THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING AND CIVIL ENGINEERING

EBC 3120: HYDRAULICS

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2012
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions
Answer question any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (20 marks)

a) The triangular gutter shown in figure 1 is conveying water at a rate of $0.04m^3/s$. If Chezy's C = 52, determine the gradient of the gutter **(10 marks)**

Figure 1

b) A trapezoidal canal has a bed width of 8m, depth of flow 2.4mf side slopes of 1:3 (H:V) as shown in figure 2. Manning n = 0.0197 and the bed slope is 1:4000, determine:

i. Average flow velocity
ii. Discharge in the channel **(10 marks)**

Fig 2

Question Two (20 marks)

A concrete lined circular channel 3.6m diameter has a bed slope of 1:600. Determine:

i) Maximum velocity
ii) Discharge at maximum velocity
iii) Maximum discharge
iv) Velocity of maximum discharge **(20 marks)**

Question Three (20 marks)

a) A rectangular channel is to convey 0.5m/s and have a bed slope of 1:2000. Given that Chezy's C = 50, Design the channel. **(8 marks)**

b) A rectangular channel 8m wide is conveying water at a rate of $1m^3/s$. The depth of flow is 1:2m. Determine:

- **i)** Specific energy of flowing water
- **ii)** Critical depth
- **iii)** Critical velocity
- **iv)** Minimum specific energy
- **v)** Froude's number
- **vi)** Whether flow is critical, subcritical or supercritical. **(12 marks)**

Question Four (20 marks)

a) A 3.6m wide rectangular channel conveys 9.0m3/s of water with a velocity of 6m/s. Determine:

- i) The height of the resulting hydraulic jump
- **ii)** Loss of head due to the jump **(12 marks)**

b) A venturi flume is 1.50m wide at the entrance and 0.7m at the throat. The depth of flow is 0.70m at the entrance and at the throat is 0.50m. Neglecting hydraulic losses in the flume determine the flow rate. **(4 marks)**

c) Differentiate a "pump" from a "compressor" **(4 marks)**

Question Five (20 marks)

a) State **TWO** reasons of using air vessels in reciprocating pumps. **(2 marks)**

b) With the aid of a sketch, briefly describe the working principle of single acting reciprocating pump. **(9 marks)**

c) A single acting reciprocating pump running at 55 r.p.m delivers $0.008846m^3/s$ of water. The diameter of the piston is 200mm and the stroke length is 300mm. The suction and delivery are 3m and 11m respectively. Determine:

- i) Theoretical discharge
- ii) Coefficient of discharge
- iii) Percentage slip of the pump
- **iv)** Power required to run the pump **(9 marks)**