The vertical main scale reading and corresponding coinciding vernier scale divisions are noted. Now the beaker is removed carefully and the microscope is adjusted to focus the tip of the pointer. The horizontal cross wire should just touch the tip and readings of microscope in vertical scale are taken. The difference in readings gives the height h of the liquid column in the capillary tube. Experiments are repeated by changing the level of liquid in the beaker and subsequently adjusting the tip of the pointer to touch a Mean value of height h is determined.

The radius r of the bore the capillary tube is found out by measuring inner diameter using vernier microscope. The tube is fixed horizontal and microscope is focused to the cross-section of the bore. Working on the horizontal movement of the vernier, the point of intersection of the cross wires is made as coincide at A and B of horizontal diameter AB, shown in figure.

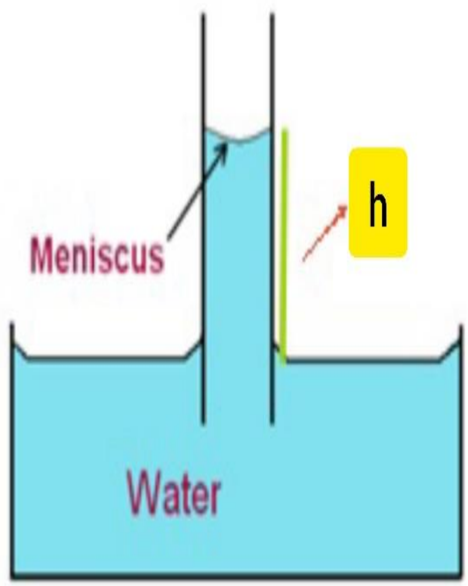

Figure 9.a

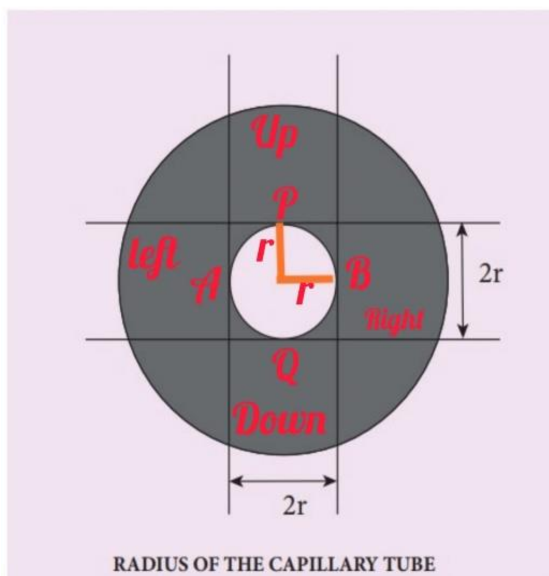

Figure 9.b

Readings are taken in horizontal scale and are recorded as in table. The differences in readings give the diameter 2r of the bore. The experiment is performed on vertical movement of the

Vernier and readings are noted corresponding to the points P and Q of vertical diameter PQ (Figure 9 a & b). Thus the mean diameter and hence the radius of the bore is determined.

The density p of the liquid is determined using Hare's apparatus. The density of water is taken to be 1000 kg m^{-3}

5.1.4 Formula

Let h be the height of liquid column in a capillary tube of radius r. If ρ is the density of the liquid, then the surface tension T of the liquid is given by

$$\boldsymbol{T = \frac{r}{2}\left(h + \frac{r}{3}\right)\rho g} \quad \mathbf{N/m}$$

T → Surface tension of the liquid (Nm^{-1})

g → the acceleration due to gravity (ms^{-2})

h → Mean height of liquid column (m)

ρ →Density of the liquid (kg m^{-3})

r → Mean radius of the bore (m)

Table.7

Height of capillary rise L.C. =0.001 cm

S.No	Reading of the meniscus		O.R. (cm)	Reading of the tip		O.R. (cm)	Height H (cm)
	MSR (cm)	Coinciding VSD		MSR (cm)	Coinciding VSD		
1	7.6	0.039	7.639	3.3	0.032	3.332	4.30

Height of the capillary rise = 4.3* 10^{-2} m

Table.8

Radius of the bore r LC= 0.001cm

horizontal scale reading 2r								Diameter 2r A~B (cm)	Vertical scale reading 2r								Dia-mete 2r P~Q (cm)	Mean 2r cm
Left (A) cm				Right (B) cm					Up (P) cm				Down (Q) cm					
MSR	VSC div	VSR	TR	MSR	VSC div	VSR	TR		MSR	VSC Div	VSR	TR	MSR	VSC div	VSR	TR		
3.4	29	0.029	3.429	3.3	15	0.015	3.315	0.114	3.4	48	0.048	3.44	3.4	2	0.02	3.42	0.04	0.077

