TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology in Conjunction with Kenya Institute of Highways and Building & Technology (KIHBT)

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN CIVIL ECONOMICS

EBE 3117: HYDRAULICS I

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: AUGUST 2013
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*
- *Mathematical Table*

This paper consists of **FIVE** questions. Answer any **THREE** questions

Maximum marks for each part of a question are as shown
This paper consists of **FOUR** printed pages
Question One (20 marks)

a) 2.5 litres of water weighs 245.25 N. determine in SI units:
   (i) Its unit weight
   (ii) Its mass density
   (iii) Its specific gravity
   (iv) The volume of 48kg of liquid **(12 marks)**

b) A jet of water from a 25mm diameter nozzle is directed vertically upwards. The velocity with which the jet leaves the nozzle is 12m/s. Assuming that the jet remains circular and neglecting any loss of energy. Determine the diameter of the jet at the point 4.5m above the nozzle. **(8 marks)**

Question Two

a) Water with a coefficient of kinematic viscosity (γ) of 1.12 x 10^{-6} m^2/s and a mass density (e) of 1000 kg/m^3 flows at a velocity (v) of 1.75m/s through a 75mm diameter pipe whose Darcy's f = 0.0025.

   Determine:
   (i) The Reynold's number (Re)
   (ii) The type of flow based on Re
   (iii) The loss due to friction that would occur in a 10m long pipe. **(8 marks)**

b) Water is flowing through tapering pipe as shown in figure 1 determine the pressure at section 2. **(12 marks)**

$d_2 = 1500mm^2$

Question Three

a) Water flows vertically downwards through a 150mm diameter pipe with a velocity of 2.4m/s. the pipe suddenly enlarges to 300mm diameter.
   (i) Determine the head lost due to the sudden expansion.

(ii) If the flow is reversed, and assuming the coefficient of contraction (cc) to be 0.62, determine the energy lost due to sudden contraction. **(11 marks)**

b) Water from a large reservoir is discharged to the atmosphere through a 100 mm diameter pipe 450m long. The entry from the reservoir is sharp and the outlet is 12 m below the water level in the reservoir. If Darcy's f = 0.01, determine

figure 2

(i) Velocity in the pipe
(ii) Discharge in the pipe. **(9 marks)**

Question Four

a) A triangular open channel is shown in Figure 3 with a water depth of 0.25m. if the discharge is $0.04m^3/s$ and chezy's C=52, determine the bed slope **(8 marks)**

60^o

b) Design a rectangular channel using the following data
- Discharge $12m^3/s$
- Average velocity m/s
- Chezy's C = 60 in SI units **(12 marks)**

Question Five

a) A trapezoidal notch has a 30cm base and sides sloping at 30^0 to the vertical. The head causing flow is 0.16 m and CD = 0.6.
Determine the rate of flow **(6 marks)**

b) Outline **THREE** major differences between a notch and a weir **(6 marks)**

c) A cippoletti weir 3m long discharges 1.88m3/s of water. If cd = 0.6, determine the height of water above the crest **(4 marks)**

d) The discharge in an open channel is measured using a right angled V-notch. The head over the notch is 0.15m and cd = 0.65. Calculate the discharge in the channel. **(4 marks)**