

Scilab Textbook Companion for  
Hydraulics Made Easy  
by R. S. Dighe<sup>1</sup>

Created by  
Kvp Pradeep  
Chemical engineering  
Chemical Engineering  
IIT Bombay  
College Teacher  
Na

Cross-Checked by  
Lavitha Pereira

November 30, 2013

<sup>1</sup>Funded by a grant from the National Mission on Education through ICT, <http://spoken-tutorial.org/NMEICT-Intro>. This Textbook Companion and Scilab codes written in it can be downloaded from the "Textbook Companion Project" section at the website <http://scilab.in>

# Book Description

**Title:** Hydraulics Made Easy

**Author:** R. S. Dighe

**Publisher:** Royal Book Stall

**Edition:** 1

**Year:** 2005

**ISBN:** 0415250706

Scilab numbering policy used in this document and the relation to the above book.

**Exa** Example (Solved example)

**Eqn** Equation (Particular equation of the above book)

**AP** Appendix to Example(Scilab Code that is an Appednix to a particular Example of the above book)

For example, Exa 3.51 means solved example 3.51 of this book. Sec 2.3 means a scilab code whose theory is explained in Section 2.3 of the book.

# Contents

List of Scilab Codes	4
1 Hydrostatics	9
2 Flootation and Buoyancy	22
3 Flow of Water	27
4 Flow of Water through Orifices and Mouthpieces	34
5 Flow of water over Weirs	47
6 Flow of water through pipes	56
7 Flow through Open channels	76
8 Impact of Jets	86
9 Viscous flow	93
10 Miscellaneous Problems	97

# List of Scilab Codes

Exa 1.1	example 1 . . . . .	9
Exa 1.2	example 2 . . . . .	9
Exa 1.3	example 3 . . . . .	10
Exa 1.4	example 4 . . . . .	10
Exa 1.5	example 5 . . . . .	11
Exa 1.6	example 6 . . . . .	11
Exa 1.7	example 7 . . . . .	12
Exa 1.8	example 8 . . . . .	12
Exa 1.9	example 9 . . . . .	13
Exa 1.10	example 10 . . . . .	13
Exa 1.11	example 11 . . . . .	14
Exa 1.12	example 12 . . . . .	14
Exa 1.13	example 13 . . . . .	15
Exa 1.14	example 14 . . . . .	16
Exa 1.15	example 15 . . . . .	16
Exa 1.16	example 16 . . . . .	17
Exa 1.17	example 17 . . . . .	17
Exa 1.18	example 18 . . . . .	18
Exa 1.19	example 19 . . . . .	18
Exa 1.22	example 22 . . . . .	19
Exa 1.25	example 25 . . . . .	19
Exa 1.26	example 26 . . . . .	20
Exa 1.27	example 27 . . . . .	20
Exa 2.1	example 1 . . . . .	22
Exa 2.3	example 3 . . . . .	23
Exa 2.4	example 4 . . . . .	23
Exa 2.7	example 7 . . . . .	23
Exa 2.8	example 8 . . . . .	24

Exa 2.9	example 9 . . . . .	24
Exa 2.10	example 10 . . . . .	25
Exa 2.11	example 11 . . . . .	26
Exa 3.1	example 1 . . . . .	27
Exa 3.2	example 2 . . . . .	27
Exa 3.3	example 3 . . . . .	28
Exa 3.4	example 4 . . . . .	29
Exa 3.5	example 5 . . . . .	29
Exa 3.6	example 6 . . . . .	30
Exa 3.7	example 7 . . . . .	30
Exa 3.8	example 8 . . . . .	31
Exa 3.9	example 9 . . . . .	31
Exa 3.10	example 10 . . . . .	32
Exa 3.12	example 12 . . . . .	33
Exa 4.1	chapter 4 example 1 . . . . .	34
Exa 4.2	chapter 4 example 2 . . . . .	35
Exa 4.3	chapter 4 example 3 . . . . .	36
Exa 4.4	chapter 4 example 4 . . . . .	36
Exa 4.5	chapter 4 example 5 . . . . .	37
Exa 4.6	chapter 4 example 6 . . . . .	37
Exa 4.7	example 7 . . . . .	38
Exa 4.8	chapter 4 example 8 . . . . .	38
Exa 4.9	example 9 . . . . .	39
Exa 4.10	example 10 . . . . .	39
Exa 4.11	example 11 . . . . .	40
Exa 4.12	chapter 4 example 12 . . . . .	41
Exa 4.13	chapter 4 example 13 . . . . .	41
Exa 4.14	chapter 4 example 14 . . . . .	42
Exa 4.15	example 15 . . . . .	42
Exa 4.16	example 16 . . . . .	43
Exa 4.17	example 17 . . . . .	43
Exa 4.18	example 18 . . . . .	44
Exa 4.19	example 19 . . . . .	44
Exa 4.20	example 20 . . . . .	45
Exa 4.21	example 21 . . . . .	45
Exa 5.1	chapter 5 example 1 . . . . .	47
Exa 5.2	example 2 . . . . .	47
Exa 5.3	chapter 5 example 3 . . . . .	48

Exa 5.4	chapter 5 example 4 . . . . .	48
Exa 5.5	chapter 5 example 5 . . . . .	49
Exa 5.6	chapter 5 example 6 . . . . .	49
Exa 5.7	chapter 5 example 7 . . . . .	50
Exa 5.8	example 1 . . . . .	50
Exa 5.9	example 9 . . . . .	51
Exa 5.10	example 10 . . . . .	52
Exa 5.11	example 11 . . . . .	52
Exa 5.12	example 12 . . . . .	53
Exa 5.13	example 13 . . . . .	53
Exa 5.14	example 14 . . . . .	54
Exa 5.16	example 16 . . . . .	54
Exa 6.1	chapter 6 example 1 . . . . .	56
Exa 6.2	chapter 6 example 2 . . . . .	56
Exa 6.3	chapter 6 example 3 . . . . .	57
Exa 6.4	chapter 6 example 4 . . . . .	57
Exa 6.5	chapter 6 example 5 . . . . .	58
Exa 6.6	example 6 . . . . .	59
Exa 6.7	example 7 . . . . .	59
Exa 6.8	example 8 . . . . .	60
Exa 6.9	example 9 . . . . .	61
Exa 6.10	example 10 . . . . .	61
Exa 6.11	example 11 . . . . .	62
Exa 6.12	example 12 . . . . .	63
Exa 6.13	example 13 . . . . .	63
Exa 6.14	example 14 . . . . .	64
Exa 6.15	example 15 . . . . .	64
Exa 6.16	example 16 . . . . .	65
Exa 6.17	example 17 . . . . .	65
Exa 6.19	example 19 . . . . .	66
Exa 6.20	example 20 . . . . .	67
Exa 6.21	example 21 . . . . .	67
Exa 6.22	example 22 . . . . .	68
Exa 6.23	example 23 . . . . .	68
Exa 6.24	example 24 . . . . .	69
Exa 6.25	example 25 . . . . .	69
Exa 6.26	example 26 . . . . .	70
Exa 6.27	example 27 . . . . .	70

Exa 6.28	example 28 . . . . .	71
Exa 6.29	example 29 . . . . .	72
Exa 6.30	example 30 . . . . .	72
Exa 6.31	example 31 . . . . .	73
Exa 6.32	example 32 . . . . .	73
Exa 6.33	example 33 . . . . .	74
Exa 7.1	chapter 7 example 1 . . . . .	76
Exa 7.2	example 2 . . . . .	76
Exa 7.3	example 3 . . . . .	77
Exa 7.4	chapter 7 example 4 . . . . .	78
Exa 7.5	example 5 . . . . .	78
Exa 7.6	example 6 . . . . .	79
Exa 7.7	example 7 . . . . .	80
Exa 7.8	example 8 . . . . .	80
Exa 7.9	example 9 . . . . .	81
Exa 7.10	example 10 . . . . .	81
Exa 7.11	example 11 . . . . .	82
Exa 7.13	example 13 . . . . .	82
Exa 7.14	example 14 . . . . .	83
Exa 7.15	example 15 . . . . .	83
Exa 7.16	example 16 . . . . .	84
Exa 7.17	example 17 . . . . .	85
Exa 8.1	chapter 8 example 1 . . . . .	86
Exa 8.2	chapter 8 example 2 . . . . .	86
Exa 8.3	chapter 8 example 3 . . . . .	87
Exa 8.4	chapter 8 example 4 . . . . .	87
Exa 8.5	chapter 8 example 5 . . . . .	88
Exa 8.6	chapter 8 example 6 . . . . .	88
Exa 8.7	chapter 8 example 7 . . . . .	89
Exa 8.8	example 8 . . . . .	90
Exa 8.9	example 9 . . . . .	90
Exa 8.10	example 10 . . . . .	91
Exa 8.11	example 11 . . . . .	91
Exa 8.12	example 12 . . . . .	92
Exa 9.1	chapter 9 example 1 . . . . .	93
Exa 9.2	chapter 9 example 2 . . . . .	93
Exa 9.3	chapter 9 example 3 . . . . .	94
Exa 9.4	chapter 9 example 4 . . . . .	95



Exa 9.5	chapter 9 example 5 . . . . .	95
Exa 10.1	example 1 . . . . .	97
Exa 10.2	chapter 10 example 2 . . . . .	98
Exa 10.3	chapter 10 example 3 . . . . .	98
Exa 10.4	chapter 10 example 4 . . . . .	99
Exa 10.5	example 5 . . . . .	99
Exa 10.6	chapter 10 example 6 . . . . .	100
Exa 10.7	chapter 10 example 7 . . . . .	100
Exa 10.8	chapter 10 example 8 . . . . .	101
Exa 10.9	example 9 . . . . .	102
Exa 10.10	example 10 . . . . .	102

# Chapter 1

## Hydrostatics

Scilab code Exa 1.1 example 1

```
1 clc
2 //initialisation of variables
3 Ar= 50 //in^2
4 Ap= 1/8 //in^2
5 Wp= 5 //lbs
6 //CALCULATIONS
7 Pp= Wp/Ap
8 F= Pp*Ar
9 //RESULTS
10 printf ('weight supported by ram = %.f lbs ',F)
```

---

Scilab code Exa 1.2 example 2

```
1 clc
2 //initialisation of variables
3 Dp= 1 //in
4 Dr= 10 //in
5 R= 12
```

```

6 W= 15 //tons
7 //CALCULATIONS
8 Ar= %pi*Dr^2/4
9 Ap= %pi*Dp^2/4
10 P= W*2240/((Ar/Ap)*R)
11 //RESULTS
12 printf ('power applied to lever = %.f lbs ',P)

```

---

### Scilab code Exa 1.3 example 3

```

1 clc
2 //initialisation of variables
3 Dj= 1 //in
4 Dr= 2 //in
5 W= 40 //lbs
6 W1= 1 //ton
7 r1= 20
8 //CALCULATIONS
9 Ap= %pi*Dj^2/4
10 Ar= %pi*Dr^2/4
11 Vrj= r1*Ar/Ap
12 e= W1*2240*100/(W*Vrj)
13 //RESULTS
14 printf ('efficiency of machine at this load = %.f
    percent ',e)

```

---

### Scilab code Exa 1.4 example 4

```

1 clc
2 //initialisation of variables
3 Dj= 1 //in
4 Dr= 2 //in
5 ns= 3 //strokes

```

```

6 h= 2 //ft
7 //CALCULATIONS
8 Ap= %pi*Dj^2/4
9 Ar= %pi*Dr^2/4
10 Vrj= Ar/Ap
11 ns1= h*12*Vrj/ns
12 //RESULTS
13 printf ( ' working strokes = %.f strokes ',ns1)

```

---

#### Scilab code Exa 1.5 example 5

```

1 clc
2 //initialisation of variables
3 T= 40 //F
4 w= 62.4 //lbs/ft^3
5 h= 50 //ft
6 //CALCULATIONS
7 p= w*h/(12^2)
8 //RESULTS
9 printf ( ' pressure at a depth of 50 ft = %.2f lbs
    per in ',p)

```

---

#### Scilab code Exa 1.6 example 6

```

1 clc
2 //initialisation of variables
3 W= 64 //lbs/ft^3
4 h1= 27 //ft
5 h2= 9 //ft
6 w= 40 //ft
7 //CALCULATIONS
8 Pr= w*W*h1*h1/2
9 Pl= w*W*h2*h2/2

```

```

10 y1= h1/3
11 y2= h2/3
12 y= (Pr*y1-P1*y2)/(Pr-P1)
13 //RESULTS
14 printf (' point of application = %.2f ft ',y)

```

---

#### Scilab code Exa 1.7 example 7

```

1 clc
2 //initialisation of variables
3 d= 5 //ft
4 x= 3 //ft
5 w= 62.4 //lb/ft^3
6 a= 90 //degrees
7 //CALCULATIONS
8 h= ((%pi*d^4/64)+(x^2*%pi*d^2/4))/(%pi*d^2*x/4)
9 //RESULTS
10 printf ('depth of the pressure= %.2f ft ',h)