Radius of the bore = 0.077/2 = 0.0385*10^-2m

=3.85*10^-4m

5.1.5 Observations

Mean height of liquid column h = $4.3*10^{-2}$ m

Mean radius of the bore r = $3.8*10^{-4}$ m

Density of the liquid ρ = Relative density *1000 kg m^{-3}

[For water, p=1000 kg m^{-3}]

Acceleration due to gravity g = 9.8 ms^{-2}

5.1.6 Calculation

$$T = \frac{3.8*10^{-4}}{2}\left(4.3*10^{-2} + \frac{3.8*10^{-4}}{3}\right)*1000*9.8$$

T = 0.0803 N/m

Surface tension of given liquid (manual answer) = 0.0803 Nm^{-1}

5.2 C-PROGRAM

5.2.1 Input:

C –Program coding for the Surface Tension - Capillary Rise.

```
#include<stdio.h>
#include<conio.h>
```

```
Void main()
{
        Printf("SURFACE TENSION BY CAPILLARY RISE METHOD\n\n");
        Printf("T=((r/2)*(h+r/3)*(p*g))N/m\n\n");
{
        int p;
        float r, h, T, g,a;
        printf("p—Density of the liquid column(kg/m^3)\n\n");
        printf("\t p=");
        scanf("%d", &p);
        printf("r—Mean radius of the bore(cm)\n\n");
        printf("\t r=");
        scanf("%f", &r);
        printf("h—Mean height of the liquid column(cm)\n\n");
        printf("\t h=");
        scanf("%f", &h);
        printf("g—Acceleration due to gravity(m/s^2)\n\n");
        printf("\t g=");
        scanf("%f", &g);
        T=((r/2)*(h+r/3)*(p*g));
        printf("The surface tension of the liquid T= %f" ,T);
}
getchar();
}
```

5.2.2 Output format

SURFACE TENSION BY CAPILLARY RISE METHOD

T=((r/2)*(h+r/3)*(p*g))N/m

p—Density of the liquid column(kg/m^3)

p=1000

r—Mean radius of the bore(cm)

r=0.00038

h—Mean height of the liquid column(cm)

h=0.043

g—Acceleration due to gravity(m/s^2)

g=9.8

The surface tension of the liquid T= 0.080302

[Process completed (code 10) – press Enter]

5.3 Visual Basic

5.3.1 Input:

Visual Basic coding for the Surface Tension - Capillary Rise.

```
Private Sub Command1_Click()
Text5.Text = (Val(Text1.Text) / 2) * (Val(Text2.Text) + Val (Text1.Text) / 3) * Val(Text3.Text)
*Val(Text4.Text)
End Sub
Private Sub Command2 _Click()
Text1.Text =  " "
```

```
Text2.Text = " "
Text3.Text = " "
Text4.Text = " "
Text5.text = " "
End Sub
Private sub Command3 _Click()
End
End Sub
```

The suitable image for the above experiment is selected and imported in visual basic which is shown in the Figure 10.

5.3.2 Output format

After importing the suitable image in Visual Basic, the output format is shown in the Figure.10.

