JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMINATIONS   FOR THE DIPLOMA IN BUILDING AND CIVIL ENGINEERING

2ND YEAR 2ND SEMESTER 2017/2018 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TBC 2223

COURSE TITLE: HYDRAULICS II

EXAM VENUE: LAB 23   **STREAM: DIP IN BLD & CIV ENG**

DATE: 20/12/2017   **EXAM SESSION: 9.00 – 10.30AM**

DURATION: 2 HOURS

Instructions

1. **Answer question 1 (Compulsory) and ANY other two questions**
2. **Candidates are advised not to write on question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE (30 MARKS)

a. State and outline the significance of the following; **(6 Marks)**
   i. Continuity equation
   ii. Bernoulli's Equation

b. Explain what you understand by an open channel flow and distinguish between uniform and non-uniform open channel flow. **(8 Marks)**

c. Outline the difference between turbulent flow and laminar flow; hence explain how Reynolds's number is used to determine the different types of flows. **(6 Marks)**

d. Explain the principle involved in measuring velocity of flow using a pitot static tube.

   Hence determine the velocity of air, if a pitot static tube is used to measure the velocity of air flowing through a duct, and the manometer shows a difference in head of 5 cm of water. The density of air and water are 1.13 kg/m3 and 1000 kg/m3. Assume the coefficient of the pitot tube as 0.98.

   (10 Marks)

QUESTION TWO (15 MARKS)

a. A venturimeter of 150 mm × 75 mm size is used to measure the flow rate of oil having specific gravity of 0.9. The reading shown by the U tube manometer connected to the venturimeter is 150 mm of mercury column. Calculate the coefficient of discharge for the venturimeter if the flow rate is 1.7 m3/min. (Note: The size of venturimeter generally specified in terms of inlet and throat diameters). **(10 Marks)**

b. Briefly explain what you understand by the term, "Economical cross-section" with reference to an open channel. **(5 Marks)**

QUESTION THREE (15 MARKS)

a. Explain what is meant by energy losses in a pipe, distinguishing both the major and minor losses. **(7 Marks)**

b. Show that the loss of head due to friction, h_f, is given by;

$$h_f = \frac{4fL}{d}\frac{v^2}{2g};$$ where f is the resistance coefficient, L length of the pipe, v is the

   mean velocity of flow, d is the pipe diameter and g the gravitational acceleration.
   (8 Marks)

QUESTION FOUR (15 MARKS)

a. Define venacontracta, and derive the expression for flow measurement through an orifice in an open tank. **(9 Marks)**

b. State Chezy and Manning formula for uniform flow through an open channel. **(6 Marks)**

QUESTION FIVE (15 MARKS)

a. Derive an expression for the flow measurement using a triangular notch in an open channel.**(9 Marks)**

b. Discuss the method of velocity measurement using (i) Vane anemometer and (ii) Turbine meter. **(6 Marks)**