

VODINA EFEM

16/ENG03/020

CIVIL ENGINEERING

QUESTION 4a

i. Fixed Point

```
commandwindow
clear
clc
format long g
p=0.35;
g = 9.81;
m = 68.1;
t = 10;
v = 40;
for i=1:inf
    iter(i+1) = i;
    p(i+1)=((g*m)/v)*(1- exp((-p(i)*t)/m));
    Ea(i+1)=abs((p(i+1)-p(i))/p(i+1))*100);
    if Ea(i+1) <= 1E-11
        break
    end
end
p'
iter'
Ea'
table=[iter',p',Ea']
```

COMMAND WINDOW

ans =

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

ans =

0

58.168

56.669

53.172

45.643

32.384
16.809
6.3246
1.9647
0.56647
0.15956
0.044645
0.012468
0.00348
0.00097117
0.00027102
7.563e-05
2.1105e-05
5.8896e-06
1.6435e-06
4.5865e-07
1.2799e-07
3.5716e-08
9.967e-09
2.7814e-09
7.7617e-10
2.1659e-10
6.044e-11
1.6862e-11
4.7166e-12

table =

| | | |
|---|---------|--------|
| 0 | 0.35 | 0 |
| 1 | 0.83669 | 58.168 |

| | | |
|----|--------|------------|
| 2 | 1.9309 | 56.669 |
| 3 | 4.1234 | 53.172 |
| 4 | 7.5858 | 45.643 |
| 5 | 11.219 | 32.384 |
| 6 | 13.486 | 16.809 |
| 7 | 14.396 | 6.3246 |
| 8 | 14.685 | 1.9647 |
| 9 | 14.768 | 0.56647 |
| 10 | 14.792 | 0.15956 |
| 11 | 14.799 | 0.044645 |
| 12 | 14.8 | 0.012468 |
| 13 | 14.801 | 0.00348 |
| 14 | 14.801 | 0.00097117 |
| 15 | 14.801 | 0.00027102 |
| 16 | 14.801 | 7.563e-05 |
| 17 | 14.801 | 2.1105e-05 |
| 18 | 14.801 | 5.8896e-06 |
| 19 | 14.801 | 1.6435e-06 |
| 20 | 14.801 | 4.5865e-07 |
| 21 | 14.801 | 1.2799e-07 |
| 22 | 14.801 | 3.5716e-08 |
| 23 | 14.801 | 9.967e-09 |
| 24 | 14.801 | 2.7814e-09 |
| 25 | 14.801 | 7.7617e-10 |
| 26 | 14.801 | 2.1659e-10 |
| 27 | 14.801 | 6.044e-11 |
| 28 | 14.801 | 1.6862e-11 |
| 29 | 14.801 | 4.7166e-12 |

ii. Newton Raphson

commandwindow

```

clear
clc
format long g
syms p
g = 9.81;
v = 40;
t = 10;
m = 68.1;
a = v - (((g*m)/p)*(1- exp((-p*t)/m)))
pretty(a)
q = diff(a)
pretty(q)
p = 0.35;
% p = double(subs(p - (a/q)))
for i= 1:10;
    iter(i+1) = i;
    pf(i) = p;
    p = double(subs(p - (a/q)));
    pf(i+1) = p;
    Ea(i+1) = abs(((pf(i+1)-pf(i))/pf(i+1))*100);
    if Ea(i+1) <= 1E-11
        break
    end
end
iter'
pf'
Ea'
table(iter',pf',Ea')

```

a =

$$(2938163350254649*(\exp(-(100*p)/681) - 1))/(4398046511104*p) + 40$$

$$\frac{\frac{2938163350254649}{\exp\left(-\frac{100p}{681}\right)} - 1}{4398046511104p} + 40$$

q =

$$-(73454083756366225 \cdot \exp(-(100 \cdot p)/681))/(748767418515456 \cdot p) - (2938163350254649 \cdot (\exp(-(100 \cdot p)/681) - 1))/(4398046511104 \cdot p^2)$$

$$\frac{\exp(-100p/681) \cdot 73454083756366225 - 2938163350254649}{748767418515456 p^2 - 4398046511104 p}$$

