KING SAUD UNIVERSITY
FACULTY OF ENGINEERING
CIVIL ENGINEERING DEPT.
The examination consists of 3 questions in 3 pages.

Mid Term Exam I
11/04/2009
Time allowed: ***1.5 hours***
Attempt all questions.

Hydraulics CE-322

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NAME:

ID:

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Question (1) **(6 marks)**

Two reservoirs with a head difference of 15 m are connected by a straight 300 m cast iron pipe (equivalent roughness $\varepsilon = 0.26$ mm and $\nu = 1 \times 10^{-6}$ m^2/s).

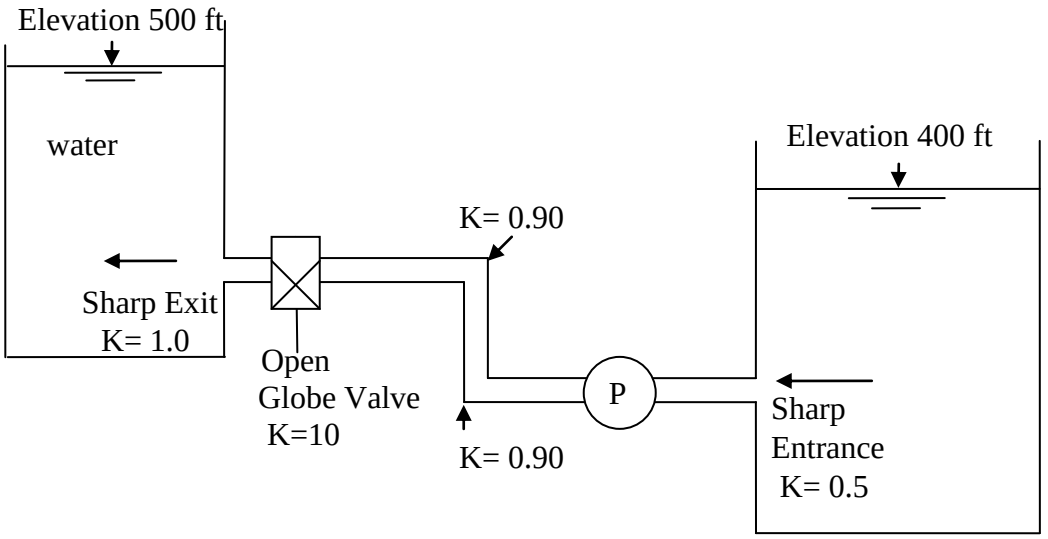
a) If the pipe diameter is 0.3 m find the discharge through the pipe.

b) Years later, this pipeline is required to deliver 0.5 m^3/s. Is the original pipe diameter acceptable? If it is not acceptable, determine the new pipe diameter. Take $f = 0.024$ as a first assumption.

Question (2) **(6 marks)**

Water is pumped between two reservoirs at a rate of 0.2 ft^3/s through a 410 ft of 2 in diameter pipe with many minor losses as shown in the figure. If the pump (P) efficiency is 70%, calculate the brake horse power.

Take the roughness (ε) of the pipe material as 1.66 x 10^{-4} ft and kinematic viscosity (ν) as 0.000011 ft^2/s. Sketch the TEL & HGL.

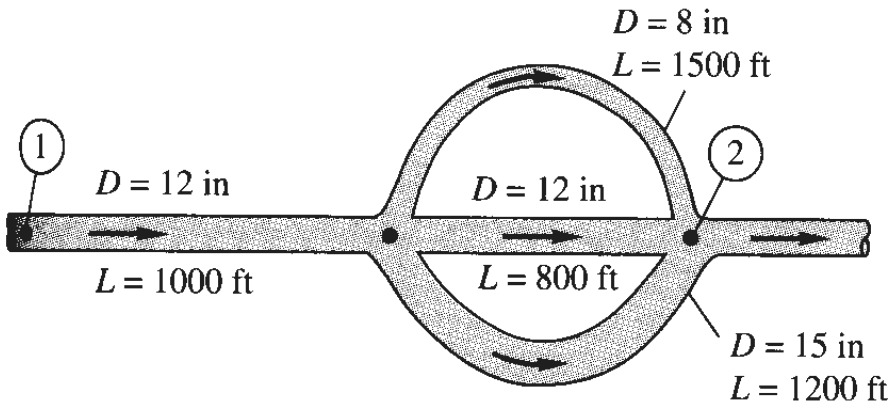


Question (3) **(4 marks)**

The total friction loss between points 1 and 2 in the concrete pipe looping system (C = 130) shown in figure is 225 ft. Determine the flow rate in the supply pipe and in the three parallel pipes. Use the Hazen-Williams Equation in the form:

$$Q = 0.432\ C\ d^{2.63}\ S^{0.54} \quad \text{(English units)}$$

Where Q is the discharge in ft^3/s and d is the pipe diameter in ft.



