Menoufiya University
Faculty of Engineering
Shebin El-Kom
Summer Exam
Academic Year: 2013-2014

Post Graduate: Diploma
Department: Mechanical power Engineering
Subject: Pipe Network system
Time Allowed: 3hrs
Date: 21/01/2014

Note: Assume any data required, state your assumption clearly.

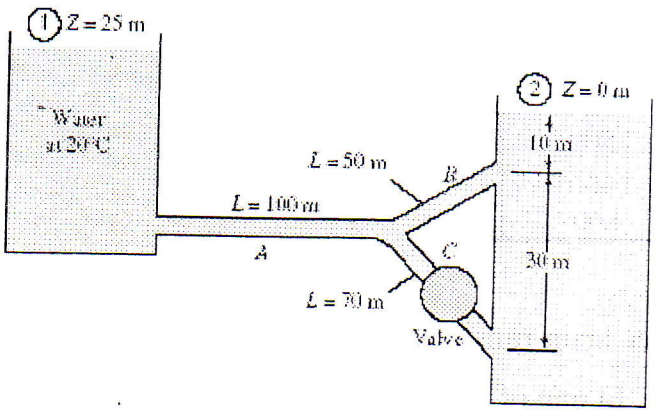
Question (1)

(25 Marks)

1.a) Drive an expression for head rise coefficient due to lateral outlet and discuss how it changes with Q_3/Q_1.

1.b) all pipes are 8-cm-diameter cast iron (ε = 0.26 mm). Determine the water (μ= 1.307× 10^{-3} Pa.s, ρ =1000 kg/m^3) flow rate from reservoir 1 if valve C is

(a) closed and (b) open, k = 0.5 based on $h_l = kv^2/2g$.

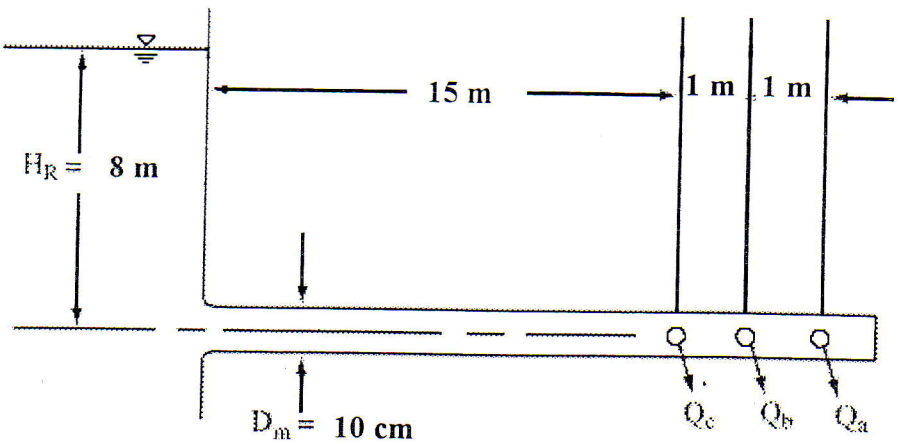


Question (2)

(25 Marks)

2.a) In manifold flow, drive an expression for orifice coefficient and show the effect of lateral length on this coefficient.

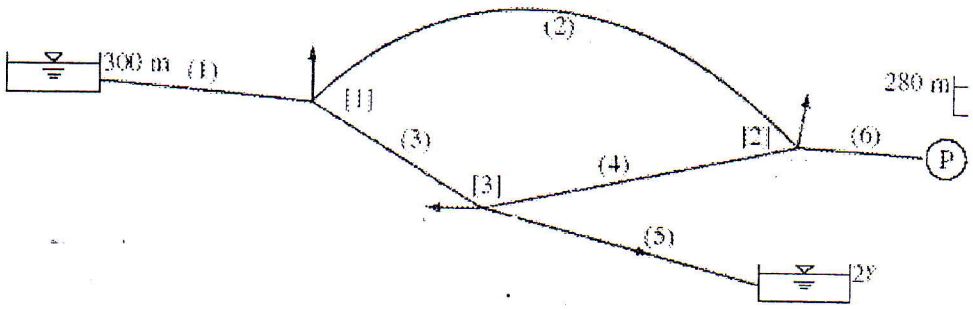
2.b) The 3-port manifold shown in the next diagram has a port-to-main diameter ratio D_3/D_1 = 0.4, a friction factor f = 0.02 in the main and all laterals, and L_3/D_3 = 4 for each lateral. Considering fluid friction in the main and laterals and junction losses, compute the port discharges Q_a, Q_b, and Q_c. The downstream end of the main is closed off by a blank plate.



Question (3) **(25 Marks)**

In the sketch the network consists of 6 pipes and 3 nodes. A source pump and one reservoir supply the netw and the reservoir connected to pipe 5 receives water. Do the following tasks: (a) write the system o equations; (b) write the system of ΔQ-equations; (c) using the Newton method, describe the solution of system of ΔQ-equations; (d) if the discharge in pipe 1 is $Q_1 = 0.08$ m^3/s from the reservoir , the discharg pipe 5 is $Q_5 = 0.06$ m^3/s into the reservoir, and the discharge in pipe 6 is $Q_6 = 0.14$ m^3/s from the reser what are discharges at other pipes and the demand at each junction? Take the friction factor to be 0.02 and $35\text{-}600Q^2$.

Pipe	Dia. m	Length m
1	0.30	1000
2	0.20	2500
3	0.20	1000
4	0.30	1500
5	0.15	1000
6	0.35	800



Question (4) **(25 Marks)**

A 675 mm water main runs horizontally for 1500 m and then branches into two 450 mm mains e 3000 m long. In one of these branches the whole water entering is drawn off at a uniform rate alc the length of the pipe; assume atmospheric pressure at the end of that branch. In the other brai one-half of the quantity entering is drawn off through five ports at 750 m intervals and remainder discharged to a tank downstream. If the friction factor equals 0.02. Calculate the fl rate entering each branch, the diameter of each port and the water level in the downstream ta when the inflow to the system is 0.28 m^3/sec and the upstream pressure head is 300 m wat Consider only frictional losses and equal discharge at each port. Calculate the diameters o e f ports.

GOOD LUCK

Dr. Samy M. El-Behery