THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

University Examination 2010

THIRD YEAR/FIRST SEMESTER EXAMINATION
FOR THE DEGREE IN BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2304: HYDRAULICS I

SERIES: APRIL/MAY 2010 **TIME:** 2 HOURS

Instructions:

Answer Question **One** and any other **TWO** questions.

QUESTION ONE

(a) Show that for a circular culvert of diameter D the Velocity of flow will be a maximum when the depth of flow h at the centre is $0.81D$. Use the Chezy formular. (20 marks)

(b) A Sewer, diameter D = 0.6m, has a slope of 1 in 200.

(i) Calculate the maximum velocity of flow that can occur. (8 marks)

(ii) Calculate the discharge at this velocity:
Take C = 55 SI units. (2 marks)

QUESTION TWO

A rectangular canal of cross-section conveys $11.3 m^3/s$ of water with a velocity of $1.8 m/s$. Calculate the gradient required.

(a) If the proportions are those of maximum discharge. (10 marks)

(b) If the width is three times the depth,
C = 66 is SI units. (10 marks)

QUESTION THREE

A concrete Grid trapezoidal channel with uniform flow has a normal depth of 2m. The base width is 5m and the side slopes are equal at 1:2. Manning's n can be taken as 0.015 and the bed slope S_0=0.001.

Calculate:

(a) Discharged (10 marks)
(b) Mean velocity (5 marks)
(c) Reynolds number (Re). (5 marks)

QUESTION FOUR

(a) Develop an expression for the quantity of liquid flowing over a sharp-edged V-notch of total angle 2θ in terms of the head H above the bottom of the notch the angle θ , and the coefficient of discharge Cd, assuming the velocity of approach to be small. (14 marks)

(b) If the rate of flow of water over a V-notch having θ = 35° is 42.5$dm3/s$, Calculate the head in centimeters. Take Cd as 0.62. (6 marks)

QUESTION FIVE

(a) A 15m vertical well carries a design flow head of 1.5m. Calculate the flow depth at the toe. (10 marks)

(b) A discharge of 4.5m^3/s occurs in a rectangular channel 1.83m wide with S=0.002 and n=0.012. Calculate the normal depth for uniform flow and calculate the critical depth. Is the flow subcritical or supercritical? (10 marks)