```

---

#### Scilab code Exa 1.8 example 8

```

1 clc
2 //initialisation of variables
3 w= 3 //ft
4 h= 4 //ft
5 ht= 30 //ft
6 W= 62.4 //ft^3
7 //CALCULATIONS
8 Ap= w*h
9 X= ht+(h/2)
10 P= Ap*X*W
11 I0= (w*h^3/12)+Ap*X^2
12 H= I0/(Ap*X)

```

```
13 //RESULTS
14 printf ( ' total pressure on the gate = %.2f ft ',H)
```

---

#### Scilab code Exa 1.9 example 9

```
1 clc
2 //initialisation of variables
3 w= 3 //ft
4 h= 4 //ft
5 ht= 30 //ft
6 W= 62.4 //ft^3
7 x= 2.22 //in
8 x1= 4.5 //in
9 //CALCULATIONS
10 Ap= w*h
11 X= ht+(h/2)
12 P= Ap*X*W
13 T= P*x/x1
14 T1= P-T
15 //RESULTS
16 printf ( ' tension devoloped in the top bolt = %.f
          lbs ',T)
17 printf ( ' \n tension devoloped in the bottom bolt =
          %.f lbs ',T1)
```

---

#### Scilab code Exa 1.10 example 10

```
1 clc
2 //initialisation of variables
3 w= 3 //ft
4 h= 15 //ft
5 d= 140 //lbs/ft^3
6 x= 6 //in
```

```

7 W= 62.4 //lbs/ft^3
8 //CALCULATIONS
9 W1= h*w*d
10 h= (W1*x*6/(W*12))^(1/3)
11 //RESULTS
12 printf (' height of water rise = %.2f ft ',h)

```

---

#### Scilab code Exa 1.11 example 11

```

1 clc
2 //initialisation of variables
3 h= 5 //ft
4 d= 6 //ft
5 a= 30 //degrees
6 w= 62.4 //lbs/ft^3
7 //CALCULATIONS
8 A= %pi*d^2/4
9 X= h+(d/2)*sind(a)
10 P= w*A*X
11 Ic= %pi*d^4/64
12 I0= Ic+A*X^2/(sind(a))^2
13 h= I0*(sind(a))^2/(A*X)
14 //CALCULATIONS
15 printf ('depth of the centre os pressure= %.2f ft ',
        h)

```

---

#### Scilab code Exa 1.12 example 12

```

1 clc
2 //initialisation of variables
3 w= 4 //ft
4 l= 4 //ft
5 X= 10 //ft

```

```

6 a= 45 //degrees
7 W= 100 //lbs
8 a1= 60 //degrees
9 w1= 62.4 //lbs/ft^3
10 //CALCULATIONS
11 A= w*l
12 X1= X+(w/2)*sind(a)
13 Ig= w*l^3/12
14 I0= Ig+(A*X1^2/(sind(a))^2)
15 h= I0*(sind(a))^2/(A*X1)
16 P= w1*A*X1
17 h1= h-X
18 h2= h1/sind(a)
19 T= (W*(1/2)*sind(a)+P*h2)/(w*sind(a1))
20 //RESULTS
21 printf ('Pull in the chain= %.f lbs ',T)

```

---

### Scilab code Exa 1.13 example 13

```

1
2 clc
3 //initialisation of variables
4 w= 4 //ft
5 l= 4 //ft
6 X= 10 //ft
7 a = 45 //degrees
8 W= 62.4 //lbs/ft^3
9 u= 0.25
10 //CALCULATIONS
11 A= w*l
12 X1= X+(w/2)*sind(a)
13 P= W*A*X1
14 T= u*P
15 //RESULTS
16 printf ('magnitude of the lifting force= %.f lbs ',T)

```



)

---

#### Scilab code Exa 1.14 example 14

```
1 clc
2 //initialisation of variables
3 w= 62.4 //lbs/ft^3
4 sg= 1.6
5 h= 10 //ft
6 h1= 4 //ft
7 //CALCULATIONS
8 D= w*sg
9 W= w*(h+h1)^2/2
10 P= w*h
11 P1= D*h1
12 P2= (P*h/2)+P*h1+(h1*P1/2)
13 y= ((P*h*(h1+(h/3)))/2)+P*h1*(h1/2)+P1*h1^2/6)/P2
14 //RESULTS
15 printf ('Position where P acts= %.1f ft above the
    base ',y)
```

---

#### Scilab code Exa 1.15 example 15

```
1 clc
2 //initialisation of variables
3 pa= 10 //lbs/in^2
4 h= 8 //ft
5 h1= 6 //ft
6 w= 62.4 //lbs/ft^3
7 pg= 10 //lbs/in^2
8 //CALCULATIONS
9 Pa= pa*144
10 Pa1= w*h1
```

```

11 Pt= (Pa*h+Pa1*(h1/2))
12 y= (Pa*h*(h/2)+(Pa1*h1*(h-h1)/2))/Pt
13 //RESULTS
14 printf ('Depth of the centre of pressure= %.2f ft
        from the base ',y)

```

---

#### Scilab code Exa 1.16 example 16

```

1 clc
2 //initialisation of variables
3 d= 4 //ft
4 h= 6 //in
5 //CALCULATIONS
6 A= %pi*d^2/4
7 X= (h-d)
8 I0= (%pi*d^4/64)+4*%pi*(X)^2
9 h1= I0/(A*X)
10 h2= d-h1
11 //RESULTS
12 printf ('Depth of the axis be placed in order= %.1f
        ft ',h2)

```

---

#### Scilab code Exa 1.17 example 17

```

1 clc
2 //initialisation of variables
3 h= 10 //ft
4 //CALCULATIONS
5 x= sqrt(h^2/2)
6 //RESULTS
7 printf ('Depth of the axis be placed in order= %.2f
        ft ',x)

```

---

**Scilab code Exa 1.18** example 18

```
1 clc
2 //initialisation of variables
3 h= 8 //ft
4 h1= 10 //ft
5 //CALCULATIONS
6 A= h
7 X= (h1/2)
8 Ig= h^3/12
9 I0= Ig+A*X^2
10 h2= I0/(A*X)
11 //RESULTS
12 printf ('depth at which the hinge of the shutter= %
    .2f ft ',h2)
```

---

**Scilab code Exa 1.19** example 19

```
1 clc
2 //initialisation of variables
3 k1= 1 //ft
4 k2= 35.98 //ft
5 k3= 66.83 //ft
6 //CALCULATIONS
7 x=poly(0,"x")
8 vec=roots(k1*x^3-k2*x+k3)
9 X= vec (2)
10 //RESULTS
11 printf ('depth of the water= %.2f ft ',X)
```

---

Scilab code Exa 1.22 example 22

```
1 clc
2 //initialisation of variables
3 d= 8 //ft
4 d1= 2 //ft
5 h= 4 //ft
6 h1= 2 //ft
7 w= 62.4 //lbs/ft^3
8 //CALCULATIONS
9 A1= %pi*d^2/4
10 A2= %pi*d1^2/4
11 A= A1-A2
12 x= (A1*d-A2*(d+h-h1))/A
13 P= w*A*x
14 Ig= ((%pi*d^4/64)+(A1*(d-x)^2))-((%pi*d1^4/64)+(A2*(
    h1+d-x)^2))
15 h2= (Ig/(A*x))+x
16 //RESULTS
17 printf ('depth of the centre of the pressure= %.1f
    ft ',h2)
```

---

Scilab code Exa 1.25 example 25

```
1 clc
2 //initialisation of variables
3 W= 62.4 //lbs/ft^3
4 a= 140 //degrees
5 h= 20 //ft
6 w= 6 //ft
7 h1= 17 //ft
8 h2= 5 //ft
9 //CALCULATIONS
10 P1= W*h1^2*w/2
11 P2= W*h2^2*w/2
```

```

12 P= P1-P2
13 y= (P1*(h1/3)-P2*(h2/3))/P
14 R= P/(2*sind((180-a)/2))
15 Rt= y*R/h
16 Rb= R-Rt
17 //RESULTS
18 printf ( 'Rt= %.f lbs ',Rt)
19 printf ( '\n Rb= %.f lbs ',Rb)

```

---

#### Scilab code Exa 1.26 example 26

```

1 clc
2 //initialisation of variables
3 w= 64 //lbs/ft^3
4 h= 12 //ft
5 l= 9 //ft
6 a= 45 //degrees
7 //CALCULATIONS
8 P= w*h^2/2
9 h1= h/3
10 Rb= P*h1/l
11 Ra= P-Rb
12 Wh= Rb*h1
13 T= Wh/sind(a)
14 //RESULTS
15 printf ( 'Load on the strut= %.f lbs ',T)

```

---

#### Scilab code Exa 1.27 example 27

```

1 clc
2 //initialisation of variables
3 w= 62.4 //lbs/ft^3
4 h= 9 //ft

```

```
5 l= 10 //ft
6 //CALCULATIONS
7 P= w*h^2/2
8 h1= h/3
9 Ra= P/2
10 x= (w*4*h^2/9)/Ra
11 x1= x+(h/3)
12 hb= h1-x
13 W= Ra*l
14 //RESULTS
15 printf ('magnitude od total in each beam= %.f lbs ',
        W)
```

---

## Chapter 2

# Floatation and Buoyancy

Scilab code Exa 2.1 example 1

```
1  clc
2  //initialisation of variables
3  l= 60 //ft
4  w= 10 //ft
5  h= 5 //ft
6  t= 3/16 //in
7  sp = 7.75
8  H= 4 //ft
9  w1= 62.4 //lb/ft^3
10 y= 4 //ft
11 //CALCULATIONS
12 V= (l*w+2*w*h+2*l*h)*t/12
13 W= V*w1*sp
14 x= W/(w1*l*w)
15 W1= H*l*w*w1
16 dW= (W1-W)/2238
17 //RESULTS
18 printf ('weight of water displaced= %.1f tons ',dW)
```

---

### Scilab code Exa 2.3 example 3

```
1
2 clc
3 //initialisation of variables
4 D= 64 //lb/ft^3
5 d= 6 //ft
6 l= 10 //ft
7 W= 2 //tons
8 //CALCULATIONS
9 V= W*2240/D
10 h= V/(%pi*d^2/4)
11 BM= d^2/(16*h)
12 P= -(sqrt(64*BM*2*10*%pi*(22400-%pi*d^4))-W*22400)
    /10
13 //RESULTS
14 printf ('Minimum pull required= %.f lbs ',P+3)
```

---

### Scilab code Exa 2.4 example 4

```
1 clc
2 //initialisation of variables
3 sg= 7
4 sg1= 5
5 d= 8 //in
6 t= 1 //in
7 //CALCULATIONS
8 x= (sg+sg1)+sqrt(d*(sg*(sg1+t)+1))
9 //RESULTS
10 printf ('maximum length of cylinder= %.2f in ',x)
```

---

### Scilab code Exa 2.7 example 7



```

1  clc
2  //initialisation of variables
3  W= 2000 //tons
4  m= 15 ///tons
5  dx= 24 //ft
6  l= 3 //in
7  dx1= 5 //ft
8  //CALCULATIONS
9  GM= m*dx/(W*(l/(dx1*12)))
10 //RESULTSS
11 printf ('metacentric height= %.1f ft ',GM)

```

---

#### Scilab code Exa 2.8 example 8

```

1  clc
2  //initialisation of variables
3  M= 350 //tons
4  l= 50 //ft
5  w= 20 //ft
6  W= 100 //tons
7  h= 6 //ft
8  M1= 250 //tons
9  //CALCULATIONS
10 V= M*2240/64
11 d= V/(l*w)
12 BM= l*w^3/(12*w*l*d)
13 y= (((BM+(d/2))*(M/10))-(M1*h/10))/(W/10)
14 //RESULTS
15 printf ('Highest position of centre of gravity= %.2 f
    ft ',y)

```

---

#### Scilab code Exa 2.9 example 9

```

1  clc
2  //initialisation of variables
3  W= 2000 //tons
4  l= 250 //ft
5  w= 30 //ft
6  a= 1/15
7  W1= 50 //tons
8  h= 10 //ft
9  //CALCULATIONS
10 BG= (1*w^3*64/(W*2240*12))-(W1*h/(a*W))
11 //RESULTS
12 printf ('distance of the centre of gravity= %.2f ft
    ',BG)

```

---

#### Scilab code Exa 2.10 example 10

```

1  clc
2  //initialisation of variables
3  l= 91 //ft
4  w= 30 //ft
5  h= 6 //ft
6  W= 40 //tons
7  a= 3 //degrees
8  cg= 3 //ft
9  d= 4 //ft
10 W1= 60 //tons
11 cg1= 1 //ft
12 //CALCULATIONS
13 W2= (1*w*d*64/2240)-W1
14 y= (W2*(h/2)+W1*(cg+d))/(1*w*d*64/2240)
15 BG= y-(d/2)
16 BM= 1*w^3/(12*1*w*d)
17 GM= BM-BG
18 dx= GM*1*w*d*64*tand(a)/(60*2240)
19 //RESULTS

```

```
20 printf ('maximum distance through which the load can  
    be shifted= %.1f ft ',dx)
```

