UNIVERSITY OF SWAZILAND
Faculty of Health Sciences
Department of Environmental Health Sciences

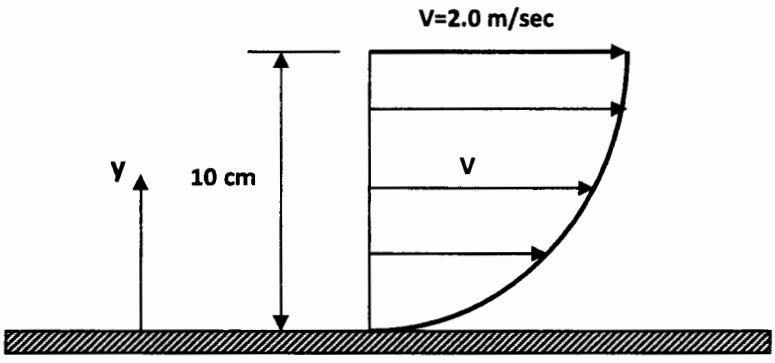
BSc Environmental Health

MAIN EXAMINATION PAPER DECEMBER 2011

TITLE OF PAPER	:	WATER DISTRIBUTION
COURSE CODE	:	EHS:586
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	THERE ARE FIVE QUESTIONS IN THIS EXAM
	:	ANSWER ANY FOUR OF THE FIVE QUESTIONS
	:	EACH QUESTION CARRIES 25 MARKS
	:	NO PAPER SHOULD BE BROUGHT INTO OR OUT OF THE EXAMINATION ROOM

QUESTION ONE (25 Marks)

Assuming a boundary layer velocity distribution of fluid shown in the figure below which is a parabola having its vertex 10 cm from the wall, calculate the shear stress for y= 0cm, 5cm, and 10cm. The velocity at the top free surface is given as 2.0 m/sec. Take coefficient of dynamic viscosity as 0.4 N-s/m^2.

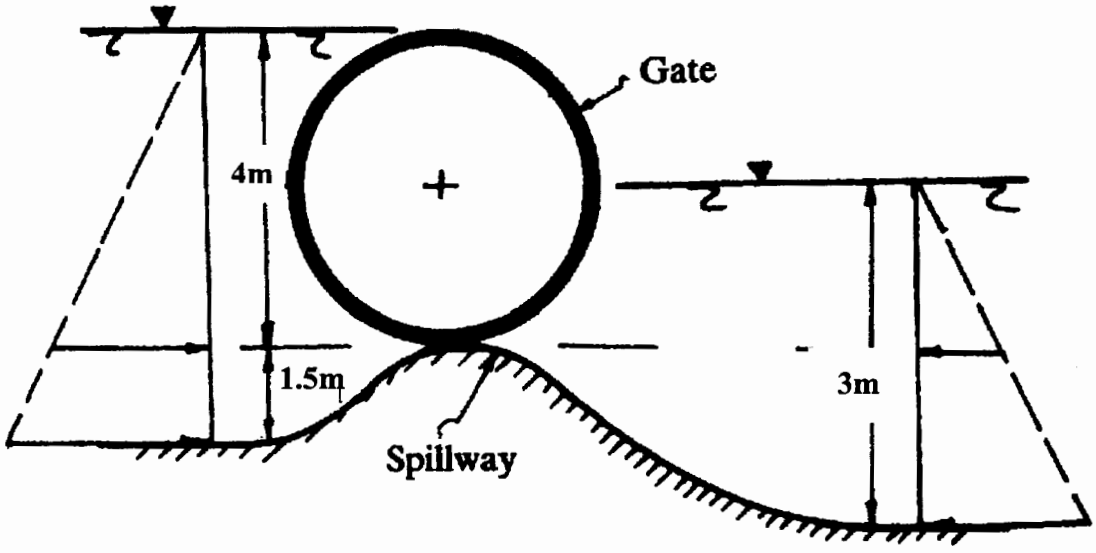


QUESTION TWO (25 Marks)

A 2.5m diameter roller gate retains water on both sides of a spillway crest as shown in the figure below. Determine

A. The magnitude direction and location of the resultant hydrostatic thrust acting on the gate per unit length.....**[15 Marks]**

