



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF SPATIAL PLANNING**  
**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE**  
**IN WATER RESOURCES AND ENVIRONMENTAL MANAGEMENT**  
**SEMESTER 2018/2019 ACADEMIC YEAR**

**CENTRE: MAIN CAMPUS**

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**COURSE CODE: PWE 3221**

**COURSE TITLE: FLUID MECHANICS II**

**EXAM VENUE:**

**STREAM: WATER**

**DATE: 1/5/19**

**EXAM SESSION: 12.00 – 2.00PM**

**TIME: 2 HOURS**

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**Instructions:**

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

**SECTION A [30 Marks]**  
**Answer ALL questions from this Section.**

**QUESTION ONE**

- a) From the principle of conservation of energy, explain how a fluid flowing in a pipe would be able to flow from a point of entry to the point of exit **(6 Marks)**
- b) Describe any SIX factors that may influence energy loss in pipes **(6 Marks)**
- c) Using sketch diagrams, illustrate the various typical velocity distribution patterns across triangular, trapezoidal, circular and natural open channels **(6 Marks)**
- d) Establish the relationship between Chezy's constant ( $C$ ), and Manning's roughness coefficient ( $n$ ) in their equation of determining velocities of water flowing in a prismatic channels. **(6 Marks)**
- e) Using a basic equation, define Specific Energy as applied for a flowing fluid in open channel **(6 Marks)**

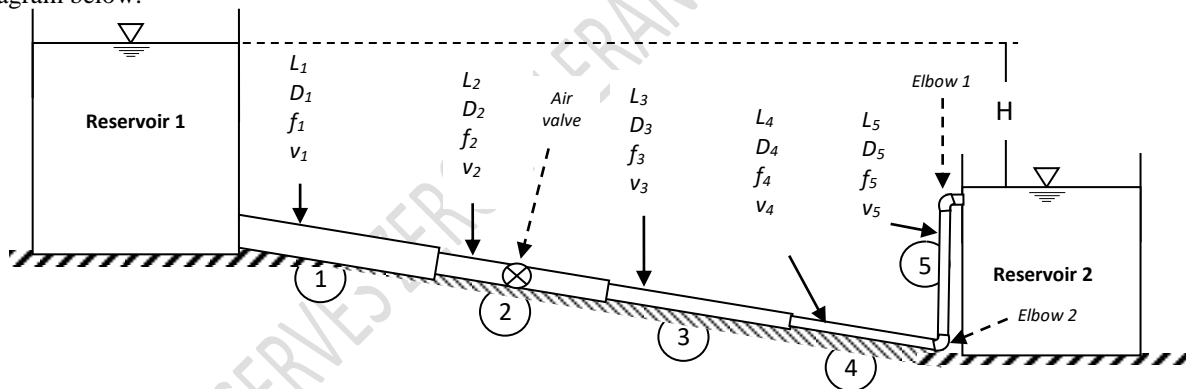
**SECTION B [40 Marks]**  
**Answer ANY TWO questions from this Section.**

**QUESTION TWO**

- a) A pipe of 80mm diameter is suddenly enlarged to 160mm diameter. Find the loss of energy head due to sudden enlargement if the velocity of water in 80mm diameter section is 5m/s. **(10 Marks)**
- b) A rectangular channel has a bottom width of 8.0m and Manning's  $n = 0.025$ . Determine its normal slope at a normal depth of 2.0m when the discharge is 12m<sup>3</sup>/s **(10 Marks)**

**QUESTION THREE**

Water is delivered from Reservoir 1 to Reservoir 2 with pipe network (1-5) connected in series as shown in the diagram below:



Using appropriate formulae identify all major and minor losses that would occur in the system. Additionally, Given  $H$  as the total head between Reservoir 1 and 2, express the available Head that the system will have to ensure water is delivered to Reservoir 2 **(20 Marks)**

**QUESTION FOUR**

- a) A rectangular channel has a width of 2m and discharges water of 4.0 m<sup>3</sup>/s. Compute the Specific Energy of water passing through its cross section. **(8 Marks)**
- b) Using Froude's Number and wave diagrams, describe the conditions under which water flowing in an open channel will be under (i) Critical flow (ii) Sub-critical flow (iii) Supercritical flow respectively **(12 Marks)**

**QUESTION FIVE**

Discuss the functions of the following hydraulic structures: (i) Weirs (ii) Sluice gates (iii) Fumes (iv) Spillway (v) Culverts **(20 Marks)**

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