THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A CONSTITUENT COLLEGE OF JKUAT)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING AND CIVIL ENGINEERING
DIPLOMA IN BUILDING AND CIVIL ENGINEERING
DIPLOMA IN CIVIL ENGINEERING AND CAD

EBC 2320/EBC3120 : HYDRAULICS

SPECIAL/SUPPLEMENTARY EXAMINATIONS

SERIES: MAY, 2011

TIME: 2 HOURS

Instructions to Candidates:

1. Answer question **ONE** (Compulsory).
2. Answer any other **TWO** Questions.

COMPULSORY (30 MARKS)

Question ONE

(a) Define the following types of flow;

(i) Steady,
(ii) Laminar,
(iii) Uniform

(6 Marks)

(b) A trapezoidal channel with a bed width of 9m, side slopes of 1:2 (H:V) and a water depth of 1.2m. If the bed slope is 1:1181 and Chezy's C = 49.5, Calculate the discharge. (6 Marks)

(c) A 2m diameter pipe is laid at a slope of 0.0875. The water depth is 750mm and Chezy's C=65. Calculate the discharge. (7 Marks)

(d) Define the following terms used in non uniform flow:

(i) Critical flow
(ii) Subcritical flow
(iii) Supercritical flow

(6 Marks)

(e) The specific energy of a 3m wide channel is 3m. Determine the maximum discharge. (5 Marks)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION (40 MARKS)

Question TWO

(a) A trapezoidal channel for conveying water is to be designed using the following data.

- Velocity of flow 0.6m/s.
- Side slopes of channel 1:1.5 (V:H)
- Discharge $3m^3/s$.
- Chezy's C = 65

Determine:

(i) The depth of flow.
(ii) Bottom width of channel.
(iii) Slope of the channel bed.

(12 Marks)

(b) A concrete lined circular channel 3.6m diameter that is conveying water has a bed slope of 1:600 and Chezy's C = 50. Determine:

(i) The maximum discharge
(ii) The velocity at maximum discharge

(8 Marks)

Question THREE

(a) A rectangular channel is 8m wide and is conveying water at a rate of $15m^3/s$. If the depth of flow is 1.2m, determine:

(i) Specific energy of the flowing water
(ii) Critical depth
(iii) Critical velocity
(iv) Minimum specific energy
(v) Froude number
(vi) Whether flow is subcritical or supercritical

(12 Marks)

(b) A sluice gate discharges water into a horizontal rectangular channel with a velocity of 10m/s and a depth of flow of 1m. Determine:

(i) The depth of flow after the hydraulic jump.
(ii) The consequent loss in total head.

(5 Marks)

(c) Show how reynold's number is used to classify types of flow. (3 Marks)

Question FOUR

(a) Make a labeled sketch of a pelton wheel and outline it principle of working. (6 Marks)

(b) A centrifugal pump delivers 30litres of water per second through a 125m long and 150mm diameter pipe. The water is lifted through a height of 25m, darcy's f = 0.01, and the overall efficiency of the pump is 75%. Calculate the power required to drive the pump. (6 Marks)

(c) With the aid of a sketch describe the working principle of a reciprocating pump. (6 Marks)

(d) State **TWO** functions of an air vessel when placed on the delivery side of a reciprocating pump. (2 Marks)

Question FIVE

(a) State **TWO** reasons that make it necessary to include 'freeboard' when designing an open channel. (2 Marks)

(b) Define the following terms as used in open channel design:

(i) Minimum allowable velocity
(ii) Maximum allowable velocity

(4 Marks)

(c) A water channel has two sides vertical and a semicircular bottom of 2m diameter. The depth of flow is 2m, Chezy's C = 70 and the bed slope is 1:1000. Calculate the discharge through the Channel. (6 Marks)

(d) A half full sewer, 1m diameter is discharging $0.4m^3/s$ of sewage. If mannings N = 0.013, find the slope of the sewer. (6 Marks)

(e) State **TWO** advantages of a centrifugal pump compared to a reciprocating pump. (2 Marks)