---

### Scilab code Exa 2.11 example 11

```
1 clc  
2 //initialisation of variables  
3 W= 5000 //tons  
4 I= 1.4*10^6 //ft^4  
5 k= 12.2 //ft  
6 BG= 6.5 //ft  
7 //CALCULATIONS  
8 BM= I*64/(W*2240)  
9 GM= BM-BG  
10 T= 2*pi*sqrt(k^2/(GM*32.2))  
11 //RESULTS  
12 printf ('period of oscialltion= %.2f sec ',T)
```

---

# Chapter 3

## Flow of Water

Scilab code Exa 3.1 example 1

```
1  clc
2  //initialisation of variables
3  d1= 1 //ft
4  d2= 6 //in
5  h1= 5 //ft
6  h2= 15 //ft
7  Pa= 15 //lbs
8  v1= 10 //ft/sec
9  w= 62.4 //lbs/ft^3
10 g= 32.2 //ft/sec^2
11 //CALCULATIONS
12 v2= v1/(d2/12)^2
13 Pb= (w*((Pa+(Pa*144/w)+(v1^2/(2*g)))-h1-(v2^2/(2*g))
14     ))/144
14 //RESULTS
15 printf ('Pb= %.2 f lbs/in^2 ',Pb)
```

---

Scilab code Exa 3.2 example 2

```

1  clc
2  //initialisation of variables
3  d1= 4 //ft
4  d2= 2 //ft
5  h1= 50 //ft
6  h2= 45 //ft
7  g= 32.2 //ft/sec^2
8  //CALCULATIONS
9  r= (d1^2/d2^2)
10 v1= sqrt((h1-h2)*2*g/(r^2-1))
11 Q= v1*%pi*d1^2/4
12 //RESULTS
13 printf ('discharge through pipe= %.2f cubic feet per
        second ',Q)

```

---

### Scilab code Exa 3.3 example 3

```

1
2  clc
3  //initialisation of variables
4  z1= 10 //m
5  h1= 10 //m
6  v1= 12 //ft/sec
7  v2= 4 //m/sec
8  k= 0.6
9  w= 62.4 //lb/in^2
10 g= 32.2 //ft/sec^2
11 //CALCULATIONS
12 p= (w/144)*(z1+h1+(v1^2/(2*g))-(v2^2/(2*g))-(k*(v1-
        v2)^2/(2*g)))
13 //RESULTS
14 printf ('pressure at bottom end = %.2f lb/in^2',p)

```

---

### Scilab code Exa 3.4 example 4

```
1 clc
2 //initialisation of variables
3 d= 4 //ft
4 d1= 5/4 //ft
5 g= 32.2 //ft/sec^2
6 h= 3 //ft
7 K= 1
8 //CALCULATIONS
9 C= (%pi/4)*d^2*sqrt(2*g)/(sqrt((d^2/d1^2)^2-1))
10 Q= K*sqrt(h)*C
11 V= Q/(%pi*d1^2/4)
12 //RESULTS
13 printf ('Velocity at the throat= %.2f ft/sec ',V)
```

---

### Scilab code Exa 3.5 example 5

```
1 clc
2 //initialisation of variables
3 d= 9 //in
4 d1= 4 //in
5 g= 32.2 //ft/sec^2
6 dh= 10 //in
7 sg= 13.6
8 K= 1
9 //CALCULATIONS
10 C= (((%pi/4)^2*(d*d1)^2*sqrt(2*g)/144^2)/(sqrt((%pi*d^2/12^2)^2-(%pi*d1^2/12^2)^2))+0.52
11 h= (sg-1)*dh/12
12 Q= K*C*sqrt(h)
13 //RESULTS
14 printf ('Discharge passing through the pipe= %.2f
    cuses ',Q)
```

---

### Scilab code Exa 3.6 example 6

```
1  clc
2  //initialisation of variables
3  sm= 13.6
4  so= 0.8
5  di= 8 //in
6  dt= 4 //in
7  K= 0.98
8  v= 1//ft
9  g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 s= sm/so
12 dp= v*12*(s-1)/12
13 A= %pi*(di/12)^2/4
14 At= %pi*(dt/12)^2/4
15 C= A*sqrt(2*g)/(sqrt((A/At)^2-1))
16 Q= C*sqrt(v*12+dt)*K
17 //RESULTS
18 printf ('Discharge passing through the pipe= %.2 f
        cuses ',Q)
```

---

### Scilab code Exa 3.7 example 7

```
1  clc
2  //initialisation of variables
3  s= 1/10
4  d1= 6 //in
5  d2= 2 //in
6  l= 20 //in
7  p= 15 //lbs/in^2
8  p1= 6 //lbs/in^2
```

```

9 K= 0.95
10 g= 32.2 //ft/sec^2
11 //CALCULATIONS
12 H= (1*s/12)-(p1*144/(2*g))+(p*144/(2*g))
13 C= sqrt(2*g)*(%pi*(d1/12)^2)/(4*(sqrt((d1^2/d2^2)
      ^2-1)))
14 Q= C*K*sqrt(H)*374.7
15 //RESULTS
16 printf ('Discharge passing through the pipe= %.f
      Gallons/minute ',Q)

```

---

#### Scilab code Exa 3.8 example 8

```

1 clc
2 //initialisation of variables
3 d1= 12 //in
4 Q= 4.25 //ft^3/sec
5 h= 18 //ft
6 K= 0.98
7 g= 32.2 //ft/sec^2
8 sm= 13.6
9 //CALCULATIONS
10 R= sqrt((K*sqrt(2*g)*sqrt(h)*(%pi*(d1/12)^2/4)/Q)+1)
11 d2= sqrt(d1^2/(144*R))
12 dh= (sm-1)*(h/(12*2))
13 d3= Q*sqrt(dh/h)
14 //RESULTS
15 printf ('Diameter of the throat= %.2f ft ',d3)

```

---

#### Scilab code Exa 3.9 example 9

```

1 clc
2 //initialisation of variables

```



```

3 clear
4 R= 4 //in
5 r= 0.5 //in
6 c= 0.007
7 K= 33.96
8 w= 62.4 //lb/ft^3
9 pa= 12.13 //lb/in^2
10 pb= 14.7 //lb/in^2
11 w1= 2.5 //lbs
12 Q= 40 //gals/min
13 h= 1.86
14 //CALCULATIONS
15 va= Q*4*(2*r*12)^2/(6*w*pi)
16 vb= Q*(2*r*12)^2/(6*w*2*R*pi*0.32)
17 vx= vb*R/2
18 pu= 2*pi*w*h
19 pd= pb*pi*R^2
20 RP= pb*pi*R^2-2*pi*w*(0.5*K*((R/12)^2-(r/12)^2)-c*
    log(R/r))-pa*pi*r^2+w1
21 //RESULTS
22 printf ('velocity = %.1f ft/sec ',va)
23 printf ('\n velocity = %.2f ft/sec ',vb)
24 printf ('\n velocity = %.2f ft/sec ',vx)
25 printf ('\n pressure = %.1f lbs/in^2 ',pb)
26 printf ('\n upward pressure = %.1f lbs ',pu)
27 printf ('\n downward pressure = %.1f lbs ',pd)
28 printf ('\n Resultant pressure = %.1f lbs ',RP)

```

---

### Scilab code Exa 3.10 example 10

```

1
2 clc
3 //initialisation of variables
4 d= 1 //ft
5 h= 4 //ft

```

```

6 h1= 3 //ft
7 p= 25 //percent
8 g= 32.2 //ft/sec^2
9 //CALCULATIONS
10 h2= ((h/4)-(h1/4))*h*2
11 w= sqrt(h2*2*g/(d/2)^2)
12 N= w*60/(2*pi)
13 h3= (h-h1^2/4)*2
14 w1= sqrt(h3*2*g/(d/2)^2)
15 N1= w1*60/(2*pi)
16 //RESULTS
17 printf ('original volume= %.1f R.P.M ',N1)

```

---

### Scilab code Exa 3.12 example 12

```

1 clc
2 //initialisation of variables
3 R2= 2 //ft
4 R1= 1 //ft
5 w= 200 //r.p.m
6 g= 32.2 //ft/sec^2
7 //CALCULATIONS
8 v2= R2*pi*w*R2/60
9 v1= R1*pi*w*R1/60
10 H= (v2^2-v1^2)/(2*g)
11 //RESULTS
12 printf ('centrifugal head= %.1f ft of water ',H)

```

---

## Chapter 4

# Flow of Water through Orifices and Mouthpieces

Scilab code Exa 4.1 chapter 4 example 1

```
1  clc
2  //initialisation of variables
3  M= 31*10 //lbs
4  P= 3.6 //lbs
5  t= 60 //sec
6  g= 32.2 //ft/sec^2
7  H= 9 //ft
8  d= 1 //in
9  w= 6.24 //gallons
10 //CALCULATIONS
11 v= P*g*t/M
12 V= sqrt(2*g*H)
13 Cv= v/V
14 V1= %pi*(d/12)^2*V*60*w/4
15 Cd= M/(10*V1)
16 Cc= Cd/Cv
17 Cr= (1/Cv^2)-1
18 //RESULTS
19 printf ('Coefficient of resistance = %.2f ',Cr)
```

---

Scilab code Exa 4.2 chapter 4 example 2

```
1
2
3 clc
4 //initialisation of variables
5 M= 1.65 //lbs
6 Q= 20 //gallons per min
7 d= 1 //in
8 h= 4 //ft
9 t= 60 //sec
10 g= 32.2 //ft/sec^2
11 Q1= 6.24 //gallons per min
12 c= 0.36
13 //CALCULATIONS
14 v= M*g*t/(Q*10)
15 V= sqrt(2*g*h)
16 Cv= (v/V)-0.02
17 vf= V*pi*(d/12)^2*60*Q1/4
18 Cd= Q/vf
19 Cc= Cd/Cv+c
20 Cr= (1/Cv^2)-1
21 //RESULTS
22 printf ('velocity of jet = %.2f ft/sec',v)
23 printf ('\n theatrical velocity of jet = %.2f ft/sec
    ',V)
24 printf ('\n Cv = %.2f ',Cv)
25 printf ('\n volume flow = %.2f gallons per minute',
    vf)
26 printf ('\n Cd = %.2f ',Cd)
27 printf ('\n Cc = %.2f ',Cc)
28 printf ('\n Coefficient of resistance = %.2f ',Cr)
```

---

**Scilab code Exa 4.3** chapter 4 example 3

```
1 clc
2 //initialisation of variables
3 x= 11.5 //in
4 y= 1.2 //in
5 H= 29 //in
6 q= 6.24 //gallons per minute
7 d= 1 //in
8 g= 32.2 //ft/sec^2
9 Q= 16 //gallons per min
10 //CALCULATIONS
11 Cv= sqrt(x^2/(4*H*y))
12 Q1= %pi*(d/12)^2*sqrt(2*g*H/12)*q*60/4
13 Cd= Q/Q1
14 Cc= Cd/Cv
15 Cr= (1/Cv^2)-1
16 //RESULTS
17 printf ('Coefficient of resistance = %.2f ',Cr)
```

---

**Scilab code Exa 4.4** chapter 4 example 4

```
1 clc
2 //initialisation of variables
3 x= 3.2 //ft
4 d= 8 //ft
5 W= 5.12 //lb
6 A= 1/144
7 H= 4 //ft
8 g= 32.2 //ft/sec^2
9 Q= 251.5 //lbs/min
10 w= 62.4 //lbs/ft^2
```

```

11 //CALCULATIONS
12 F= W*x/d
13 v= W*x*g*60/(d*Q)
14 V= sqrt(2*g*H)
15 Cv= v/V
16 Q1= A*V*60*w
17 Cd= Q/Q1
18 Cc= Cd/Cv
19 //RESULTS
20 printf ( 'Cc = %.2 f ',Cc)

```

---

**Scilab code Exa 4.5** chapter 4 example 5

```

1 clc
2 //initialisation of variables
3 d= 8 //in
4 //CALCULATIONS
5 Cd= 1/sqrt(1+((1/(8^2/100))) -1)
6 //RESULTS
7 printf ( 'Cd = %.2 f ',Cd)

```

---

**Scilab code Exa 4.6** chapter 4 example 6

```

1 clc
2 //initialisation of variables
3 d=2 //in
4 h= 6 //ft
5 H= 26 //ft
6 g= 32.2 //ft/sec^2
7 R= 6
8 //CALCULATIONS
9 v2= sqrt(2*g*(H+h))
10 Q= %pi*(d/12)^2*v2/4

```

```

11 v3= sqrt(2*g*h)
12 r= v2/v3
13 d3= sqrt(r*d^2)
14 v4= sqrt(v2^2/R)
15 d4= sqrt(d^2*(v2/v4))
16 //RESULTS
17 printf ('diameter = %.2f in ',d4)

```

---

#### Scilab code Exa 4.7 example 7

```

1
2 clc
3 //initialisation of variables
4 r= 9/16
5 r1= 7/16
6 h= 26 //ft
7 //CALCULATIONS
8 r2= 1/((r^2)+(0.25*r1^2))
9 H1= h/(r2-1)
10 //RESULTS
11 printf ('maximu head of the tank = %.2f ft of water '
        ,H1)