COMMAND WINDOW

ans =

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

ans =

- 0.35
- 8.34099580691024
- 13.3210094965819
- 14.7172021430025
- 14.8008605185077
- 14.8011359420219

14.8011359449913

14.8011359449913

ans =

0

95.8038583389523

37.3846568531425

9.48680756609994

0.565226429913042

0.00186082686707078

2.00616185516846e-08

0

ans =

8×3 table

| Var1 | Var2 | Var3 |
|------|------------------|----------------------|
| 0 | 0.35 | 0 |
| 1 | 8.34099580691024 | 95.8038583389523 |
| 2 | 13.3210094965819 | 37.3846568531425 |
| 3 | 14.7172021430025 | 9.48680756609994 |
| 4 | 14.8008605185077 | 0.565226429913042 |
| 5 | 14.8011359420219 | 0.00186082686707078 |
| 6 | 14.8011359449913 | 2.00616185516846e-08 |
| 7 | 14.8011359449913 | 0 |

QUESTION 4B

| x | y | dy | h | y0 |
|-----|----------|----------|-----|----|
| 0 | 1 | -1 | 0.1 | 1 |
| 0.1 | 0.9 | -0.7 | | |
| 0.2 | 0.83 | -0.43 | | |
| 0.3 | 0.787 | -0.187 | | |
| 0.4 | 0.7683 | 0.0317 | | |
| 0.5 | 0.77147 | 0.22853 | | |
| 0.6 | 0.794323 | 0.405677 | | |
| 0.7 | 0.834891 | 0.565109 | | |
| 0.8 | 0.891402 | 0.708598 | | |
| 0.9 | 0.962261 | 0.837739 | | |
| 1 | 1.046035 | 0.953965 | | |
| 1.1 | 1.141432 | 1.058568 | | |
| 1.2 | 1.247289 | 1.152711 | | |
| 1.3 | 1.36256 | 1.23744 | | |
| 1.4 | 1.486304 | 1.313696 | | |
| 1.5 | 1.617673 | 1.382327 | | |

| | y | Dy |
|-------------------|---|------------------|
| | 1 | $=((2*A2)-B2)$ |
| = B2+(\$E\$2*C2) | | $=((2*A3)-B3)$ |
| =B3+(\$E\$2*C3) | | $=((2*A4)-B4)$ |
| =B4+(\$E\$2*C4) | | $=((2*A5)-B5)$ |
| =B5+(\$E\$2*C5) | | $=((2*A6)-B6)$ |
| =B6+(\$E\$2*C6) | | $=((2*A7)-B7)$ |
| =B7+(\$E\$2*C7) | | $=((2*A8)-B8)$ |
| =B8+(\$E\$2*C8) | | $=((2*A9)-B9)$ |
| =B9+(\$E\$2*C9) | | $=((2*A10)-B10)$ |
| =B10+(\$E\$2*C10) | | $=((2*A11)-B11)$ |
| =B11+(\$E\$2*C11) | | $=((2*A12)-B12)$ |
| =B12+(\$E\$2*C12) | | $=((2*A13)-B13)$ |

$$\begin{aligned}
 &=B13+(\$E\$2*C13) & =((2*A14)-B14) \\
 &=B14+(\$E\$2*C14) & =((2*A15)-B15) \\
 &=B15+(\$E\$2*C15) & =((2*A16)-B16) \\
 &=B16+(\$E\$2*C16) & =((2*A17)-B17) \\
 &=B17+(\$E\$2*C17) & =((2*A18)-B18)
 \end{aligned}$$

QUESTION 4 C

EXCEL

| y | x | z | l |
|-----|-----|----|------|
| 0.5 | 4.5 | 84 | 74.8 |
| 0.4 | 3.9 | 82 | 34 |
| 0.3 | 3.3 | 74 | 32.8 |
| 0.4 | 5.2 | 81 | 64 |
| 0.5 | 6.1 | 76 | 48.9 |
| 0.7 | 3.2 | 74 | 43.1 |