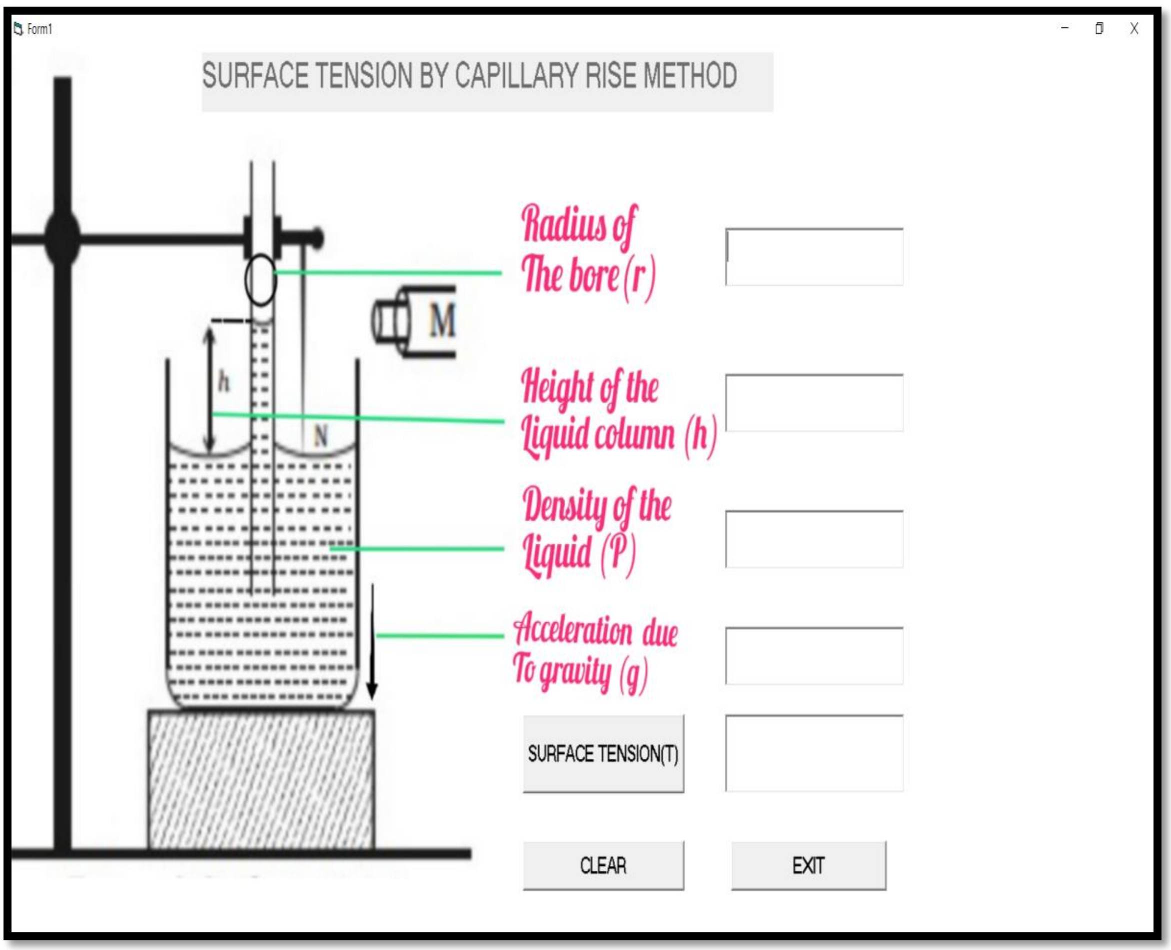

Figure.10

CHAPTER 6

Results and Discussion

6. Results and Discussion

Result from C-program and visual basic of selected experiments is reported here.

6.1 System 1- Youngs Modulus – Uniform Bending-I (Pin And Microscope)

```
Compile Result

YOUNG'S MODULUS BY UNIFORM BENDING M
ETHOD

E=3/2*(g*a*l*l/b*d*d*d)*(m/x)N/M*M


 g -- Acceleration due to gravity(m/
s^2)=9.81



 m -- Load producing the depression(
mg)=0.05



 a -- Distance between the knife edg
es and load applied(cm)

         a = 0.1


 l -- Distance between the two knife
 edges(cm)

         l = 0.6


 b -- Breadth of the beam(cm)

         b = 0.02766

 d -- Thickness of the beam(mm)

         d = 0.00526

 x -- Elevation

         x = 0.00367

 The Young's modules (E) = 179290538
0.377628
[Process completed (code 10) - press
 Enter]
```