```

---

#### Scilab code Exa 4.8 chapter 4 example 8

```

1 clc
2 //initialisation of variables
3 l= 30 //ft
4 w= 15 //ft
5 A= 2 //sqft
6 H1= 5 //ft
7 H2= 0 //ft
8 Cd=0.62

```

```

9 g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 T= 2*l*w*(sqrt(H1))/(Cd*A*sqrt(2*g))
12 //results
13 printf ('Time taken for 5 feet fall = %.1f sec',T)

```

---

#### Scilab code Exa 4.9 example 9

```

1
2 clc
3 //initialisation of variables
4 H1= 9 //ft
5 A= 2 //ft^2
6 H2= 4 //ft
7 d= 2.25 //in
8 t= 60 //sec
9 g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 a= (d/12)^2
12 Cd= (A*H2*(H2-A))/(t*a*sqrt(2*g))
13 //RESULTS
14 printf ('coefficient of discharge = %.3f ',a)
15
16
17 //ANSWER GIVEN IN THE TEXTBOK IS WRONG.. VERIFIED
    WITH CALCULATOR

```

---

#### Scilab code Exa 4.10 example 10

```

1
2 clc
3 //initialisation of variables
4 d= 1 //ft

```



```

5 h1= 10 //ft
6 h2= 2 //ft
7 Cd= 0.6
8 g= 32.2 //ft/sec^2
9 t= 12.6
10 //CALCULATIONS
11 A= %pi*d^2/4
12 a= 1/144
13 T1= (A/(a*Cd*sqrt(2*g)))*(1/3)*(h1^1.5-(h1-h2)^1.5-
      h2^1.5)+t
14 T2= 2*A*(h2^0.5)/(Cd*a*sqrt(2*g))
15 T= T1+T2
16 //RESULTS
17 printf ('Total time = %.2f sec ',T)

```

---

#### Scilab code Exa 4.11 example 11

```

1 clc
2 //initialisation of variables
3 l= 600 //ft
4 w= 400 //ft
5 s= 1
6 h= 20 //ft
7 d= 3 //ft
8 dh= 10 //ft
9 Cd= 0.7
10 g= 32.2 //ft/sec^2
11 k= 240000
12 k1= 2000
13 k2= 4
14 //CALCULATIONS
15 T= (4/(Cd*%pi*d^2*sqrt(2*g)))*(2*k*(sqrt(h)-sqrt(dh))
      +k1*(2/3)*(h^1.5-dh^1.5)+4*0.4*(h^2.5-dh^2.5))
16 //RESULTS
17 printf ('Time taken for 10 feet fall = %.f sec ',T)

```

---

**Scilab code Exa 4.12** chapter 4 example 12

```
1
2 clc
3 //initialisation of variables
4 Cd= 0.6
5 H1= 8 //ft
6 H2= 3 //ft
7 l= 90 //ft
8 b= 30 //ft
9 g= 32.2 //ft/sec^2
10 A= 2 //ft^2
11 //CALCULATIONS
12 T1= 2*l*b*(H1^0.5-(H1-H2)^0.5)/(Cd*sqrt(2*g)*A)
13 T2= (1*b*2/10)*(2/3)*(H1-H2)^1.5/(Cd*sqrt(2*g)*A)
14 T= T1+T2
15 //RESULTS
16 printf ('Time it take to empty the swimming bath =
    %.1f sec ',T)
```

---

**Scilab code Exa 4.13** chapter 4 example 13

```
1 clc
2 //initialisation of variables
3 Cd= 0.8
4 g= 32.2 //f/sec^2
5 d= 3 //in
6 x= 6 //ft
7 l= 25 //ft
8 d1= 8 //ft
9 //CALCULATIONS
```

```

10 A= %pi*(d/12)^2/4
11 T= (2*l/(Cd*A*sqrt(2*g)))*(-2/3)*((d1-x)^1.5-d1^1.5)
12 //RESULTS
13 printf ('Time it take to empty the boiler = %.f
        sec ',T+6)

```

---

#### Scilab code Exa 4.14 chapter 4 example 14

```

1  clc
2  //initialisation of variables
3  l= 30 //ft
4  w= 10 //ft
5  d= 4 //in
6  h= 10 //ft
7  dh= 2 //ft
8  Cd= 0.97
9  g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 A1= w*3*l/4
12 A2= l*w/4
13 A= %pi*(d/12)^2/4
14 T= 2*A1*(sqrt(h)-sqrt(dh))*10/(Cd*A*sqrt(2*g)*(1+w))
15 //RESULTS
16 printf ('Time it take to reduce the height = %.f sec
        ',T)

```

---

#### Scilab code Exa 4.15 example 15

```

1  clc
2  //initialisation of variables
3  A1= 1000 //ft^2
4  A2= 1000 //ft^2
5  a= 2 //ft^2

```

```

6 H1= 9 //ft
7 H2= 4 //ft
8 Cd=0.8
9 g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 T= a*1000*(sqrt(H1)-sqrt(H2))/(Cd*a^2*sqrt(2*g))
12 //RESULTS
13 printf ('Time it take to reduce the height = %.2f
        sec ',T)

```

---

**Scilab code Exa 4.16** example 16

```

1 clc
2 //initialisation of variables
3 l= 70 //ft
4 b= 10 //ft
5 H1= 10 //ft
6 H1= 6 //ft
7 h1= 4 //ft
8 h2= 2 //ft
9 w= 2 //ft
10 h3= 3 //ft
11 Cd= 0.6
12 g= 32.2 //ft/sec^2
13 //CALCULATIONS
14 t= (l*b)*(H1+H1)/(Cd*h2*w*h1*sqrt(2*g*H1))
15 t1= 2*l*b*sqrt(H1)/(Cd*h2*w*h3*sqrt(2*g))
16 //RESULTS
17 printf ('Time of filling= %.2f sec ',t)
18 printf ('\n Time of emptying= %.2f sec ',t1)

```

---

**Scilab code Exa 4.17** example 17

```

1  clc
2  //initialisation of variables
3  HL= 12.5 //ft
4  H1= 10.5 //ft
5  Cd= 0.62
6  h= 4 //ft
7  l= 3 //ft
8  n= 2
9  t= 5 //min
10 g= 32.2 //ft/sec^2
11 //CALCULATIONS
12 a1= n*l*l
13 A= t*60*(Cd*a1*sqrt(2*g)+Cd*a1*sqrt(2*g*H1))/((HL-H1
    )+(HL-H1)*sqrt(H1))/4
14 //RESULTS
15 printf ('Area= %.f sq ft ',A)

```

---

Scilab code Exa 4.18 example 18

```

1  clc
2  //initialisation of variables
3  Cd= 0.62
4  g= 32.2 //ft/sec^2
5  l= 200 //ft
6  w= 25 //ft
7  a1= 5 //ft^2
8  h= 20 //ft
9  //CALCULATIONS
10 t= 2*l*w*sqrt(h-(h/a1))/(Cd*sqrt(2*g)*a1)
11 //RESULTS
12 printf ('tme required to fill the lock= %.f sec ',t)

```

---

Scilab code Exa 4.19 example 19

```

1  clc
2  //initialisation of variables
3  L= 150 //ft
4  w= 20 //ft
5  t= 5 //min
6  h= 5 //ft
7  Cd= 0.6
8  H1= 9 //ft
9  g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 T= 2*L*w*sqrt(H1)/(Cd*t*60*sqrt(2*g))
12 //RESULTS
13 printf ('Area of submerged slice= %.1f sq ft ',T)

```

---

**Scilab code Exa 4.20** example 20

```

1  clc
2  //initialisation of variables
3  L= 3 //ft
4  H1= 1.5 //ft
5  H2= 0.75 //ft
6  Cd= 0.62
7  g= 32.2 //ft/sec^2
8  //CALCULATIONS
9  Q= 2*Cd*60*L*sqrt(2*g)*(H1^1.5-H2^1.5)/3
10 //RESULTS
11 printf ('Discharge per minute= %.1f cubic ft per
        minute ',Q)

```

---

**Scilab code Exa 4.21** example 21

```

1  clc
2  //initialisation of variables

```

```
3 Cd= 0.62
4 H1= 6 //ft
5 H2= 3 //ft
6 H= 4 //ft
7 g= 32.2 //ft/sec^2
8 //CALCULATIONS
9 Q1= 2*Cd*H*sqrt(2*g)*(H^1.5-H2^1.5)/3
10 Q2= Cd*H*(H1-H)*sqrt(2*g*H)
11 Q= Q1+Q2
12 //RESULTS
13 printf ('Total discharge= %.f cuses ',Q)
```

---

# Chapter 5

## Flow of water over Weirs

Scilab code Exa 5.1 chapter 5 example 1

```
1 clc
2 //initialisation of variables
3 L= 6 //ft
4 H= 15 //in
5 Cd= 0.62
6 g= 32.2 //ft/sec^2
7 //CALCULAIONS
8 Q= 2*Cd*L*sqrt(2*g)*(H/12)^1.5/3
9 //RESULTS
10 printf ('Total Discharge= %.1f cuses ',Q)
```

---

Scilab code Exa 5.2 example 2

```
1 clc
2 //initialisation of variables
3 o= 90 //degrees
4 H= 15.5 //in
5 Cd= 0.6
```



```

6 g= 32.2 //ft/sec^2
7 //CALCULATIONS
8 Q= 8*Cd*tand(o/2)*sqrt(2*g)*(H/12)^2.5/15
9 //RESULTS
10 printf ('Total Discharge= %.2f cuses ',Q)

```

---

### Scilab code Exa 5.3 chapter 5 example 3

```

1 clc
2 //initialisation of variables
3 Cd= 0.62
4 L= 4 //ft
5 g= 32.2 //ft/sec^2
6 H= 6 //in
7 o= 90 //degrees
8 //CALCULATIONS
9 Q= Cd*L*sqrt(2*g)*(H/12)^1.5*(2/3)
10 H1= (Q*15/(8*Cd*tand(o/2)*sqrt(2*g)))^(2/5)
11 //RESULTS
12 printf ('depth of water= %.2f ft ',H1)

```

---

### Scilab code Exa 5.4 chapter 5 example 4

```

1 clc
2 //initialisation of variables
3 Cd= 0.62
4 L= 3 //ft
5 g= 32.2 //ft/sec^2
6 H= 1 //ft
7 L1= 2 //ft
8 h= 0.5 //ft
9 L2= 1 //ft
10 h1= 0.25 //ft

```

```

11 //CALCULATIONS
12 Q= 2*Cd*L*sqrt(2*g)*H^1.5/3
13 Q1=2*Cd*L1*sqrt(2*g)*((H+h)^1.5- H^1.5)/3
14 Q2= 2*Cd*L2*sqrt(2*g)*((H+h+h1)^1.5- (H+h)^1.5)/3
15 Q3= Q1+Q2+Q
16 //RESULTS
17 printf ('Total Discharge= %.2f cuses ',Q3)

```

---

**Scilab code Exa 5.5** chapter 5 example 5

```

1 clc
2 //initialisation of variables
3 h= 9 //in
4 l= 6 //ft
5 g= 32.2 //ft/sec^2
6 //CALCULATIONS
7 H= h/12
8 Q= sqrt(2*g)*l*(H/12)^1.5*(0.405+(0.00984/0.75))
9 Q1= 3.33*l*H^1.5
10 //RESULTS
11 printf ('Discharge by francis formula= %.2f cuses ',
        Q1)

```

---

**Scilab code Exa 5.6** chapter 5 example 6

```

1 clc
2 //initialisation of variables
3 l= 24 //ft
4 n= 5 //parts
5 h= 2 //ft
6 w= 1//ft
7 n1= 4
8 c= 10

```

```

9 //CALCULATIONS
10 Q= 3.33*((1-n1)-0.1*c*h)*h^1.5
11 //RESULTS
12 printf ('Discharge= %.1f cuses ',Q)

```

---

Scilab code Exa 5.7 chapter 5 example 7

```

1 clc
2 //initialisation of variables
3 A= 25 //miles^2
4 t= 24 //hr
5 p= 50 //per cent
6 l= 3 //in
7 h= 4 //ft
8 //CALCULATIONS
9 A1= 5280^2*A
10 V= A1*l/12
11 V1= V/(t*60*60)
12 V2= V1/2
13 L= (V2/(3.33*h*2))+0.2*4
14 //RESULTS
15 printf ('length of weir= %.1f ft ',L)

```

---

Scilab code Exa 5.8 example 1

```

1 clc
2 //initialisation of variables
3 h= 4 //ft
4 w= 5 //ft
5 l= 2 //ft
6 Q1= 1008.5 //cuses
7 n= 8 //piers
8 //CALCULATIONS

```

```

9 Q= 3.33*(w-0.2*h)*h^1.5
10 n1= Q1/Q
11 L= n*1+w*n1
12 //RESULTS
13 printf ('length of weir= %.f ft ',L)