SUMMARY OUTPUT

| <i>Regression Statistics</i> | |
|------------------------------|----------|
| Multiple R | 0.492524 |
| R Square | 0.24258 |
| Adjusted R Square | -0.89355 |
| Standard Error | 0.188006 |
| Observations | 6 |

ANOVA

| | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>Significance F</i> |
|------------|-----------|-----------|-----------|----------|-----------------------|
| Regression | 3 | 0.022641 | 0.007547 | 0.213514 | 0.880524 |
| Residual | 2 | 0.070693 | 0.035346 | | |
| Total | 5 | 0.093333 | | | |

| | <i>Coefficients</i> | <i>Standard Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> | <i>Lower 95.0%</i> | <i>Upper 95.0%</i> |
|--------------|---------------------|-----------------------|---------------|----------------|------------------|------------------|--------------------|--------------------|
| Intercept | 1.623638 | 1.76937 | 0.917636 | 0.45568 | -5.98935 | 9.236624 | -5.98935 | 9.236624 |
| X Variable 1 | -0.02866 | 0.085235 | -0.33626 | 0.768674 | -0.3954 | 0.338076 | -0.3954 | 0.338076 |

| | | | | | | | | |
|--------------|----------|----------|----------|----------|----------|----------|----------|----------|
| X Variable 2 | -0.01639 | 0.024472 | -0.66957 | 0.572081 | -0.12168 | 0.08891 | -0.12168 | 0.08891 |
| X Variable 3 | 0.005131 | 0.007027 | 0.730102 | 0.541265 | -0.02511 | 0.035367 | -0.02511 | 0.035367 |

MATLAB

| y | x | z | l | c |
|-----|-----|----|------|---|
| 0.5 | 4.5 | 84 | 74.8 | 1 |
| 0.4 | 3.9 | 82 | 34 | 1 |
| 0.3 | 3.3 | 74 | 32.8 | 1 |
| 0.4 | 5.2 | 81 | 64 | 1 |
| 0.5 | 6.1 | 76 | 48.9 | 1 |
| 0.7 | 3.2 | 74 | 43.1 | 1 |

```

commandwindow
clear
clc
format short g
greg = xlsread('testmultiple')
y = greg(:,1)
x1 = greg(:,2)
x0 = greg(:,5)
x2 = greg(:,3)
x3 = greg(:,4)
x = [x0,x1,x2,x3]
beed =regress(y,x)
a0 = beed(1)
a1 = beed(2)
a2 = beed(3)
a3 = beed(4)
ysim = a0 + a1*x1 + a2*x2 + a3*x3
Rvalue = corr(y,ysim)
Rsquare = Rvalue^2

```

COMMAND WINDOW

greg =

| | | | | |
|-----|-----|----|------|---|
| 0.5 | 4.5 | 84 | 74.8 | 1 |
| 0.4 | 3.9 | 82 | 34 | 1 |
| 0.3 | 3.3 | 74 | 32.8 | 1 |
| 0.4 | 5.2 | 81 | 64 | 1 |
| 0.5 | 6.1 | 76 | 48.9 | 1 |

0.7 3.2 74 43.1 1

y =

0.5

0.4

0.3

0.4

0.5

0.7

x1 =

4.5

3.9

3.3

5.2

6.1

3.2

x0 =

1

1

1

1

1

1

x2 =

84

82

74

81

76

74

x3 =

74.8

34

32.8

64

48.9

43.1

x =

| | | | |
|---|-----|----|------|
| 1 | 4.5 | 84 | 74.8 |
|---|-----|----|------|

| | | | |
|---|-----|----|----|
| 1 | 3.9 | 82 | 34 |
|---|-----|----|----|

| | | | |
|---|-----|----|------|
| 1 | 3.3 | 74 | 32.8 |
|---|-----|----|------|

| | | | |
|---|-----|----|----|
| 1 | 5.2 | 81 | 64 |
|---|-----|----|----|

| | | | |
|---|-----|----|------|
| 1 | 6.1 | 76 | 48.9 |
|---|-----|----|------|

| | | | |
|---|-----|----|------|
| 1 | 3.2 | 74 | 43.1 |
|---|-----|----|------|

