S.E (CIVIL) SEM -IV

Fluid Mechanics -II

12 1 MAY 2012

Con. 3787-12. (REVISED COURSE) GN–5447

(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is **compulsory**.
(2) Solve any **four** questions of remaining questions.
(3) Assume **suitable** data if **required**.

1. Solve any four ; 20

a) **Differentiate between viscous and turbulent flow.**

b) **Obtain condition for maximum transmission of power in pipeline. For this condition what is efficiency of transmission.**

c) **Explain – Water hammer.**

d) **Describe Reynolds experiment to demonstrate types of flow.**

e) **What are smooth and rough pipes.**

f) **What is Mach number. Explain sub-sonic, sonic and supersonic flow.**

2(a) 10

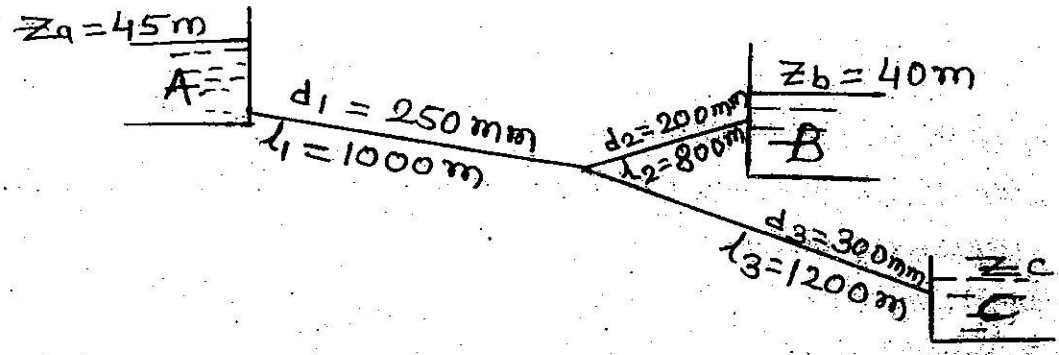
The difference of water levels of two water reservoirs is 8 m. They are connected by a 40m long pipe. For first 25m length the diameter of pipe is 120mm and for remaining length the diameter is 200mm, the change in diameter being sudden. Find discharge into the lower reservoir. Take f= 0.008. Draw TEL and HGL also.

2(b) 10

Two pipes each 300m long are available for connecting reservoir from which flow of 0.085 m^3/s is required, if the diameter of two pipe are 0.30m and 0.15m respectively. Determine the ratio of head lost when they are connected in series to the head lost when they are connected in parallel. Neglect minor losses.

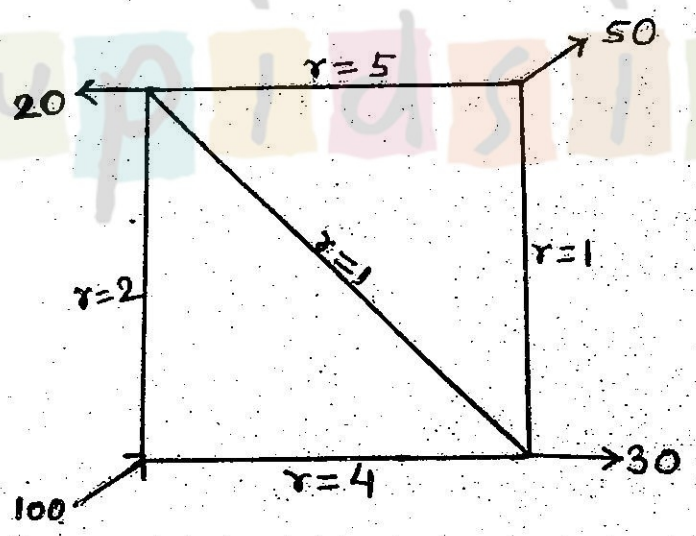
3(a) 10

Three reservoir A,B and C are connected by a pipe system shown in figure. If the discharge from reservoir A is 0.05 cumec, determine the rate of flow into or from B and C. Take f = 0.008.



3(b) 10

For a pipe network shown in figure determine the flow in each pipe. The value of n may be assumed as 2.0



(a) 10

Crude oil of dynamic viscosity 0.15 Ns/m^2 and specific gravity 0.9 flows through a 20mm diameter vertical pipe. Two pressure gauges have been fixed at 20m apart. The pressure gauge fixed at higher level reads 200 Kpa and that at lower reads 600 Kpa. Find the direction and rate of flow through the pipe.

b) 10

Derive Hagen Poiiseuille's formula for discharge through a pipe.

5(a) 10

Considering variation of velocity with area, prove that $dA/dV = (A/V)(Ma^2-1)$.

5(b)

I. Explain Mach cone. 04

II. A rocket travels in air of pressure 0.65 Kg/cm^2 and temperature -7^{0}C. If mach angle is 30^0, find the velocity of projectile. Take K = 1.4 and R = 29.27 m/^{0}k. 06

6(a) 10

Explain Prantle mixing length theory. Derive expression for velocity distribution for turbulent flow in smooth pipes.

6(b) 10

Water is flowing through a rough pipe of diameter 500mm and length 4000m at the rate of 0.5 m^3/s. Find the power required to maintain this flow. Take average height of roughness as K= 0.40mm.

7(a) 10

A power is to be transmitted hydraulically for a distance of 8 Km by means of a number of 100mm diameter pipes laid horizontally for which the coefficient of friction f = 0.0075. The pressure at inlet of pipe is 6500 Kpa. Determine the minimum number of pipes required to ensure an efficiency of transmission of at least 92%. When power delivered is 150KW.

7(b) 10

A single jet pelton wheel is fed by three equal parallel pipes, each of length L, diameter D and having coefficient of friction f, connected to a machine through a junction box. Determine the diameter of theoretically best nozzle through which the joint flow in the pipes should be discharged from the junction box to give the maximum power output. Find nozzle diameter and power of jet if for each pipe D = 150mm, L = 1350m, f= 0.0075 and gross head available is 216m.