SOLUTIONS TO MULTIPHASE FLOW PART PET 505 - 2013

1 a) Theory

1 b)

D = 0.1000 → A = 0.0079

qL = 0.0120, qG = 0.0040

ULS = 1.5279

UGS = 0.5093

epsg = 0.3000

S = 0.7778

epsgsjekk = 0.3000

1c) Teori

OPPGAVE 2

ULS2 = 3

UGS2 = 1

rol = 900 , rogref = 1.2000

myl = 0.0030 , myg = 2.0000e-04

H = 10

PB = 120

Pref = 1

2a) - noslip assumption

epsg = 0.2500 , rog = 144

romix = 711 , mymix = 0.0023

b)

g = 9.8000

dPdxH = 6.9678e+03

Umix = 4

Reyn = 1.2365e+05

frik = 0.0044

dPdxF = 1.0031e+03

PA = 119.2029

c)

Pressure at A in the small pipe will be

PA_parallel = 119.1180

this is less than in the big pipe - so the flow will be from top to bottom

MATLAB PROGRAM

```
% Matlab solution to PET 505 - Multiphase part - Fall 2013
format compact
clc
%Problem 1
% a) Theory

%b)
'1 b)'

D=0.1 % Pipe diameter
A= pi*D^2/4
qL=1.2e-2 %m^3/s
qG=4e-3   %m^3/s

ULS= qL/A
UGS= qG/A
epsg= 0.3
S = UGS*(1/epsg-1)/ULS

epsgsjekk= UGS/(UGS+S*ULS)

% PROBLEM 2

ULS2=3
UGS2=1
rol=900
rogref=1.2
myl=3e-3
myg=0.2e-3
H=10
PB=120
Pref=1

'2a) - noslip assumption'
epsg=UGS2/(UGS2+ULS2)
rog=rogref*PB/Pref

romix=rog*epsg+rol*(1-epsg)
mymix=myg*epsg+myl*(1-epsg)

'b)'
g=9.8
dPdxH=romix*g
Umix=ULS2+UGS2
```

```
Reyn=romix*Umix*D/mymix
frik=0.046*Reyn^-0.2
dPdxF=(4/D)*frik*0.5*romix*Umix^2
PA=PB-(dPdxH+dPdxF)*H*1e-5

'c)'
'Pressure at A in the small pipe will be'
PA_parallel=PB-rol*g*H*1e-5
'this is less than in the big pipe'
'so the flow will be from top to bottom'
```