beed =

1.6236

-0.028662

-0.016386

0.0051308

a0 =

1.6236

a1 =

-0.028662

a2 =

-0.016386

a3 =

0.0051308

ysim =

0.50202

0.34265

0.48478

0.4757

0.45436

0.54049

Rvalue =

0.49252

Rsquare =

0.24258

QUESTION 4 d

Microsoft Excel

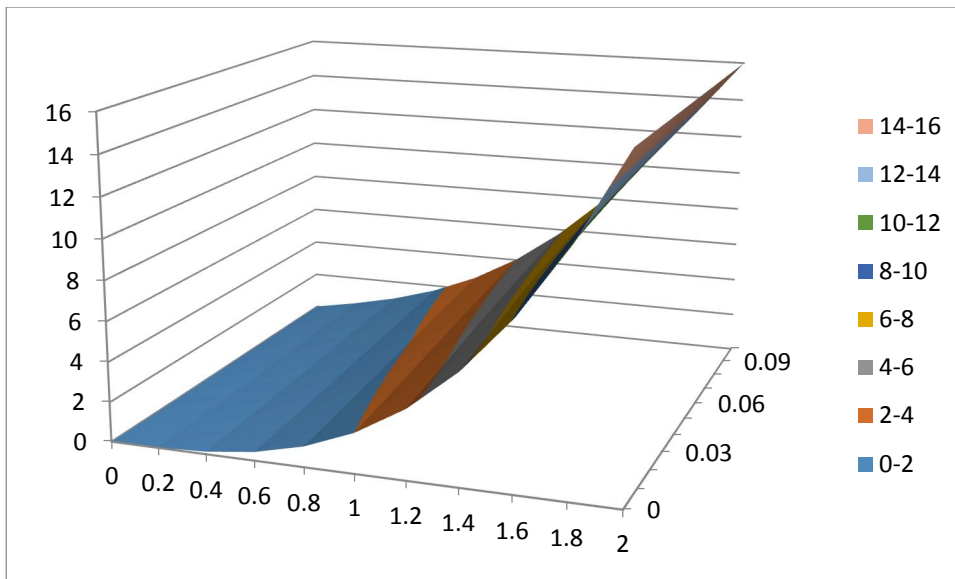
| | |
|----|--------|
| tf | 0.1 |
| zf | 2 |
| n | 11 |
| m | 11 |
| dt | 0.01 |
| dz | 0.2 |
| A | 1.79 |
| r | 0.4475 |

| t | x | 0 | 1 | 2 | 3 |
|----|------|---|----------|----------|----------|
| | | 0 | 0.2 | 0.4 | 0.6 |
| 0 | 0 | 0 | 0.016 | 0.128 | 0.432 |
| 1 | 0.01 | 0 | 0.05896 | 0.21392 | 0.56088 |
| 2 | 0.02 | 0 | 0.10192 | 0.29984 | 0.68976 |
| 3 | 0.03 | 0 | 0.14488 | 0.38576 | 0.81864 |
| 4 | 0.04 | 0 | 0.18784 | 0.47168 | 0.94752 |
| 5 | 0.05 | 0 | 0.2308 | 0.5576 | 1.0764 |
| 6 | 0.06 | 0 | 0.27376 | 0.64352 | 1.20528 |
| 7 | 0.07 | 0 | 0.31672 | 0.72944 | 1.33416 |
| 8 | 0.08 | 0 | 0.35968 | 0.81536 | 1.461496 |
| 9 | 0.09 | 0 | 0.40264 | 0.900589 | 1.587697 |
| 10 | 0.1 | 0 | 0.445291 | 0.985238 | 1.711258 |

| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|----------|----------|----------|----------|----------|----------|----|
| 0.8 | 1 | 1.2 | 1.4 | 1.6 | 1.8 | 2 |
| 1.024 | 2 | 3.456 | 5.488 | 8.192 | 11.664 | 16 |
| 1.19584 | 2.2148 | 3.71376 | 5.78872 | 8.53568 | 12.05064 | 16 |
| 1.36768 | 2.4296 | 3.97152 | 6.08944 | 8.87936 | 12.24503 | 16 |
| 1.53952 | 2.6444 | 4.22928 | 6.39016 | 9.13701 | 12.41924 | 16 |
| 1.71136 | 2.8592 | 4.48704 | 6.652382 | 9.376594 | 12.55283 | 16 |
| 1.8832 | 3.074 | 4.727572 | 6.902476 | 9.578876 | 12.67407 | 16 |
| 2.05504 | 3.28109 | 4.960868 | 7.126895 | 9.766288 | 12.77732 | 16 |
| 2.22343 | 3.484133 | 5.178465 | 7.338726 | 9.932599 | 12.87203 | 16 |
| 2.389646 | 3.678182 | 5.386968 | 7.532767 | 10.08724 | 12.9564 | 16 |
| 2.550919 | 3.866244 | 5.582531 | 7.715648 | 10.22806 | 13.03446 | 16 |
| 2.708485 | 4.045675 | 5.769062 | 7.885384 | 10.35962 | 13.10568 | 16 |

=2*(G12^3)----- (drag down)

=($\$E\8 *F13)+(1-(2* $\$E\8))*G13+($\$E\8 *H13)



MATLAB

```

commandwindow
clear
clc
format short g
t0 = 0;
z0 = 0;
tf = 0.10;
zf = 2;
dz = 0.2;
dt = 0.01;
c = 1.79;
r = c*(dt/(dz^2));
t = [t0:dt:tf]'
z = [z0:dz:zf]
n = (zf-z0)/dz
m = (tf-t0)/dt
T(1:m+1,1) = zeros(m+1,1);
T(1:m+1,n+1) = 16;
T(1,1:n+1) = 2*(z.^3);
for j = 1:m
    for i = 2:n
        T(j+1,i) = r*T(j,i-1) + (1-(2*r))*T(j,i) + r*T(j,i+1)
    end
end
end
T
mesh(z,t,T)

```

COMMANDWINDOW

T =

```

0    0.016    0.128    0.432    1.024    2    3.456    5.488    8.192    11.664

```

16

| | | | | | | | | |
|--------|---------|---------|---------|--------|--------|--------|--------|--------|
| 0 | 0.05896 | 0.21392 | 0.56088 | 1.1958 | 2.2148 | 3.7138 | 5.7887 | 8.5357 |
| 12.051 | 16 | | | | | | | |
| 0 | 0.10192 | 0.29984 | 0.68976 | 1.3677 | 2.4296 | 3.9715 | 6.0894 | 8.8794 |
| 12.245 | 16 | | | | | | | |
| 0 | 0.14488 | 0.38576 | 0.81864 | 1.5395 | 2.6444 | 4.2293 | 6.3902 | 9.137 |
| 12.419 | 16 | | | | | | | |
| 0 | 0.18784 | 0.47168 | 0.94752 | 1.7114 | 2.8592 | 4.487 | 6.6524 | 9.3766 |
| 12.553 | 16 | | | | | | | |
| 0 | 0.2308 | 0.5576 | 1.0764 | 1.8832 | 3.074 | 4.7276 | 6.9025 | 9.5789 |
| 12.674 | 16 | | | | | | | |
| 0 | 0.27376 | 0.64352 | 1.2053 | 2.055 | 3.2811 | 4.9609 | 7.1269 | 9.7663 |
| 12.777 | 16 | | | | | | | |
| 0 | 0.31672 | 0.72944 | 1.3342 | 2.2234 | 3.4841 | 5.1785 | 7.3387 | 9.9326 |
| 12.872 | 16 | | | | | | | |
| 0 | 0.35968 | 0.81536 | 1.4615 | 2.3896 | 3.6782 | 5.387 | 7.5328 | 10.087 |
| 12.956 | 16 | | | | | | | |
| 0 | 0.40264 | 0.90059 | 1.5877 | 2.5509 | 3.8662 | 5.5825 | 7.7156 | 10.228 |
| 13.034 | 16 | | | | | | | |
| 0 | 0.44529 | 0.98524 | 1.7113 | 2.7085 | 4.0457 | 5.7691 | 7.8854 | 10.36 |
| 13.106 | 16 | | | | | | | |

