

MANSOURA UNIVERSITY

2nd YEAR CIVIL ENGINEERING

FACULTY OF ENGINEERING

TIME : 3 HOURS

DEPT. OF CIVIL ENGINEERING.

HYDRAULICS

MAY 1993

Any missing data can be reasonably assumed.

Answer the following question:-

Question 1:

- A) Derive an expression for the force of jet on an inclined fixed plate.
- B) A 50 mm diameter stream of water strikes a 1,2m square door which is an angle of 30° with the stream's is 18 m/s and the jet strikes the door at its center of gravity. Neglecting friction, what normal force applied at the edge of the door will maintain equilibrium?

Question 2:

- A) What is a hydraulic jump? Explain clearly how it is formed?
- B) A hydraulic jump takes place in a horizontal open channel of triangular cross section having an apex of 90° at the bottom. If the initial and final depth of the jump are 1,0 and 3,0 ft. respectively, find the discharge and energy in the jump.

Question 3:

- A) Obtain an expression for the time of emptying a tank through a long pipe.
- B) A tank of 100 square meters in area contains water 4m deep. Find the time taken to fall water level 2m through a pipe 300m long and 15 cm diameter connected to the bottom of the tank. ($f=0,01$).

Question 4:

- A) From Darcy equation, derive Chezy formula. Find the relation ship between Mannings coefficient and Chezy's coefficient.
- B) The mean velocity in a 12" pipeline is 10 f.p.s. the relative roughness of the pipe is 0,002 and kinematic viscosity of water 0,00001 sq ft/sec. Determine the friction factor, velocity 4" from the centerline of the pipe and the head lost in 30m of the pipe.