Mid-West University

Examinations Management Office

End Semester Examinations 2081

Bachelor level/ B.E. Civil/ 4th Semester — Full Marks: 50

Time: 3 hours — Pass Marks: 25

Subject: Hydraulics (CE443/CE211)

- *Attempt all the questions*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

1. a) Derive Hagen Poiseuille equation for steady laminar flow in a circular pipe? How to find Reynold's number in lab? (3+2)

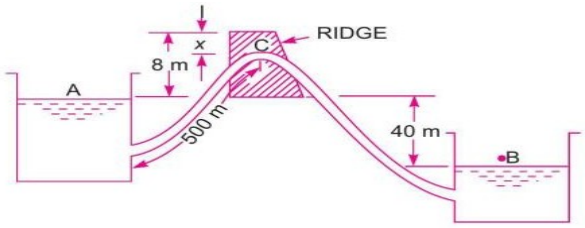
b) In a smooth pipe of diameter 0.5m and length 1000m water is flowing at the rate of .05m3/sec. Assuming the kinematic viscosity of water as 0.02 stokes, find: (5)

i) Head lost due to friction

ii) Wall shear stress

iii) Centre-line velocity

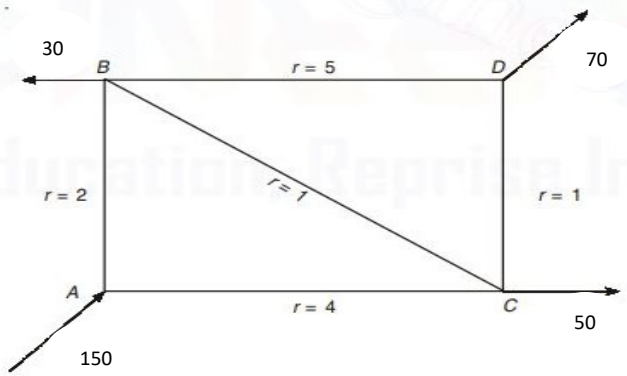
2. a) A syphon of diameter 200mm connects two reservoirs whose water surface level differ by 40m.The total length of the pipe is 8000m.The pipe crosses a ridge. The summit of ridge is 8m above the level of water in the upper reservoir. Determine the minimum depth of the pipe below the summit of the ridge, if the absolute pressure head at the summit of the syphon is not to fall below 3m of water. take f=0.006 and atmospheric pressure head=10.3m of water. The length of the syphon from the upper reservoir to the summit is 500m.Find the discharge also. (5)



b) Derive the tractive force method and also explain the incipient motion condition phenomenon on the channel bed? (4)

3. a) The water flowing with a velocity of 2m/sec in a pipe of length 4500m and of diameter 500mm and the thickness of the pipe is 10mm and the valve is suddenly in 30 second, find the rise in the pressure if the pipe is considered to be elastic. Take $E=20.62\times10^{10} N/m^2$ for pipe material and $K=19.62\times10^4$ N/cm^2 and C=1460m/sec for water. Calculate the circumferential stress and longitudinal stress developed in the pipe wall. (5)

b) Determine the distribution of discharge in the pipe network as shown in figure below using the Hardy cross method. The value of n may be assumed as 2.0. (7)



4. a) A river whose section may be assumed to be rectangular is 40m wide. At a bridge the flow width is restricted to 35m due to bridge piers. The maximum flood discharge is 600 m^3/sec. Corresponding to the condition the depth upstream should be minimum for the above discharge what type of flow will prevail under the bridge? Find also the upstream depth, ignore loss of energy head? (4)

b) A trapezoidal channel having bottom width 6m, side slope 6horizonal to 3vertical manning's roughness coefficient 0.025 and bottom slope 0.0016 carries a discharge of 25m^3/sec. Compute the backwater profile created by a dam which back up the water to a depth of 2m immediately behind the dam. Use the direct step method for computation. (6)

5. a) Find the pre jump and post jump height of the hydraulic jump formed at the toe of the spillway, neglecting the energy loss due to the overflow over spillway. Find the loss of energy due to formation of hydraulic jump. Since the flow over the spillways is 90m3/sec, width of the canal downstream is 15m, head over the crest of the spillway is 2.75m? (5)

b) Explain the difference between Geometric and Kinematic similarity and also explain the scale effect in modelling? (4)

The End

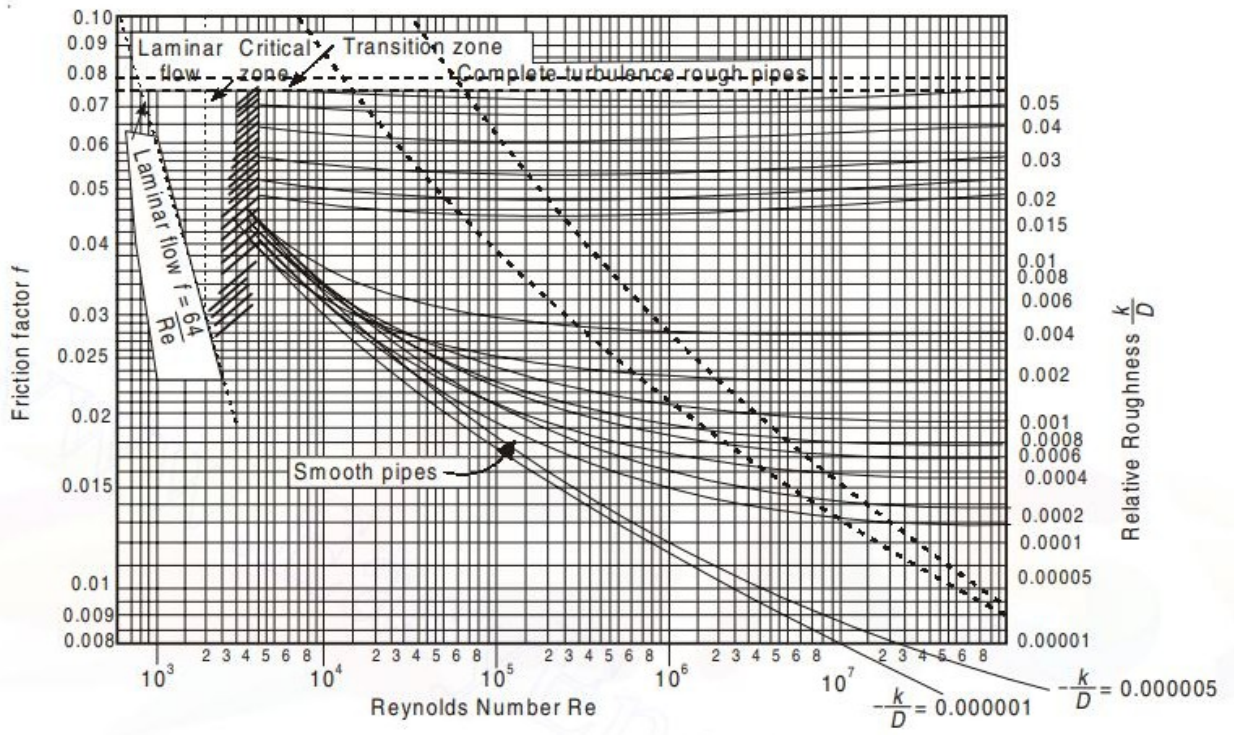


Figure 14.12 *Moody's diagram for friction factor for commercial pipes*