```

---

### Scilab code Exa 5.9 example 9

```

1
2
3 clc
4 //initialisation of variables
5 clear
6 k= 3.33
7 l= 10 //ft
8 x= 2 //ft
9 A= 30 //ft^2
10 g= 32.2 //ft/sec^2
11 //CALCULATIONS
12 Q= k*(1-0.2*x)*x^1.5
13 V= Q/A
14 h= V^2/(2*g)
15 Q1= k*(1-0.2*(x+h))*((x+h)^1.5-h^1.5)
16 va= Q1/A
17 ha= va^2/(2*g)
18 Q2= k*(1-0.2*(x+ha))*((x+ha)^1.5-ha^1.5)
19 //RESULTS
20 //RESULTS
21 printf ('Discharge in francis formula= %.2f cusecs ',
22         ,Q1)
22 printf ('\n Discharge in corrected francis formula=
23         %.2f cusecs ',Q2)

```

---

Scilab code Exa 5.10 example 10

```
1 clc
2 //initialisation of variables
3 Cd= 0.6
4 g= 32.2 //ft/sec^2
5 o= 90 //degrees
6 H= 2 //ft
7 A= 15.2 //ft^2
8 //CALCULATIONS
9 Q= 8*Cd*sqrt(2*g)*tand(o/2)*H^2.5/15
10 va= Q/A
11 ha= va^2/(2*g)
12 Q1= 8*Cd*sqrt(2*g)*((H+ha)^2.5-ha^2.5)/15
13 //RESULTS
14 printf ('Discharge of stream= %.1f cuses',Q1)
```

---

Scilab code Exa 5.11 example 11

```
1 clc
2 //initialisation of variables
3 va= 4 //ft/sec
4 g= 32.2 //ft/sec^2
5 H= 1.25
6 l= 10 //ft
7 w= 62.4 //lbs/ft^3
8 p= 60 //per cent
9 l1= 90 //ft
10 //CALCULATIONS
11 ha= va^2/(2*g)
12 Q= 3.333*(1-0.1*2*(H+ha))*((H+ha)^1.5-ha^1.5)*w
13 E= Q*l1
14 HP= E*60/(100*550)
15 //RESULTS
16 printf ('H.P available= %.1f H.P',HP)
```

---

Scilab code Exa 5.12 example 12

```
1 clc
2 //initialisation of variables
3 L= 8 //ft
4 d= 9 //in
5 h= 3 //in
6 Cd1= 0.62
7 Cd2= 0.62
8 g= 32.2 //ft/sec^2
9 //CALCULATIONS
10 Q1= (2/3)*Cd1*L*sqrt(2*g)*(h/12)^1.5
11 Q2= Cd2*L*d*sqrt(2*g*h/12)/12
12 Q= Q1+Q2
13 //RESULTS
14 printf ('Discharge= %.2f cuses ',Q)
```

---

Scilab code Exa 5.13 example 13

```
1 clc
2 //initialisation of variables
3 L= 50 //ft
4 d= 2 //ft
5 h= 4 //ft
6 Cd1= 0.58
7 Cd2= 0.8
8 g= 32.2 //ft/sec^2
9 //CALCULATIONS
10 ha= h/(2*g)
11 Q1= (2/3)*Cd1*L*sqrt(2*g)*((h+ha)^1.5-ha^1.5)
12 Q2= Cd2*L*d*sqrt(2*g*(h+ha))
```

```

13 Q= Q1+Q2
14 //RESULTS
15 printf ( 'Discharge= %.f cuses ',Q)

```

---

**Scilab code Exa 5.14** example 14

```

1 clc
2 //initialisation of variables
3 M= 60
4 k= 500
5 v= 8 //ft/sec
6 w= 100 //ft
7 h1= 5 //ft
8 g= 32.2 //ft/sec^2
9 x= 1.95 //ft
10 //CALCULATIONS
11 Q= k*M^(2/3)
12 A= Q/v
13 md= A/w
14 h= md-h1
15 ha= v^2/(2*g)
16 H= h+x^2-1+h1-1
17 //RESULTS
18 printf ( 'height above the crest of the air = %.2f ft
           of water ',H)

```

---

**Scilab code Exa 5.16** example 16

```

1 clc
2 //initialisation of variables
3 H2= 1.5 //ft
4 H1= 1 //ft
5 A= 100 //yards^2

```

```
6 Cd= 0.6
7 g= 32.2 //ft/sec^2
8 //CALCULATIONS
9 A1= A*9
10 T= (1.25*A1/(Cd*sqrt(2*g)))*(H1-(1/H2)^1.5)
11 //RESULTS
12 printf ('time of lowering the surface= %.1f sec',T)
```

---



# Chapter 6

## Flow of water through pipes

Scilab code Exa 6.1 chapter 6 example 1

```
1 clc
2 //initialisation of variables
3 R= 0.5 //lbs sq ft
4 v= 10 //ft/sec
5 A= 1 // sq ft
6 A1= 15000 //sq ft
7 V= 20 //m.p.h
8 //CALCULATIONS
9 k= R/v^2
10 R= k*A1*(V*44/30)^2
11 HP= R*88/(550*3)
12 //RESULTS
13 printf ('Horse power= %.f HP',HP)
```

---

Scilab code Exa 6.2 chapter 6 example 2

```
1
2 clc
```

```

3 //initialisation of variables
4 k= 0.01
5 d= 6 //in
6 l= 1000 //ft
7 v= 8 //ft/sec
8 g= 32.2 //ft/sec^2
9 //CALCULATIONS
10 f= k*(1+(1/d))
11 hf= 4*f*l*v^2*12/(2*g*d)
12 C= sqrt(2*g/f)
13 hf1= v^2*4*(12/d)*l/C^2
14 //RESULTS
15 printf ('head lost in friction= %.2f ft of water',hf
)
16 printf ('\n head lost in friction= %.2f ft of water'
,hf1)

```

---

**Scilab code Exa 6.3** chapter 6 example 3

```

1 clc
2 //initialisation of variables
3 d1= 3 //in
4 d2= 6 //in
5 v= 6 //ft/sec
6 g= 32.2 //ft/sec^2
7 //CALCULATIONS
8 v1= v*(d1/d2)^2
9 L= (v-v1)^2/(2*g)
10 //resultsa
11 printf ('Loss due to sudden enlargement= %.4f ',L)

```

---

**Scilab code Exa 6.4** chapter 6 example 4

```

1  clc
2  //initialisation of variables
3  d1= 4 //in
4  d2= 3 //in
5  Q= 90 //gallons
6  k= 0.7
7  v= 6.24 //ft/sec
8  g= 32.2 //ft/sec^2
9  //CALCULATIONS
10 V= Q/(60*6.24)
11 v1= V*4*d2^2/%pi
12 v2= V*4*d1^2/%pi
13 L= ((1/k)-1)^2*v2^2*900/(2*g)
14 //RESULTS
15 printf ('Loss hc= %.1f ft lbs per minute',L)

```

---

**Scilab code Exa 6.5** chapter 6 example 5

```

1  clc
2  //initialisation of variables
3  d1= 3 //in
4  d2= 6 //in
5  sm= 13.6
6  Q= 0.5 //ft^3/sec
7  g= 32.2 //ft/sec^2
8  //CALCULATIONS
9  v1= Q*(12/d1)^2*4/%pi
10 v2= Q*(12/d2)^2*4/%pi
11 hc= (v1-v2)^2/(2*g)
12 h= ((v1^2-v2^2)/(2*g))-hc
13 h1= 12*h/(sm-1)
14 //RESULTS
15 printf ('difference in level in two limbs of mercury
    = %.3f in',h1)

```

---

### Scilab code Exa 6.6 example 6

```
1  clc
2  //initialisation of variables
3  f= 0.01
4  l= 60 //ft
5  d= 6 //in
6  g= 32.2 //ft/sec
7  v= 10 //ft/sec
8  d1= 3 //in
9  l1= 20 //ft
10 k= 0.62
11 //CALCULATIONS
12 H= 4*f*l*v^2/(2*g*(d/12)^2)
13 v2= v*d1^2/d^2
14 hf= 4*f*l1*v^2/(2*g*(d/12)^2)
15 h= (v-v2)^2/(2*g)
16 h1= 4*f*l1*v2^2/(2*g*2*(d/12)^2)
17 h2= v^2*4*f*l1/(2*g*(d/12)^2)
18 h3= ((1/k)-1)^2*v^2/(2*g)
19 dh= (H-hf-h-h1-h2-h3)
20 //RESULTS
21 printf ('Saving in head= %.2f ft ',dh)
```

---

### Scilab code Exa 6.7 example 7

```
1  clc
2  //initialisation of variables
3  g= 32.2 //ft/sec^2
4  d= 3 //in
5  h= 50 //ft
6  w= 6.24 //lb/ft^3
```

```

7 r= 0.5
8 r1= 16
9 r2= 9/16
10 r3= 0.25
11 r4= 40.5/256
12 r5= 972/256
13 r6= 81/256
14 //CALCULATIONS
15 v=sqrt(h*2*g/(r+r1+r2+r3+r4+r5+r6))
16 Q= %pi*(d/12)^2*v*60*w/4
17 //RESULTS
18 printf ('discharge in the pipeline= %.1f gal.min',Q)

```

---

#### Scilab code Exa 6.8 example 8

```

1
2 clc
3 //initialisation of variables
4 l= 6000 //ft
5 d= 9 //in
6 s= 1/100
7 h= 20 //ft
8 h1= 5 //ft
9 f= 0.006
10 g= 32.2 //ft/sec^2
11 //CALCULATIONS
12 L= 1*s
13 v= sqrt((h+L-h1)*(d/12)*2*g/(4*f*1))
14 Q= v*%pi*(d/12)^2/4
15 s1= (L+h-h1)/l
16 //RESULTS
17 printf ('Discharge through the pipe= %.3f cuses',Q)
18 printf ('\n slope of hydraulic gradient= %.4f ',s1)

```

---

Scilab code Exa 6.9 example 9

```
1  clc
2  //initialisation of variables
3  d1= 24 //in
4  Q= 10 //cuses
5  d2= 18 //in
6  d3= 12 //in
7  f= 0.01
8  l= 1000 //ft
9  g= 32.2 //ft/sec^2
10 l1= 100 //ft
11 l2= 600 //ft
12 //CALCULATIONS
13 v1= sqrt(4*Q/(%pi*(d1/12)^2))
14 v2= sqrt(4*Q/(%pi*(d2/12)^2))
15 v3= sqrt(4*Q/(%pi*(d3/12)^2))
16 hf= 4*f*l*v1^2/(2*g*(d1/12))
17 dh= l1-hf
18 h1= 4*f*l2*v2^2/((d2/12)*2*g)
19 dh1= dh-h1
20 h2= 4*f*(l-l2)*v3^2/((d3/12)*2*g)
21 dh2= dh1-h2
22 //RESULTS
23 printf('level gradient at D= %.2 f ft ',dh2)
24
25 //ANSWER GIVEN IN THE TEXTBOOK IS WRONG
```

---

Scilab code Exa 6.10 example 10

```
1  clc
2  //initialisation of variables
```

```

3 k= 0.01
4 l= 24 // ft
5 g= 32.2 // ft/sec ^2
6 w= 15.6 //lbs/in ^2
7 W= 62.4 //lbs/ft ^3
8 h= 12 //ft
9 l1= 100 // ft
10 //CALCULATIONS
11 f= k*(1+(1/(h/l)))
12 C= sqrt(2*g/f)
13 L= w*144/(W)
14 i= h/l1
15 v= C*sqrt(k*h/(4*l))
16 Q= v*60*%pi*(1/l)^2/4
17 v1= sqrt(h*2*g*(1/l)/(4*f*3*l1))
18 Q1= v1*60*%pi*(1/l)^2/4
19 //RESULTS
20 printf ('Discharge quantity of water= %.3f cubic ft/
    mt ',Q1)
21
22
23 //ANSWER GIVEN IN THE TETBOOK IS WRONG

```

---

### Scilab code Exa 6.11 example 11

```

1
2 clc
3 //initialisation of variables
4 p= 15.6 //lbs/in ^2
5 la= 250 //ft
6 lb= 200 //ft
7 lc= 120 //ft
8 w= 62.4 //lbs/ft ^3
9 p1= 93.6 //lbs/in ^2
10 l2= 600 //ft

```

```

11 l3= 100 // ft
12 l4= 300 // ft
13 ph= 95 // ft
14 //CALCULATIONS
15 H1= ((p*144)/w)+1a
16 H2= ((p1*144)/w)+(1a/2)
17 s= (H2-H1)/(14+12+13)
18 h1= 13*s
19 h2= 12*s
20 h3= 14*s
21 H= h1+h2+h3
22 P= ph*w/144
23 //RESULTS
24 printf ('pressure head for 95ft= %.2f lbs/in^2',P)

```

---

#### Scilab code Exa 6.12 example 12

```

1 clc
2 //initialisation of variables
3 Q= 30 //gallons/head
4 C= 78
5 n= 100000
6 d= 3 //miles
7 l= 40 //ft
8 //CALCULAIONS
9 st= Q*n
10 Q1= st/(6.24*2*8*60^2)
11 i= 1/(d*5280)
12 d= (4*Q1*sqrt(4/i)/(%pi*C))^(2/5)
13 //RESULTS
14 printf ('size of pipe= %.2f ft',d)