B. The horizontal water thrust on the spillway per unit length.....**[10 Marks]**



QUESTION THREE (25 Marks)

The discharge over a triangular notch can be written as:

$$Q = \left(\frac{8}{15}\right) * C_d * \sqrt{2g} * tan\left(\frac{1}{2}\theta\right) H^{5/2}$$

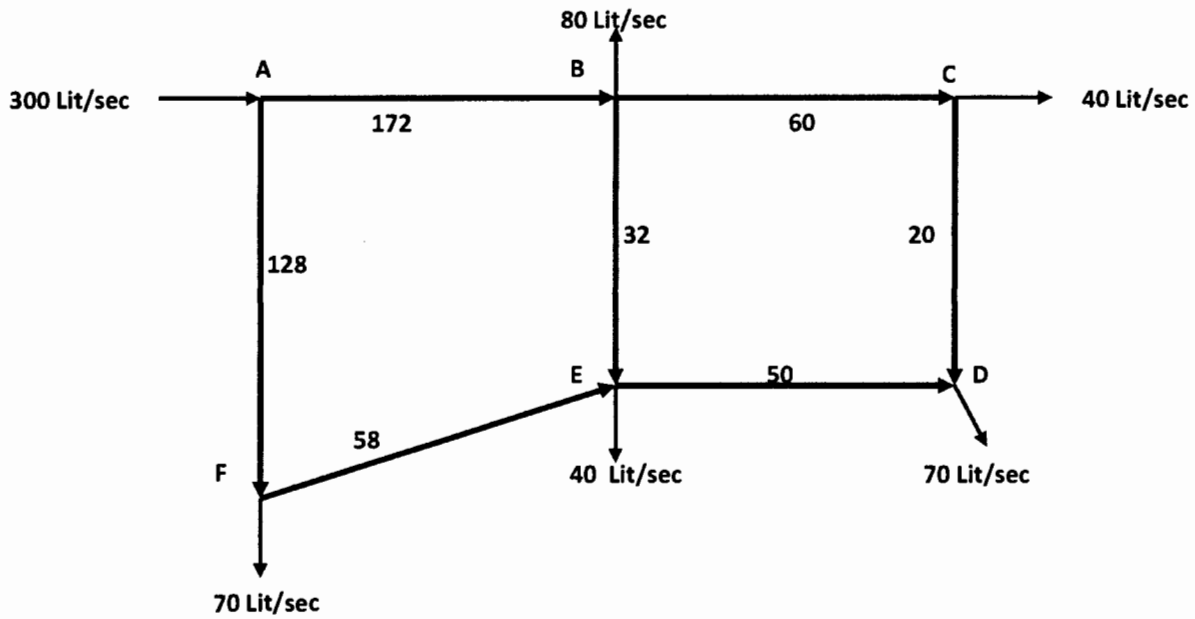
A. If an error of 2% in measuring H is introduced, determine the corresponding error in the computed discharge.....**[13 Marks]**

B. A triangular notch with a notch angle of 45^0 is used for gauging the flow of a laboratory flume. If the coefficient of discharge of the notch is 0.6 and an error of 3mm is suspected in observing the head, find the percentage error in computing an estimated discharge of 10 lit/sec. .....**[12 Marks]**

QUESTION FOUR (25 Marks)

For the network shown below, using the Hardy Cross method determine the flows in each pipe and the head loss over the two loops after one iteration and starting with the assumed flow magnitudes and directions shown for each of the pipes in the figure below. Use the following formula for the head loss in each pipe:

Where the K values are indicated in the table below for each pipe and the discharge Q should be expressed in m^3/sec.



Pipe	AB	BC	CD	DE	EF	AF	BE
K value	1015	13057	33050	13057	13057	1032	33050

QUESTION FIVE (25 Marks)

A concrete lined trapezoidal channel shown below has a bed width of 4.0m, side slopes 30^0 to the horizontal, a bed slope 1 in 1000 and Manning's roughness coefficient of 0.015. Calculate the depth of uniform flow when the discharge is 15 m^3/sec. For interpolation take depths between 1.0 meter and 2.0 meter at intervals of 0.2 meter.