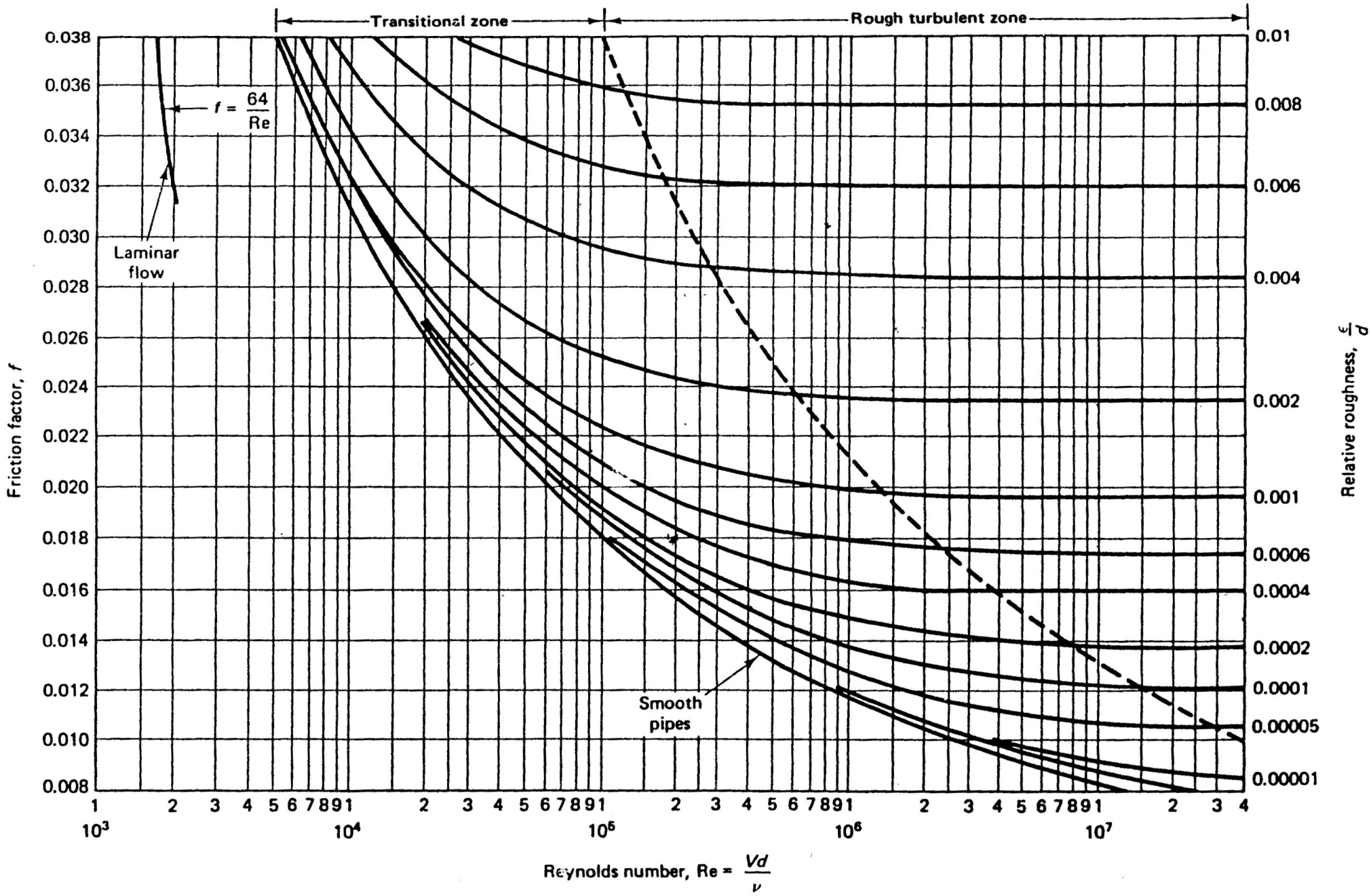


Figure 11.4 Moody diagram for friction factor for pipes.