Figure.11

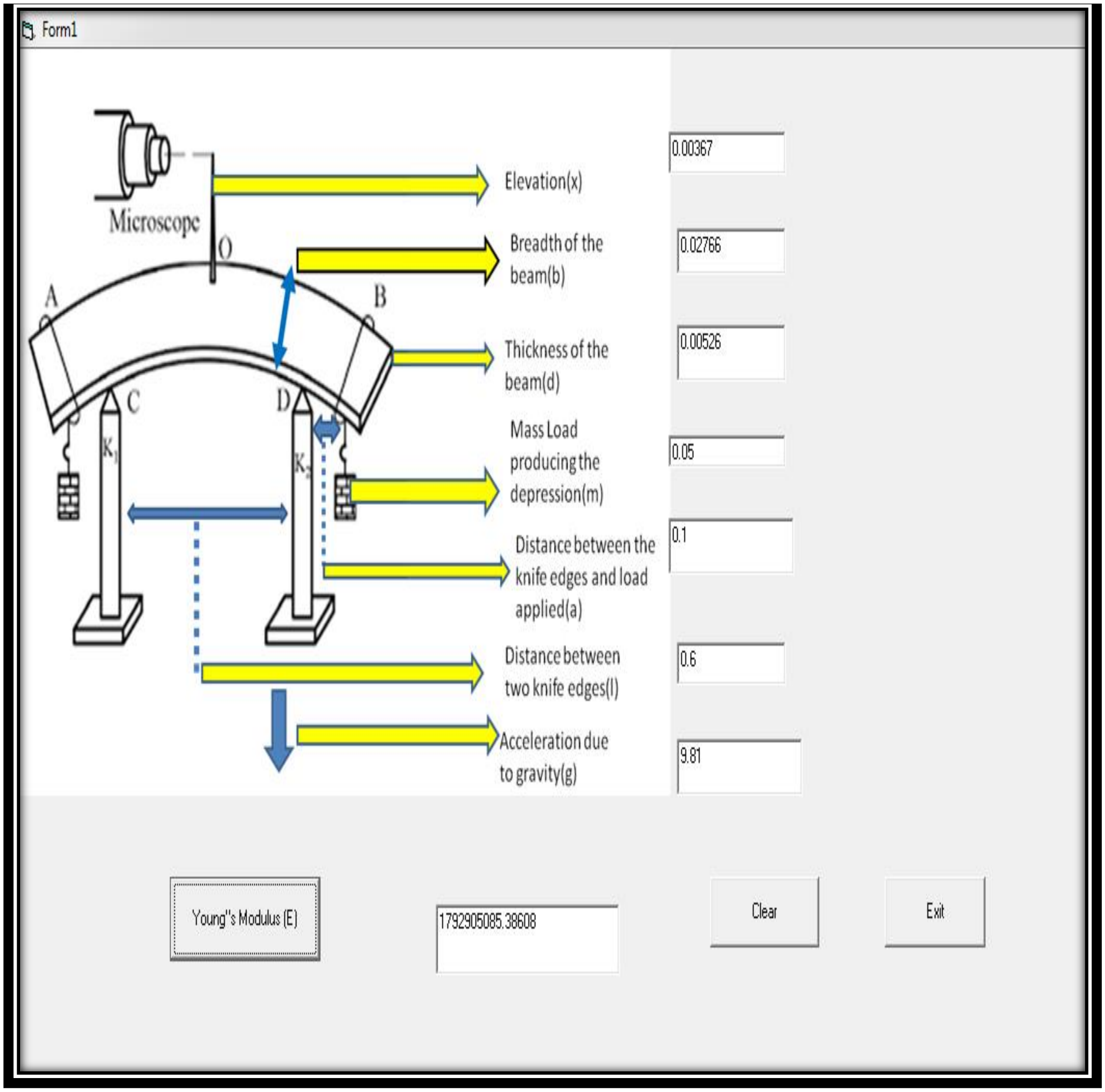

Figure.12

6.2 System 2 - Young’s Modulus – Non-Uniform Bending (Single Optic Lever)

```
YOUNG'S MODULES BY NON-UNIFORM BENDI
NG USING OPTIC LEVER


 g--Acceleration due to gravity (m/s
^2)n

 l--Distance between the two knife e
dges (m)

         l=0.7

 D--Distance between mirror and scal
e (cm)

         D=0.65


 b--Breadh of the beam (m)

         b=0.02595

 d--Thickness of the beam (m)

         d=0.005352

 p--Perpendicular distance between f
ront leg and hind leg (m)

         p=0.048

 m--mass (kg)
```

```
 p--Perpendicular distance between f
ront leg and hind leg (m)

         p=0.048


 m--mass (kg)

         m=0.1


 x--Elevation (m)

         x=0.049


 The Young's modulus (E)=1.16756e+10
[Process completed (code 10) - press
 Enter]
```