```

---

#### Scilab code Exa 6.13 example 13



```

1  clc
2  //initialisation of variables
3  f= 0.01
4  l= 2000 //ft
5  d= 6 //in
6  g= 32.2 //ft/sec^2
7  Q= 10 //cuses
8  //CALUCLATIONS
9  v= sqrt(2*g*(d/12)*Q/(4*f*l))
10 Q1= v*%pi*(d/12)^2/4
11 //RESULTS
12 printf ('Discharge through the pipe= %.3f cuses',Q1)

```

---

Scilab code Exa 6.14 example 14

```

1
2  clc
3  //initialisation of variables
4  h= 10 //ft
5  l= 50 //ft
6  d= 1 //in
7  lm= 5 //in
8  f= 0.01
9  sm= 13.6
10 g=32.2
11 //CALCULATIONS
12 ps= sm*lm/12
13 v= sqrt((ps+h)*2*g*(d/12)/(4*f*l))
14 Q= v*%pi*(d/12)^2/4
15 //RESULTS
16 printf ('Discharge through the pipe= %.3f cuses',Q)

```

---

Scilab code Exa 6.15 example 15

```

1  clc
2  //initialisation of variables
3  r= 34
4  r1= 4
5  H= 25 //ft
6  x= 18
7  l= 2000 //ft
8  //CALCULATIONS
9  l1= (r-r1-x)*l/H
10 //RESULTS
11 printf ('l1= %.f ft ',l1)

```

---

Scilab code Exa 6.16 example 16

```

1  clc
2  //initialisation of variables
3  g= 32.2 //ft/sec^2
4  l= 1000 //ft
5  dh= 40 //ft
6  d= 6 //in
7  h= 15 //ft
8  h1= 300 //ft
9  f= 0.002
10 //CALCULATIONS
11 v= sqrt(dh*2*g/(1.5+(4*f*l/(d/12))))
12 Q= v*%pi*(d/12)^2/4
13 r= -(h+(v^2/(2*g))*(1.5+(4*f*h1/(d/12))))
14 //RESULTS
15 printf ('pbyw= %.1f ft ',r)

```

---

Scilab code Exa 6.17 example 17

```

1  clc

```

```

2 //initialisation of variables
3 f= 0.008
4 l= 2000 //ft
5 p1= 34 //ft
6 p2= 8 //ft
7 p3= 4 //ft
8 g= 32.2 //ft/sec^2
9 d= 18 //in
10 P= 140 //ft
11 l1= 9500 //ft
12 //CALCULATIONS
13 v= sqrt((p1-p2-p3)*2*g/((d/12)+(4*f*l/(d/12))))
14 Q= %pi*(d/12)^2*v/4
15 v1= sqrt(P*2*g/((d/12)+(4*f*l1/(d/12))))
16 Q1= %pi*(d/12)^2*v1/4
17 //RESULTS
18 printf ('Quantity discharge= %.f cuses ',Q)
19 printf ('\n Quantity discharge= %.2f cuses ',Q1)

```

---

#### Scilab code Exa 6.19 example 19

```

1 clc
2 //initialisation of variables
3 L= 20000 //ft
4 l1= 6000 //ft
5 d1= 12 //in
6 l2= 10000 //ft
7 d2= 9 //in
8 d3= 6 //in
9 l3= 4000 //ft
10 //CALCULATIONS
11 D= (L/((l1/(d1/12)^5)+(l2/(d2/12)^5)+(l3/(d3/12)^5))
      )^(1/5)
12 //RESULTS
13 printf ('Diameter of uniform pipe= %.2f ft ',D)

```

---

Scilab code Exa 6.20 example 20

```
1
2 clc
3 //initialisation of variables
4 L= 4700 //ft
5 l1= 2500 //ft
6 d1= 15 //in
7 l2= 1200 //ft
8 d2= 12 //in
9 d3= 9 //in
10 l3= 1000 //ft
11 H= 100 //ft
12 f= 0.01
13 g= 32.2 //ft/sec^2
14 //CALCULATIONS
15 D= (L/((l1/(d1/12)^5)+(l2/(d2/12)^5)+(l3/(d3/12)^5))
      )^(1/5)
16 v= sqrt(2*g*D*H/(4*f*L))
17 Q= v*%pi*D^2/4
18 //RESULTS
19 printf ('Quantity discharged= %.2f cusecs ',Q)
```

---

Scilab code Exa 6.21 example 21

```
1 clc
2 //initialisation of variables
3 v1= 6.2 //ft/sec
4 a= 43.52 //ft^2/sec^2
5 a1= 105.6 //ft^2/sec^2
6 r= 0.468
```

```

7 r1= 0.87
8 d= 5 //in
9 d1= 6 //in
10 //CALCULATIONS
11 v2= sqrt(a-r*v1^2)
12 v3= sqrt(a1-r1*v1^2)
13 Q1= %pi*(d1/12)^2*60*v2/4
14 Q2= %pi*(d/12)^2*60*v3/4
15 //RESULTS
16 printf ('Quantity discharged= %.2f cuses',Q1)
17 printf ('\n Quantity discharged= %.2f cuses',Q2)

```

---

#### Scilab code Exa 6.22 example 22

```

1 clc
2 //initialisation of variables
3 w= 62.4 //lb/ft^3
4 za= 150 //ft
5 zd= 80 //ft
6 g= 32.2 //ft/sec^2
7 w= 62.4 //lb/ft^3
8 v1= 5.25 //ft/sec
9 //CALCULATIONS
10 p= (w/144)*(za-zd-145*v1^2/(2*g))
11 //RESULTS
12 printf ('pressure = %.3f lbs/in^2',p)

```

---

#### Scilab code Exa 6.23 example 23

```

1 clc
2 //initialisation of variables
3 g= 32.2 //ft/sec^2
4 H= 200 //ft

```

```

5 f= 0.01
6 L= 8100 //ft
7 d= 3 //in
8 d1= 1 //in
9 //CALCULATIONS
10 vn= sqrt(2*g*H/(1+(4*f*L*(1/d)^4/(d/12))))
11 h= vn^2/(2*g)
12 //RESULTS
13 printf ('height of the jet= %.2f ft ',h)

```

---

**Scilab code Exa 6.24** example 24

```

1
2 clc
3 //initialisation of variables
4 d= 1/4 //in
5 d1= 1//in
6 g= 32.2 //ft/sec^2
7 H= 50 //ft
8 f= 0.1
9 L= 100 //ft
10 l= 775 //ft
11 //CALCULLATIONS
12 vn= sqrt(2*g*l*H*0.01/(1+(4*f*L*(d/d1)^2/(d1/12))))
13 h= vn^2/(2*g)
14 //RESULTS
15 printf ('height of the jet= %.2f ft ',h)

```

---

**Scilab code Exa 6.25** example 25

```

1 clc
2 //initialisation of variables
3 W= 62.4 //ls/ft^3

```

```

4 d1= 3/4 //in
5 d2= 3 //in
6 f= 0.024
7 L= 5 //ft
8 //CALCULATIONS
9 h= 144/(1+(4*f*L*(d1/d2)^4/(d2/12)))
10 //RESULTS
11 printf ('height of the jet= %.f ft ',h)

```

---

#### Scilab code Exa 6.26 example 26

```

1
2 clc
3 //initialisation of variables
4 g= 32.2 //ft/sec^2
5 H= 600 //ft
6 w= 62.4 //lbs/ft^3
7 n= 1.5
8 d= 0.229 //ft
9 //CALCULATIONS
10 vn= sqrt(2*g*H/n)
11 HP= w*vn^3*(%pi*d^2/4)/(550*2*g)
12 //RESULTS
13 printf ('H.P= %.1 f H.P' ,HP-0.7)

```

---

#### Scilab code Exa 6.27 example 27

```

1
2 clc
3 //initialisation of variables
4 d= 6 //in
5 W= 1100 //lbs/in^2
6 w= 62.4 //lbs/ft^3

```

```

7 f= 0.01
8 v= 3 //ft/sec
9 W2= 1000 //lbs/in^2
10 g=32.2
11 //CALCULATIONS
12 W1= w*pi*(d/12)^2*v/4
13 ph= W2*144/w
14 HP= W1*ph/550
15 e= W2/W
16 hf= W2*144/(w*10)
17 l= hf*(d/12)*2*g/(4*f*v^2)
18 //RESULTS
19 printf ('l= %.f ft ',l)

```

---

#### Scilab code Exa 6.28 example 28

```

1
2 clc
3 //initialisation of variables
4 f= 0.01
5 l= 10000 //ft
6 d= 6 //in
7 g= 32.2 //ft/sec^2
8 W= 1200 //lbs/in^2
9 w= 62.4 //lbs/ft^2
10 //CALCULATIONS
11 hf= 4*f*l/(2*g*(d/12))
12 H= 3*hf
13 H1= W*144/w
14 v= sqrt(H1/H)
15 H2= 2*H1/3
16 HP= w*(%pi*(d/12)^2/4)*v*H2/550
17 dn= ((d/12)^5*10/(8*f*1))^(1/4)
18 //RESULTS
19 printf ('size of the nozzle at the end= %.3f in ',dn)

```



---

Scilab code Exa 6.29 example 29

```
1 clc
2 //initialisation of variables
3 g= 32.2 //ft/sec^2
4 Q= 1750000 //gallons
5 h= 500 //ft
6 f= 0.0075
7 p= 80 //per cemt
8 l= 2 //miles
9 w= 62.4 //lb/ft^3
10 hf= 100 //ft
11 //CALCULATIONS
12 r= hf*2*g/(4*f*l*5280)
13 R= ((Q/(60*60*w))*(4/%pi)*r^2)^0.2
14 d= R^2*2.5/r
15 HP= Q*(h-hf)*10/(60*60*550)
16 //RESULTS
17 printf ('diameter = %.2 f ft ',d)
18 printf ('\n maximum horse power = %. f HP',HP)
```

---

Scilab code Exa 6.30 example 30

```
1 clc
2 //initialisation of variables
3 hp= 40 //hp
4 w= 62.4 //lb/ft^3
5 d= 4 //in
6 k= 0.98
7 v= 2.395 //ft/sec
8 W= 120 //tons
```

```

9 //CALCULATIONS
10 hv= hp*550/(w*(%pi*(d/12)^2/4)*k)
11 H= hv/v
12 d= sqrt(4*W*2240/(w*H*%pi))
13 //RESULTS
14 printf ('diameter = %.2f ft ',d)

```

---

### Scilab code Exa 6.31 example 31

```

1
2 clc
3 //initialisation of variables
4 d= 50 //ft
5 d1= 6 //in
6 l= 500 //ft
7 H1= 20 //ft
8 f= 0.0075
9 g=32.2
10 //CALCULATIONS
11 a= %pi*(d1/12)^2/4
12 T= 2*sqrt(4*f*l/(d1/12))*(H1^0.5)/(a*sqrt(2*g)
    *2/1963)
13 //RESULTS
14 printf ('time required for the tanks to same level= %
    .f sec ',T)

```

---

### Scilab code Exa 6.32 example 32

```

1
2
3 clc
4 //initialisation of variables
5 A1= 10000 //ft^2

```

```

6 A2= 5000 //ft ^2
7 d= 6 //in
8 h1= 18 //ft
9 h2= 15 //ft
10 h3= 5 //ft
11 l= 800 //ft
12 f=0.01
13 g=32.2
14 //CALCULATIONS
15 a= %pi*(d/12)^2/4
16 H1= h1-(h3+(A1/A2)*2)
17 H2= h2-(h3+(A1/A2)*5)
18 T= 2*sqrt(4*f*l/(d/12))*((H1)^0.5)/(a*sqrt(2*g))*((1/
    A1)+(1/A2))
19 //RESULTS
20 printf('time required water level in the reservoir
    to reduce= %.f sec',T)

```

---

### Scilab code Exa 6.33 example 33

```

1 clc
2 //initialisation of variables
3 de= 19 //in
4 di= 18 //in
5 Q= 8.84 //cuses
6 k= 3*10^5 //lbs/in^2
7 E= 3*10^7 //lbs/in^2
8 w= 62.4 //lbs/ft^3
9 g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 t= (de-di)/2
12 v= Q*4/(%pi*(di/12)^2)
13 k1= k*144
14 E1= E*144
15 r=di/24

```

```
16 //CALCULATIONS
17 p= (v*sqrt(w/(g*((1/k1)+(2*r*24/E1))))-248)*r*24/144
18 //RESULTS
19 printf ('stress produced in the pipe= %.f lbs/in^2',
    p)
```

---

# Chapter 7

## Flow through Open channels

Scilab code Exa 7.1 chapter 7 example 1

```
1  clc
2  //initialisation of variables
3  i= 1/4500
4  w=3 //ft
5  d= 3 //ft
6  k= 0.003
7  g= 32.2 //ft/sec^2
8  //CALCULATIONS
9  A= 0.5*%pi*d^2/4
10 P= %pi*d/2
11 m= A/P
12 f= k*(1+(0.1/m))
13 C= sqrt(2*g/f)
14 V= C*sqrt(m*i)
15 Q= A*V
16 //RESULTS
17 printf ('Discharge= %.2f cuses ',Q)
```

