

Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 level 1st Semester Examination - May / Jul. 2017
MRT375-2 Hydraulics



Instructions to candidates:

Duration: Two (02) hours

Number of questions: Four (04)

Answer all questions

Some useful equations are shown in page 4

Mark allocation: 100

1)

a. Categorize energy losses due to flow through pipes and write the causes.
Explain where necessary. (3 Marks)

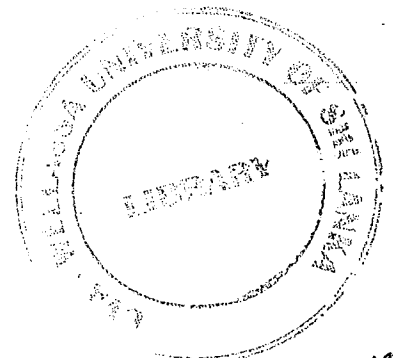
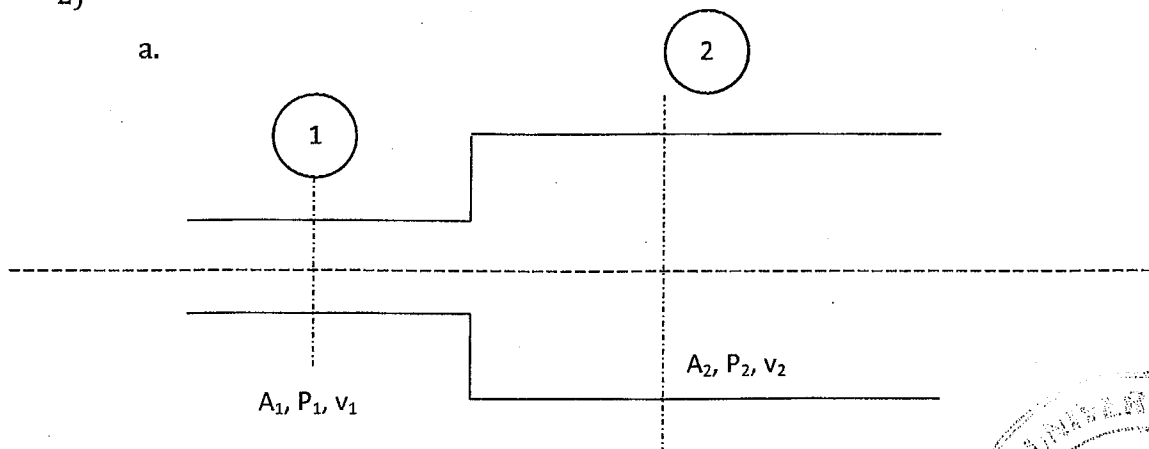
b. How will you determine the losses of head due to friction in pipes by using,
i. Darcy formula
ii. Chezy's formula (4 Marks)

c. Find the head loss due to friction in a pipe of diameter 300mm and length 70m through which water is flowing at a velocity of 2.5 m/s using,
i. Darcy formula
ii. Chezy's formula for which $C = 50$. Take $\nu = 0.015$ stokes.

(18 Marks)

2)

a.



99
100
50

Show that loss of head due to sudden enlargement (h_e),

$$h_e = \frac{(v_1 - v_2)^2}{2g}$$

Where,

v_1	= Velocity at (1)	v_2	= Velocity at (2)
P_1	= Pressure at (1)	P_2	= Pressure at (2)
A_1	= Cross section area at (1)	A_2	= Cross section area at (2)

Use the figure above and clearly mention all the assumptions that you used.

(10 Marks)

- b. The rate of flow of water through a horizontal pipe is $0.3\text{m}^3/\text{s}$. The diameter of the pipe is suddenly enlarged from 250mm to 500mm. The pressure intensity in the smaller pipe is $13.734\text{N}/\text{cm}^2$. Determine,
- Loss of head due to sudden enlargement
 - Pressure intensity in large pipe
 - Power loss due to sudden enlargement

(15 Marks)

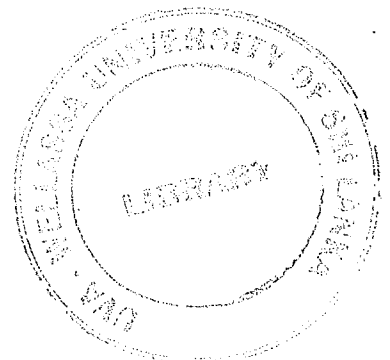
3)

- What is "Hydraulic gradient line"? (2 Marks)
 - What is "total energy line"? (2 Marks)
- c. Two tanks are connected with help of two pipes in series. The lengths of the pipes are 1000m and 800m whereas the diameters are 400mm and 200mm respectively. The coefficient of friction for both pipes is 0.008. The difference of water level in the two tanks is 15m.
- Find the rate of flow of pipes considering all losses.
 - Draw the total energy line.
 - Draw the hydraulic gradient line. (21 Marks)

4)

- a. List three advantages and three disadvantages of
i. Centrifugal pump
ii. Reciprocating pump (4 Marks)
- b. List,
i. Semiannual, (2 Marks)
ii. Annual,
Inspection check list under pump maintenance.
- c. List cause for the following issues of pumps.
i. Mechanical noise issues (2 Marks)
ii. Hydraulic noise issues
- d. What are the possible causes for low pressures in pumps? (2 Marks)
- e. What are the possible causes for electric faults? (2 Marks)
- f. A pipe of diameter 0.4m and length of 2000m is connected to a reservoir at one end. The other end is connected to a junction from which two pipes of length 1000m and diameter 300mm run in parallel. These parallel pipes are connected to another reservoir which is having a level of water 10m below the water level of above reservoir. Determine the discharge if $f=0.015$. Neglect the minor losses.

(13 Marks)



Useful equations

Note: Standard variables have used.

- Darcy -Weisbach equation: $h_f = \frac{4flv^2}{d \times 2g}$
- Chezy's formula: $h_f = \frac{fPLv^2}{\rho g A}$ also $v = C\sqrt{mi}$ where $C = \sqrt{\frac{\rho g}{f}}$ and $i = \frac{h_f}{L}$ and $m = d/4$
- Reynolds no: $Re = \frac{uL}{\nu}$
- If $Re < 2000$: $f = 16/Re$
- If $Re > 4000$: $f = 0.079/Re^{0.25}$
- 1stoke = $10^{-4} \text{ m}^2/\text{s}$