Figure.13

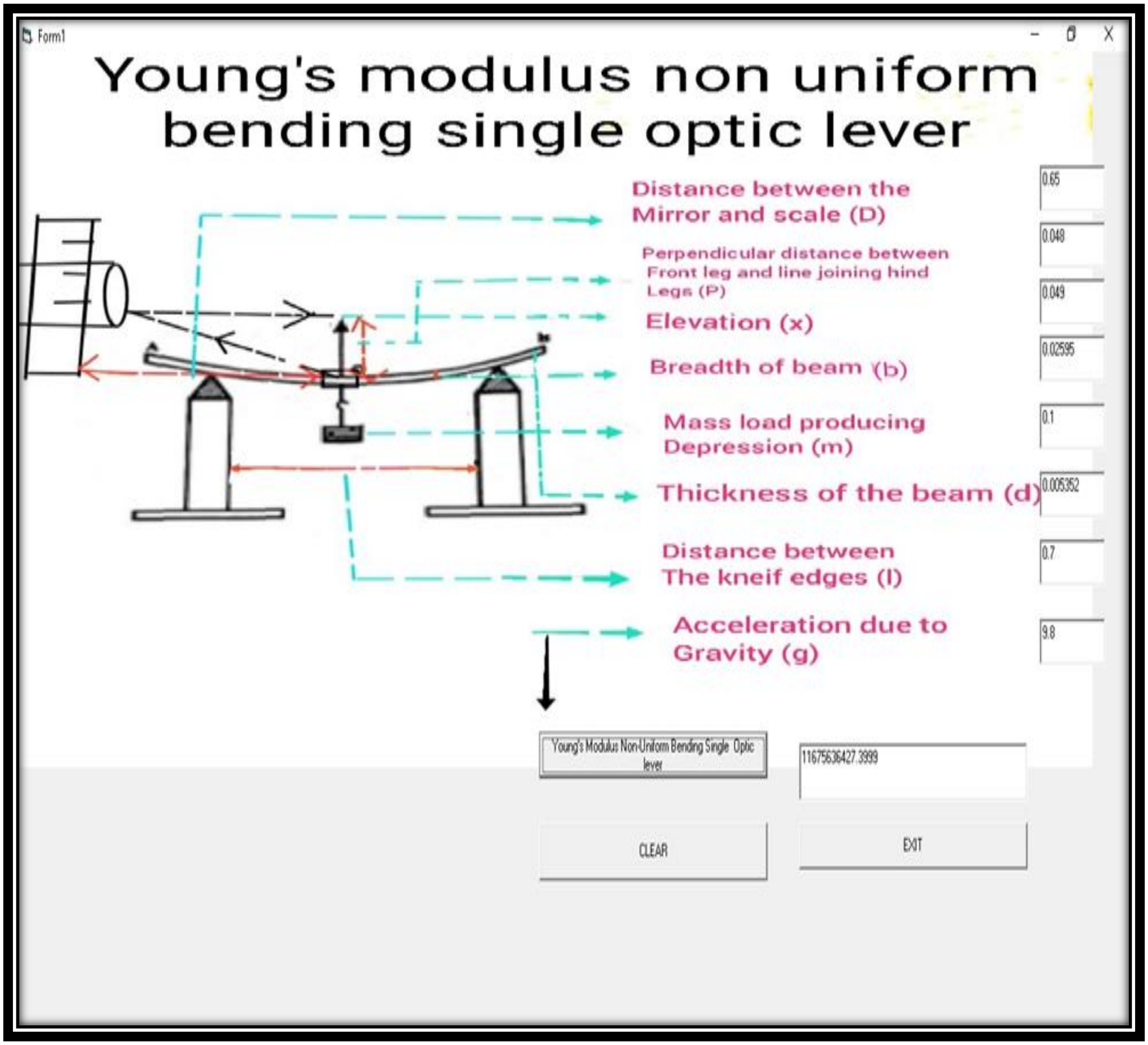
Form1
Young's modulus non uniform bending single optic lever
Distance between the Mirror and scale (D)
0.65
Perpendicular distance between Front leg and line joining hind Legs (P)
0.048
Elevation (x)
0.049
Breadth of beam (b)
0.02595
Mass load producing Depression (m)
0.1
Thickness of the beam (d)
0.005352
Distance between The kneif edges (l)
0.7
Acceleration due to Gravity (g)
9.8
Young's Modulus Non-Uniform Bending Single Optic lever
11675636427.3999
CLEAR
EXIT

Figure.14

6.3 System 3 - Surface Tension - Capillary Rise

```
Compile Result

SURFACE TENSION BY CAPILLARY RISE ME
THOD

T=((r/2)*(h+r/3)*(p*g))N/m

p--Density of the liquid column(kg/m
^3)

         p=1000
r--Mean radius of the bore(cm)

         r=0.00038
h--Mean height of the liquid column(
cm)

         h=0.043
g-- Acceleration due to gravity(m/s^
2)

         g=9.8
The surface tension of the liquid T=
 0.080302
[Process completed (code 10) - press
 Enter]
```

