THE UNIVERSITY OF NEWCASTLE

EXAMINATION

CALLAGHAN CAMPUS

DEPARTMENT OF CIVIL, SURVEYING AND ENVIRONMENTAL ENGINEERING

NOVEMBER 2000

CIVL131 FLUID MECHANICS 1

THREE (3) HOURS

* Total number of questions: 5 (Five)
* Attempt all questions of examination paper
* All questions are of equal value, each part of each question are of equal value
* There will be 10 minutes reading time
* Any hand-held calculator may be used
* Text: One of the following may be used
  (1) "Fluid Mechanics" by Streeter & Wylie
  (2) "Fluid Mechanics with Engineering Applications" by Daugherty et al
* One (1) Examination answer booklet will be provided

Examiner: A/Prof. Garry Willgoose
a) In the figure below the pressure gauge A reads 1.5 kPa (gage). The specific gravities of fuel oil and glycerin are 0.68 and 1.26 respectively. Determine the reading X (in mm) of the liquid level in the manometer.
a) In the figure below what is the total force in the bolts holding the square gate (1.1m by 1.1m) shut? Ignore the weight of the gate.

![Square gate diagram]

b) The figure below shows the cross-section of a tunnel segment (each segment is 20m long) to be used for a submerged underwater tunnel. During construction the tunnel segments will be floated into place. The ends of the tunnel segment are sealed and the traffic lanes filled with air so that the segment floats. The tunnel will then be lowered into place by gradually flooding the holes for the traffic lanes with water. When the traffic lanes in the tunnel segment are filled with air, and the specific gravity of concrete is 2.5, how much of tunnel segment will be above the water (Z in the figure).
In the figure below calculate the gage pressure at the pressure gauge. The discharge through the pipe is 12 litres per second. The figure is an elevation view of the pipe (i.e. as seen from the side). Ignore all losses (i.e. friction, bends, etc).

4) Determine the head loss in metres and loss coefficient for the pipe entrance shown in the figure below. Note that this entrance is NOT one of the standard entrances for which loss coefficients are provided in the text book. You must calculate it from first principles. Ignore friction losses in the outlet pipe.
j) The figure below shows a pipe connecting two reservoirs. The pipe is made of galvanised iron. The discharge through the pipe is 35 litres per second.

a) Calculate the head difference $Z$ between the reservoirs ignoring minor losses.

b) Calculate the head loss in metres resulting solely from minor losses. The pipe entrance for the upper reservoir square edged.

---

End of Examination