TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY IN CONJUCTION WITH KENYA INSTITUTE OF HIGHWAYS AND BUILIDNG TECHNOLOGY (KIHBT)

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

HIGHER DIPLOMA IN BUILDING ECONOMICS

EBE 3117: HYDRAULICS I B

END OF SEMESTER EXAMINATIONS
SERIES: OCTOBER 2016

TIME: 2HOURS

Instruction to candidates

You should have the following for this examination

- Answer booklet
- Pocket Calculator

This paper consist of five question.
Answer any three questions of the five questions
All question carry equal marks
Maximum marks for each part of a question are as shown
This paper consist of two printed pages

QUESTION 1

a) A certain liquid has a specific gravity of 13.0 For the same liquid, determine the following in SI units:

I. Its mas density
II. Its unit weight
III. The mass of 1900 litres
IV. The volume of 21 kg

(Make any necessary assumption) (8 marks)

b) Differentiate between : (12 marks)

I. Steady and unsteady flow
II. Uniform and non-uniform flow
III. Laminar and turbulent flow
IV. Pipe and open channel flow

QUESTION 2

a) Water flows through pipe AB, 450 mm in diameter at 3m/s and then branches into two pipes BC 300 mm in diameter and BD 200 mm in diameter. The velocity in the 200 mm diameter pipe is 2.5 m/s, Determine;

I. The discharge in AB
II. The velocity in BC
III. The discharge in BD

(6 marks)

b) A liquid of specific gravity 1.3 flows in a pipe at a rate of 800l/s. from point A which is 600mm diameter to point B which is 300 mm diameter. Point B is 1 m above point A. if the pressure at A is 1000 KN/m^2. Ignoring friction losses, determine the pressure at point B

(7 marks)

c) A pipeline is set up to draw water from a reservoir as shown in fig Q2c. The pipeline has to go over a barrier which is above the water level. The outlet is 8 m below the water level A. The pressure at the highest point of the barrier at B is not to fall below 1.0 m of water to avoid cavitation. Determine the maximum height of the barrier (h). Atmospheric pressure is 10.3 m of water. Ignore energy losses.

(5 marks)

d) State TWO assumptions made in deriving Bernoulli's theorem.

(2 marks)

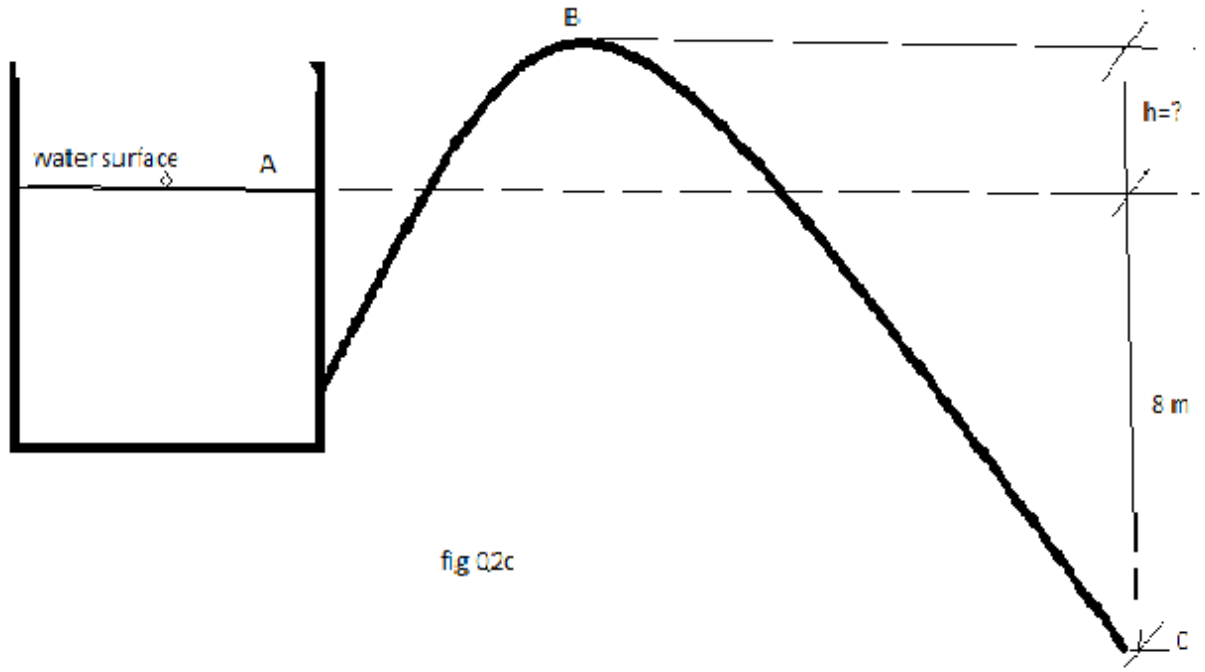

fig Q2c

QUESTION 3

a) Water flows upwards through a pipe which tapers from 200 mm diameter at point M to 150 mm diameter at N. Point N is 1.0 m above M. the gauge pressure at M and N are 200 KN/m^2 and 150 KN/m^2 respectively. Ignoring friction losses, determine the flow in the pipe.
(6 marks)

b) Water discharges from a large tank through a sharp entry into a pipe of 50 mm diameter pipe which is 45 m long. It is then joined to a 75 mm pipe which is 30 m long which discharges into atmosphere, 6 m below the water level in the tank. The pipe entry is sharp and the expansion is sudden. Darcy's f=0.005 for both pipes. Determine the discharge in l/s
(7marks)

c) A 6 m long pipe that is 50 mm in diameter is transmitting water with a velocity of 2.4 m/s. If the central 1.8 m of the pipe is replaced by a 75 mm diameter pipe, determine the loss of head that would be saved. Darcy's f =0.01 for both pipes and the changes of section are sudden.
(7marks)

QUESTION 4

a) A sewer with a diameter of 2 m and an inclination of 5^0 to the horizontal has a water depth of 0.75 m. Chezy's c=65 in SI units. Determine the discharge through the pipe.

(7 marks)

b) For a given slope of 1 in 2500 and the flow rate of 4 m/s determine the depth of flow and area of cross section at optimum conditions for;

I. Rectangular section
II. Trapezoidal section

(13 marks)

QUESTION 5

a) A cipolletti weir with a crest length of 0.6 m is installed in a channel which is 0.8 m wide and 0.6 m deep. The head of water over the weir is 0.36 m. if cd=0.6, determine the flow over the weir. (Make only one trial for velocity of approach) (7 marks)

b) The heights of water on the upstream and downstream of a 3.0 m long weir are 20 cm and 10 cm respectively. The cd for the free and drowned portions are0.6 and 0.8 respectively. Determine the discharge over the notch. (4 marks)

c) A trapezoidal notch is 1.2 m wide at the top, 0.5 m wide at the bottom and 0.4 m deep. The head of water over the notch is 0.3 m. Determine the discharge through the notch. Assume cd is 0.62 and 0.6 for the rectangular and triangular portions respectively. (6 marks)

d) Define the following terms in connection with weirs ;(3 marks)

I. Nappe
II. Crest
III. notch