Figure.15

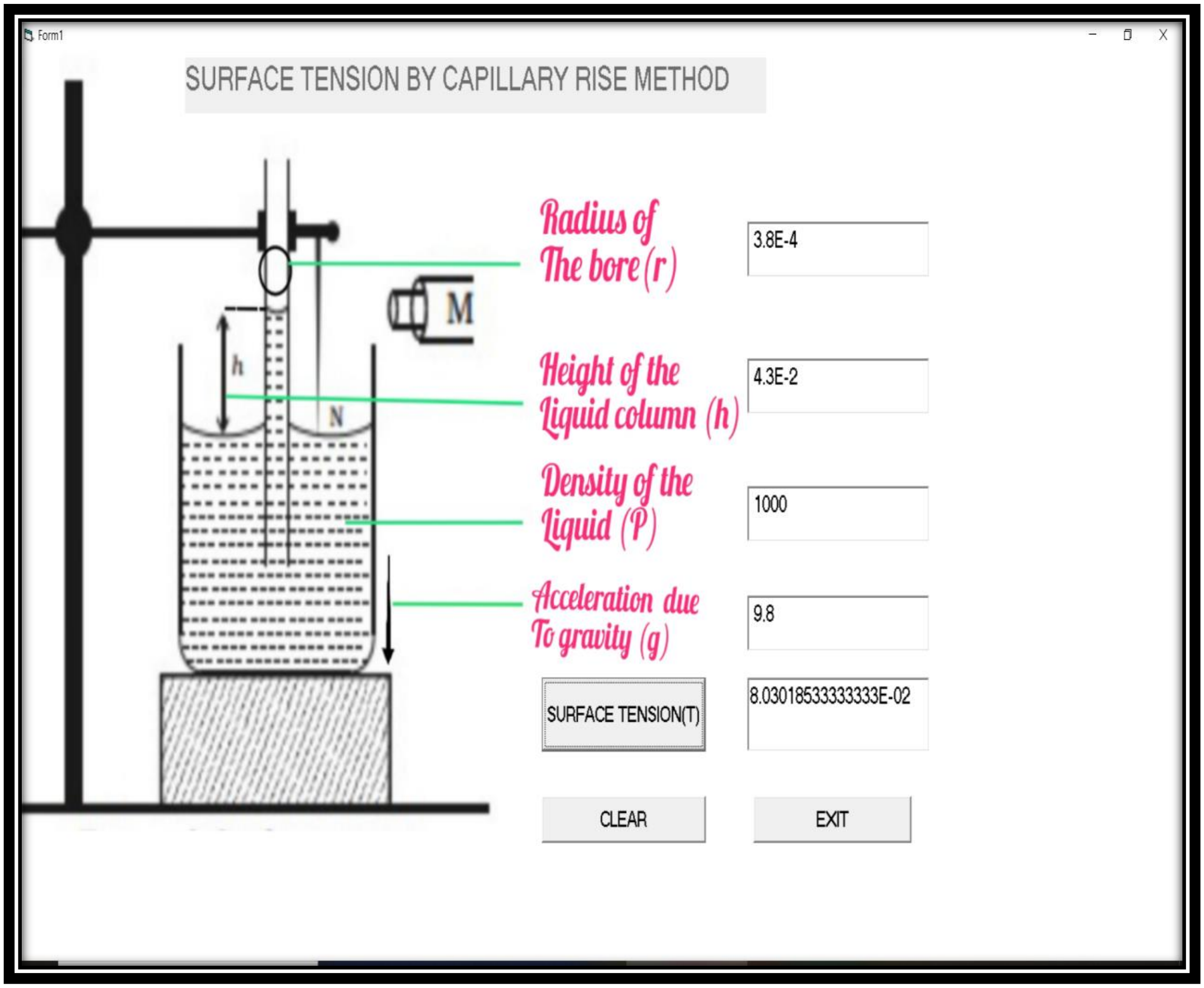

Figure.16

6.4 Discussion

The results from all the methods are coinciding with each other. The final output of visual basic is shows like a graphical representation. The parameter which is determined from practical experiment has some necessary observation data. The Visual basic output form design which explain the necessary observation due to calculate the parameter. The same results are obtained from C-program and Visual basic.

CHAPTER 7

Conclusion

7 Conclusion

- The selected physics practical are done in physics laboratory.
- The C-Program coding of the selected practical are written and it's successfully complied.
- The suitable graphical images are developed and it's imported in Visual basic.
- The visual basic coding of the selected practical are written and it's complied with graphical image.
- The graphical representation of selected practical's are successfully developed.

8. REFERENCES

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