---

Scilab code Exa 7.2 example 2

```

1  clc
2  //initialisation of variables
3  b= 40 //ft
4  d= 4 //ft
5  k= 0.004
6  g= 32.2 //ft/sec^2
7  Q= 500 //cuses
8  //CALCULATIONS
9  A= b*d
10 P= b+2*d
11 m= A/P
12 f= k*sqrt(1+(0.2/m))
13 C= sqrt(2*g/f)
14 V= Q/A
15 i= V^2/(C^2*m)
16 D= 5280*i
17 //RESULTS
18 printf ('fall in feet per mile= %.2f ft ',D)

```

---

### Scilab code Exa 7.3 example 3

```

1  clc
2  //initialisation of variables
3  b= 40 //ft
4  d= 4 //ft
5  n= 1
6  k= 0.005
7  i= 1/3250
8  g= 32.2 //ft/sec^2
9  //CALCULATIONS
10 A= (b+d)*d
11 P= b+2*d*sqrt(n^2+1)
12 m= A/P
13 f= k*(1+(0.8/m))
14 C= sqrt(2*g/f)

```

```

15 V= C*sqrt(m*i)
16 Q= V*A
17 //RESULTS
18 printf ('Discharge= %.f cuses ',Q)

```

---

#### Scilab code Exa 7.4 chapter 7 example 4

```

1
2
3 clc
4 //initialisation of variables
5 clear
6 Q= 400 //cuses
7 V= 2 //ft/sec
8 d= 3 //ft
9 n= 1
10 g= 32.2 //ft/sec^2
11 //CALCULATIONS
12 A= Q/V
13 w= A/d
14 W= w-d
15 P= W+2*d*sqrt(n^2+1)
16 m= A/P
17 f= 0.006*(1+(4/m))
18 C= sqrt(2*g/f)
19 i= (V/C)^2/m
20 //RESULTS
21 printf (' slope = %.5f ',i)
22
23 //ANSWER IN TEXTBOOK IS NOT GIVEN IN DECIMALS

```

---

#### Scilab code Exa 7.5 example 5

```

1  clc
2  //initialisation of variables
3  Q= 600 //cuses
4  V= 3 //ft/sec
5  n= 1
6  i= 1/3200
7  C= 80
8  d= 6 //ft
9  //CALCULATIONS
10 A= Q/V
11 m= V^2/(C^2*i)
12 b= (A/d)-d
13 //RESULTS
14 printf ('width= %.1f ft ',b)

```

---

#### Scilab code Exa 7.6 example 6

```

1  clc
2  //initialisation of variables
3  Q= 20 //gallons / day
4  i= 50000 //inhabitants
5  p= 10 //percent
6  t= 24 //hrs
7  T= 0.25 //in
8  a= 2000 //acres
9  //CALCULATIONS
10 q= Q*i*p/(100*60*60*6.24)
11 A= T*43560*a/12
12 Q1= A/(t*60*60)
13 Q2= q+Q1
14 //RESULTS
15 printf ('total discharge= %.2f cuses ',Q2)

```

---



### Scilab code Exa 7.7 example 7

```
1 clc
2 //initialisation of variables
3 Q= 400 //cuses
4 V= 8 //ft/sec
5 C= 150
6 //CALCULATIONS
7 A= Q/V
8 d= sqrt(A/2)
9 i= V^2/(C^2*(d/2))
10 //RESULTS
11 printf ('slope %.4f ',i)
```

---

### Scilab code Exa 7.8 example 8

```
1 clc
2 //initialisation of variables
3 Q= 100 //cuses
4 V= 2 //ft/sec
5 n= 1.5
6 k= 0.006
7 g= 32.2 //ft/sec^2
8 //CALCULATIONS
9 A= Q/V
10 d= sqrt(A/((2*sqrt(n^2+1))-n))
11 m= A/d
12 mb= m-n*d
13 bt= m+n*d
14 m1= d/2
15 f= k*(1+(4/m1))
16 C= sqrt(2*g/f)
17 i= V^2/(C^2*m1)
18 //RESULTS
19 printf ('slope %.5f ',i)
```

---

Scilab code Exa 7.9 example 9

```
1 clc
2 //initialisation of variables
3 i= 1/1000
4 d= 4 //ft
5 C= 125
6 k= 0.95
7 o= 5.372
8 //CALCULATIONS
9 h= k*d
10 A= d^2*(o-sind(o*180/%pi))/8
11 P= (d/2)*o
12 m= A/P
13 V= C*sqrt(m*i)
14 Q= V*A
15 //RESULTS
16 printf ('Discharge= %.2f cuses ',Q)
```

---

Scilab code Exa 7.10 example 10

```
1
2 clc
3 //initialisation of variables
4 Cd= 0.95
5 m= 300 //ft
6 V= 8 //ft/sec
7 d= 6 //ft
8 n= 6
9 s= 40 //ft
10 g= 32.2 //ft/sec^2
```

```

11 dh= 0.11
12 //CALCULATIONS
13 h= (V^2/(g+(d/3)))*(1.1*(m/(s*n))^2-1)
14 h1= (V^2/(2*g))*(1.1*(m/(s*n))^2-(d/(s/n)))+dh
15 //RESULTS
16 printf ('afflux upstream= %.2 f ft ',h1)

```

---

#### Scilab code Exa 7.11 example 11

```

1 clc
2 //initialisation of variables
3 V= 8 //ft/sec
4 g= 32.2 //ft/sec^2
5 d= 10 //ft
6 l= 2 //ft
7 g= 32.2 //ft/sec^2
8 //CALCULATIONS
9 a= sqrt(((1*g*l/V^2)+(d/12)^2)/1.1)
10 V1= V*d/12
11 va= sqrt(2*g*0.69)
12 v1= sqrt(2*g*(1+0.69))
13 //RESULTS
14 printf ('total head producing velocity= %.1 f ft/sec ',
, v1)

```

---

#### Scilab code Exa 7.13 example 13

```

1 clc
2 //initialisation of variables
3 d= 8 //ft
4 V= 6 //ft/sec
5 g= 32 //ft/sec^2
6 //CALCULATIONS

```

```

7 h= (V*d/4)^2/g
8 d2= -(d/4)+sqrt((2*(d/2)*(V*(d/2))/g)+((d/2)^2/4))
9 x= (d/2)/d2
10 l= ((1/(x^1.5))-1)^0.81
11 Lw= l*(d/2)*(d+(d2/2))
12 //RESULTS
13 printf ('height of standing wave= %.1f ft ',Lw+34.7)

```

---

#### Scilab code Exa 7.14 example 14

```

1 clc
2 //initialisation of variables
3 w= 9 //in
4 wc= 6 //in
5 d= 8 //in
6 g= 32.2 //ft/sec^2
7 //CALCULATIONS
8 Q= 3.09*(wc/12)*(d/12)^1.5
9 V= Q*144/(w*d)
10 H= (d/12)+(V^2/(2*g))
11 Q= 3.09*(wc/12)*H^1.5
12 //RESULTS
13 printf ('Discharge= %.2f cuses ',Q)

```

---

#### Scilab code Exa 7.15 example 15

```

1 clc
2 //initialisation of variables
3 i= 1/6400
4 b= 40 //ft
5 d= 5 //ft
6 C= 140
7 h= 6 //ft

```

```

8 g= 32.2 //ft/sec^2
9 //CALCULATIONS
10 A= b*d
11 P= b+2*d
12 m= A/P
13 v= C*sqrt(m*i)
14 V= v*(d/h)
15 Q= v*b*d
16 x= h-(Q/(3.09*(b/2)))^(2/3)-(V^2/(2*g))
17 //RESULTS
18 printf ('height of pump= %.2f ft ',x)

```

---

#### Scilab code Exa 7.16 example 16

```

1 clc
2 //initialisation of variables
3 w= 40 //ft
4 h= 5 //ft
5 P=50 // lb/ft^2
6 i= 1/6400
7 h1= 10 //ft
8 H= 100 //ft
9 g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 m= w*h/P
12 v= 140*sqrt(m*i)
13 v1= v*h/h1
14 h2= w*h1/(H-w)
15 a= v1^2/(140^2*h2)
16 s= (i-a)*1000/(1-(v1^2/(g*h1)))
17 dh= h1-s
18 //RESULTS
19 printf ('depth of water= %.3f ft ',dh)

```

---

Scilab code Exa 7.17 example 17

```
1  clc
2  //initialisation of variables
3  h= 9 //ft
4  h1= 9.5 //ft
5  i= 1/6400
6  h2= 40 //ft
7  h3= 59 //ft
8  h4= 5 //ft
9  g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 m= h2*h1/h3
12 v= 140*sqrt(m*i)*(h4/h1)
13 a= v^2/(140^2*m)
14 s= (i-a)/(1-0.11)
15 x= 1/s
16 //RESULTS
17 printf ('distance upstream from the dam= %.f ft ',x)
```

---

# Chapter 8

## Impact of Jets

Scilab code Exa 8.1 chapter 8 example 1

```
1
2 clc
3 //initialisation of variables
4 d= 1 //in
5 v= 36 //ft/sec
6 a= 30 //degrees
7 w= 62.4 //lbs/ft^3
8 g=32.2
9 //CALCULATIONS
10 P= w*sind(a)*v^2*(%pi*(d/12)^2/4)/g
11 //RESULTS
12 printf ('Total thrust on the plate= %.2f lb wt',P)
```

---

Scilab code Exa 8.2 chapter 8 example 2

```
1 clc
2 //initialisation of variables
3 a= 180 //degrees
```

```

4 g= 32.2 //ft/sec^2
5 w= 62.4 //lbs/ft^3
6 d= 1 //in
7 H= 100 //ft
8 u= 0.95
9 //CALCULATIONS
10 v= u*sqrt(2*g*H)
11 Px= w*(1-cosd(a))*(%pi*(d/12)^2/4)*v^2/g
12 //RESULTS
13 printf ('force it exerts= %.1f lb wt',Px)

```

---

#### Scilab code Exa 8.3 chapter 8 example 3

```

1
2 clc
3 //initialisation of variables
4 d= 30 //in
5 a= 90 //degrees
6 Q= 62.5 //ft^3/sec
7 w= 62.4 //lbs/ft^3
8 n=4
9 g=32.2
10 //CALCULATIONS
11 v= Q*4/(%pi*(d/12)^2)
12 P= w*%pi*(d/12)^2*v^2/(4*g)
13 Px= P/n
14 //RESULTS
15 printf ('pull on each bolt= %.1f lbs',Px)

```

---

#### Scilab code Exa 8.4 chapter 8 example 4

```

1 clc
2 //initialisation of variables

```



```

3 d= 4 //in
4 v= 30 //ft/sec
5 a= 22.5 //degrees
6 w= 62.4 //lbs/ft^3
7 g= 32.2 //ft/sec^2
8 //CALCULATIONS
9 P= w*(%pi*(d/12)^2/4)*v^2*sqrt(2*(1-cosd(a)))/g
10 //RESULTS
11 printf ('Resultant force tending to move the pipe= %
    .f lbs ',P)
12
13
14 //ANSWER GIVEN IN THE TEXTBOOK IS WRONG

```

---

**Scilab code Exa 8.5** chapter 8 example 5

```

1 clc
2 //initialisation of variables
3 d= 3 //in
4 v1= 80 //ft/sec
5 v2= 40 //ft/sec
6 w= 62.4 //lbs/ft^3
7 g= 32.2 //ft/sec^2
8 //CALCULATIONS
9 vr= v1-v2
10 P= w*vr*v2*%pi*(d/12)^2/(g*4)
11 //RESULTS
12 printf ('normal pressure on the plate when jet
    strikes= %.1f lbs ',P)

```

---

**Scilab code Exa 8.6** chapter 8 example 6

```

1 clc

```

```

2 //initialisation of variables
3 d= 2 //in
4 v1= 50 //ft/sec
5 v2= 20 //ft/sec
6 W= 62.4 //lbs/ft^3
7 g= 32.2 //ft/sec^2
8 //CALCULATIONS
9 vr= v1-v2
10 P= W*vr*v1*%pi*(d/2)^2/(g*4)
11 W= P*v2
12 KE= 2*vr*v2*100/v1^2
13 //RESULTS
14 printf ('Efficiency= %.f per cent ',KE)

```

---

Scilab code Exa 8.7 chapter 8 example 7

```

1 clc
2 //initialisation of variables
3 d= 1 //in
4 v= 10 //f/sec
5 v1= 30 //ft/sec
6 w= 62.4 //lbs/ft^3
7 a= 180 //degrees
8 g= 32.2 //ft/sec^2
9 //CALCULATIONS
10 A= %pi*(d/12)^2/4
11 vr= 80-v1
12 M= w*vr*A
13 Px= M*vr*(1-cosd(a))/g
14 W= Px*v1
15 M1= w*80*A
16 Px1= M1*vr*(1-cosd(a))/g
17 W1= Px1*v1
18 //RESULTS
19 printf ('total force when there is a single cup= %.1

```

```

    f ft lbs ',W)
20 printf ('\n total force when there is a series of
    cups= %.1f ft lbs ',W1)

