TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
DIPLOMA IN BUILDING AND CIVIL ENGINEERING
ECV2304 : HYDRAULICS
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
TIME: 2 HOURS
DATE: Sep 2018

Instructions to Candidates
You should have the following for this examination
  -*Answer Booklet, examination pass and student ID*
  -*Drawing instruments.*
  -*Scientific calculator*
This paper consists of five questions.
Attempt any THREE questions.
Do not write on the question paper.

QUESTION ONE

a) Differentiate the following types of flow;
  I.   Laminar and turbulent flow
  II.   Uniform and non-uniform flow
  III. Steady and unsteady flow   (6marks)

b) A circular pipe, 2m diameter is laid at an inclination of 5° to the horizontal. The depth of water in the pipe is 0.75m and chezy's C is 65 SI units. Calculate the discharge through the pipe.

(8marks)

c) A rectangular channel is 1.2m wide and 1m deep. It has a bed slope of 1:3000. The value of k in Bain's formula is 1.54. Given that chezy's, $C = \dfrac{157.6}{1.81+\frac{k}{\sqrt{m}}}$ determine the discharge through the channel.

(6marks)

QUESTION TWO

a) Derive the expression for the dimensions of the best rectangular section

(6marks)

b) Design a trapezoidal channel using the following hydraulic particulars
- Side slope---- -60°to the horizontal
- Discharge----4.25 m^3/s
- Bed slope----1:9000
- Chezy's C----49 SI units

(8marks)

c) Explain the importance of the following in open channel design:
   i.   Maximum velocity
   ii. Minimum velocity
   iii. Free board

(6marks)

QUESTION THREE

a) Water is flowing through a 3m wide rectangular channel at a rate of 12m³/s. The depth of flow is 2m. determine ;
   I.Specific energy
   II.Critical depth
   III.Critical velocity
   IV.Minimum specific energy
   V.Froude's number
   VI.Whether the flow is critical ,sub-critical or super-critical

(12marks)

b) With the aid of a sketch explain the procedure of drawing the specific energy diagrams using both the kinetic and potential energy diagrams

(8marks)

QUESTION FOUR

a) With the aid of a sketch explain the working principle of :
   i. Centrifugal pump
   ii. Pelton wheel

(8marks)

b) A single acting pump has a 300mm diameter plunger with a stroke of 200mm. the speed of the pump is 300rpm and it delivers 6.5 l/s of water' determine

   I. The theoretical discharge
   II. Coefficient of discharge
   III. Percentage slip of the pump

(6marks)

c) A double acting reciprocating pump has a stroke of 300mm and a piston of 150mm diameter. The delivery and suction heads are 26m and 4m respectively including friction heads. If the pump is working at 60rpm, power required to drive the pump with 80% efficiency

(6marks)

Question five

a) With the aid of a sketch illustrate the working principle of a double acting reciprocating pump

(8marks)

b) Explain the main functions of the following accessories in a reciprocating
   i. Pump air vessels
   ii. Foot valve
   iii. Strainer
   iv. Delivery valve   (8marks)

c) Differentiate a turbine from a pump   (4marks)