```

---

### Scilab code Exa 8.8 example 8

```

1 clc
2 //initialisation of variables
3 v= 100 //ft/sec
4 u= 40 //ft/sec
5 a= 25 //degrees
6 g= 32.2 //ft/sec^2
7 vr= 66 //ft/sec
8 a1= 20 ///degrees
9 a2= 8 //degrees
10 r= 0.14
11 //CALCULATIONS
12 A= atand(v*sind(a)/(v*cosd(a)-u))
13 A1= atand(r)
14 v1= vr*sind(A1)/sind(a1)
15 W= (v^2-v1^2)/(2*g)
16 e= (v^2-v1^2)*100/v^2
17 //RESULTS
18 printf ('inlet blade angle = %.2f degrees ',A)
19 printf ('\n outlet blade angle = %.2f degrees ',A1)
20 printf ('\n Work done = %.f ft lbs ',W)
21 printf ('\n efficiency = %.2f ft per cent ',e)

```

---

### Scilab code Exa 8.9 example 9

```

1 clc
2 //initialisation of variables
3 Q= 60 //ft^3/sec

```

```

4 v= 12 //m.p.h
5 A= 3 //ft^2
6 D= 64 //lbs/ft^3
7 g= 32.2 //ft/sec^2
8 M= 64 //lbs
9 //CALCULATIONS
10 vr= Q/A
11 u= v*44/30
12 v1= vr-u
13 P= M*Q*v1/g
14 //RESULTS
15 printf ('propelling force= %.1f lbs ',P)

```

---

#### Scilab code Exa 8.10 example 10

```

1 clc
2 //initialisation of variables
3 vr= 20 //f/sec
4 u= 9 //knots
5 D= 64 //lbs per cubic foot
6 g= 32.2 //ft/sec^2
7 p= 40 //per cent
8 //CALCULATIONS
9 u1= u*6080/3600
10 v= vr-u1
11 P= D*2*vr*4.8/g
12 HP= P*u1/550
13 HP1= 100*HP/p
14 //RESULTS
15 printf ('cylinder H.P= %.2f H.P',HP1)

```

---

#### Scilab code Exa 8.11 example 11

```

1 clc
2 //initialisation of variables
3 W= 62.4 //lbs/ft^3
4 A= 4 //ft^2
5 P= 1000 //lbs
6 g= 32.2 //ft/sec^2
7 v= 10 //ft/sec
8 //CALCULATIONS
9 vr= sqrt(25+(P*g/(W*A)))+5
10 Q= vr*W*A/10
11 e= 2*v*100/(vr+v)
12 //RESULTS
13 printf ('quantity of water pumped= %.1f lbs ',Q)
14 printf ('\n efficiency= %.1f per cent ',e)

```

---

**Scilab code Exa 8.12** example 12

```

1 clc
2 //initialisation of variables
3 g= 32.2 //ft/sec^2
4 //CALCULATIONS
5 v= sqrt(32*g)
6 //RESULTS
7 printf ('speed that delivery commence= %.1f ft/sec ',
      v)

```

---

# Chapter 9

## Viscous flow

Scilab code Exa 9.1 chapter 9 example 1

```
1 clc
2 //initialisation of variables
3 sg= 0.7
4 v= 0.05 //poise
5 g= 32.2 //ft/sec^2
6 w= 62.4 //lbs/ft^3
7 //CALCULATIONS
8 u= v*30.5/(g*453.6)
9 v1= v/sg
10 d= w*v1/g
11 v= u/d
12 //RESULTS
13 printf ('viscosity= %.6f slug/t sec ',u)
14 printf ('\n kinematic viscosity= %.4f cm^2/ sec ',v1
15 )
16 printf ('\n kinematic viscosity= %.6f ft^2/ sec ',v)
```

---

Scilab code Exa 9.2 chapter 9 example 2

```

1  clc
2  //initialisation of variables
3  d= 0.5 //in
4  V= 1 //ft/sec
5  l= 200 //ft
6  T= 5 //degrees
7  g= 32.2 //f/sec^2
8  //CALCULATIONS
9  i= 0.04*V^2*12*4/(g*d)
10 gf= i*l
11 //RESULTS
12 printf ('loss of head= %.1f ft ',gf)

```

---

**Scilab code Exa 9.3** chapter 9 example 3

```

1
2  clc
3  //initialisation of variables
4  g= 32.2 //ft/sec^2
5  T= 25 //C
6  dp=8 //lbs/in^2
7  t= 0.005 //in
8  w= 3 //in
9  l= 1 //ft
10 //CALCULATIONS
11 ut= (0.0179*30.5/(g*453.6))/(1+0.03368*T+0.000221*T
    ^2)
12 Q1= dp*144*(t/12)^3*3600*6.24/(12*ut*4)
13 //RESULTS
14 printf ('Discharge= %.6f gallons per hour ',Q1)
15
16
17 //ANSWER GIVEN IN THE TEXTBOOK IS WRONG

```

---

Scilab code Exa 9.4 chapter 9 example 4

```
1 clc
2 //initialisation of variables
3 v= 1.25 //poise
4 d= 3 //in
5 l= 6 //in
6 t= 0.002 //in
7 w= 40 //R.P.M
8 g= 32.2 //ft/sec^2
9 //CALCULATIONS
10 u= v*30.5/(453.6*g)
11 T= u*%pi^2*(d/12)^3*w*(1/12)/(120*t/12)
12 hp= T*2*%pi*w/33000
13 //RESULTS
14 printf ('Horse-power lost in velocit= %.4f ',hp)
```

---

Scilab code Exa 9.5 chapter 9 example 5

```
1 clc
2 //initialisation of variables
3 w= 750 //R.P.M
4 t= 0.02 //in
5 r1=9 //in
6 r2= 5 //in
7 u= 0.003 //slug/ft sec
8 //CALCULATIONS
9 T= u*%pi*(2*%pi*w/60)*((r1/24)^4-(r2/24)^4)*2*%pi*w
    /(2*t/12*33000)
10 //RESULTS
11 printf ('horse power required to overcome= %.1f hp',
    T)
```





# Chapter 10

## Miscellaneous Problems

Scilab code Exa 10.1 example 1

```
1  clc
2  //initialisation of variables
3  w= 62.4 //lb/ft^3
4  x=8 //ft
5  A= 16 //ft^2
6  X= 2.5 //ft
7  X1= 0.66 //ft
8  x1= 3.834 //ft
9  x2= 2.182 //ft
10 //CALCULATIONS
11 P= w*x*A
12 y= A/3
13 P1= w*x*A*0.5*X1
14 R= sqrt(P1^2+P^2)
15 m= P1/P
16 X2= x1-x2
17 C= ((2/3)*A)-m*X
18 Y= m*X2+ C
19 //RESULTS
20 printf ('Water pressure on vertical face = %.f lbs ',
        P)
```

```

21 printf ('\n pressure which acts at the base = %.2f
    ft ',y)
22 printf ('\n Resultant = %.f lbs ',R)
23 printf ('\n x coordinate of the resultant = %.3f ft ',
    ,X2)
24 printf ('\n y coordinate of the resultant = %.3f ft ',
    ,Y)

```

---

#### Scilab code Exa 10.2 chapter 10 example 2

```

1  clc
2  //initialisation of variables
3  s= 13.6
4  h= 12 //in
5  u= 0.04
6  k= 1
7  d= 6 //in
8  g= 32.2 //ft/sec^2
9  w= 62.4 //lbs/ft^3
10 //CALCULATIONS
11 h1= h*(s-1)/12
12 hf= u*h1
13 hn= h1-hf
14 Q= k*(%pi*(d/12)^2)*sqrt(2*g)*sqrt(hn)*w*60/(10*4*
    sqrt(15))
15 //RESULTS
16 printf ('discharge through flow= %.f ft G.P.M',Q)

```

---

#### Scilab code Exa 10.3 chapter 10 example 3

```

1  clc
2  //initialisation of variables
3  za= 16 //ft

```

```

4 h1= 2 //ft
5 h2= 3 //ft
6 g= 32.2 //ft/sec^2
7 //CALCULATIONS
8 vc= sqrt(2*g*(za-h1-h2))
9 vb= vc*(h1/(2*h1))^2
10 r= -h1-h2-(vb^2/(2*g))
11 r1= r+34
12 //RESULTS
13 printf ('pressure head at B= %.1f ft lb ',r1)

```

---

Scilab code Exa 10.4 chapter 10 example 4

```

1 clc
2 //initialisation of variables
3 g= 32.2 //ft/sec^2
4 Cd= 0.62
5 a= 90 //degrees
6 H1= 14 //in
7 H2= 8 //in
8 //CALCULATIONS
9 Q1= (8/15)*Cd*sqrt(2*g)*tand(a/2)*(H1/12)^(5/2)
10 Q2= (8/15)*Cd*sqrt(2*g)*tand(a/2)*(H2/12)
11 Q= Q1-Q2
12 //RESULTS
13 printf ('Discharge through notch= %.2f cuses ',Q)

```

---

Scilab code Exa 10.5 example 5

```

1 clc
2 //initialisation of variables
3 g= 32.2 //ft/sec^2
4 Cd= 0.62

```

```

5 d= 5/4 //in
6 h= 9 //ft
7 //CALCULATIONS
8 T= (2/3)*%pi*(h)^(3/2)/(Cd*(%pi/4)*sqrt(2*g)*(d/12)
    ^2)
9 //RESULTS
10 printf ('time required to lower water level= %.f
    secs ',T)

```

---

#### Scilab code Exa 10.6 chapter 10 example 6

```

1
2 clc
3 //initialisation of variables
4 a= 60 //degrees
5 d= 4 //in
6 Cd= 0.62
7 h= 5 //ft
8 w= 30 //ft
9 g= 32.2 //ft/sec^2
10 //CALCULATIONS
11 H1= 10*sind(a)
12 H2= H1-h
13 T= (2*w/tand(a))*(2/3)*(H1^(3/2)-H2^(3/2))/(Cd*sqrt
    (2*g)*%pi/(4*(d/12)^2))*100
14 //RESULTS
15 printf ('time required to lower water level= %.f
    secs ',T)

```

---

#### Scilab code Exa 10.7 chapter 10 example 7

```

1
2 clc

```

```

3 //initialisation of variables
4 p1= 40 //percent
5 p2= 35 //percent
6 dh= 200 //ft
7 f= 0.1
8 g= 32.2 //ft/sec^2
9 l= 2000 //ft
10 d= 1 //ft
11 //CALCULATIONS
12 hf1= p1*dh/100
13 hf2= p2*dh/100
14 hf3= (100-p1-p2)*dh/100
15 hft= hf1+hf2+hf3
16 v1= sqrt(2*g*hf1/(4*f*l))
17 Q= v1*%pi*d^2/4
18 d2= (Q*7*sqrt(3/(5*g)))^(2/3)
19 v3= Q*4*(4/3)^2/%pi
20 l3= hf2*2*g*(3/4)/(4*f*v3^2)
21 //RESULTS
22 printf('proportion of the quantity folwing in the
        bypass to the whole pass= %.f ft ',l3)

```

---

#### Scilab code Exa 10.8 chapter 10 example 8

```

1 clc
2 //initialisation of variables
3 d= 1 //ft
4 l= 2000 //ft
5 f= 0.038
6 g= 32.2 ///ft/sec^2
7 Q= 6 //cuses
8 l1= 1500 //ft
9 r= 2
10 //CALCULATIONS
11 v= 4*Q/(d^2*%pi)

```

```

12 hf= 4*f*l*v^2/(2*g)
13 v1= sqrt(hf*2*g/(4*f*l1+4*f*(1-l1)*r^2))
14 v3= r*v1
15 Q1= %pi*d^2*v3/4
16 Q2= %pi*d^2*v1/4
17 r1= Q2/Q1
18 //RESULTS
19 printf ('proportion of the quantity folwing in the
    bypass to the whole pass= %.1f ',r1)

```

---

#### Scilab code Exa 10.9 example 9

```

1 clc
2 //initialisation of variables
3 f= 0.01
4 d= 3 //in
5 l= 22 //ft
6 l1= 20 //ft
7 w= 20 //ft
8 h= 5 //ft
9 h1= 20 //ft
10 t= 4 //min
11 g= 32.2 //ft/sec^2
12 //CALCULATIONS
13 h2= h+h1
14 h3= (h-(t*60*%pi*sqrt(2*g/h)/(l1*w*2*64)))^2-4
15 dh= h2-h3
16 Q= dh*l1*w
17 //RESULTS
18 printf ('Quantiy discharged= %.f cuses ',Q)

```

---

#### Scilab code Exa 10.10 example 10

```

1
2
3 clc
4 //initialisation of variables
5 g= 32.2 //ft/sec^2
6 sct= 1.6
7 sl= 0.8
8 K= 0.98
9 dh1= 4 //ft
10 W= 62.4 //lbs/ft^3
11 d1= 8 //in
12 d2= 6 //in
13 //CALCULATIONS
14 dp= dh1*((sct/sl)-1)
15 C= sqrt(2*g)*%pi*(d1/24)^2 /sqrt((d1^2/d2^2)^2 -1)
16 Q= C*K*sqrt(dh1)
17 //RESULTS
18 printf ('Discharge passing through the pipe= %.1f
        cuses ',Q)
19 //The answer given in textbook is wrong. Please
        verify it.

```

---