UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMMES: AGRICULTURAL AND BIOSYSTEMS ENGINEERING

COURSE CODE: ABE 303

TITLE OF PAPER: FLUID MECHANICS AND HYDRAULICS

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

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FLUID MECHANICS AND HYDRAULICS

COMPULSORY

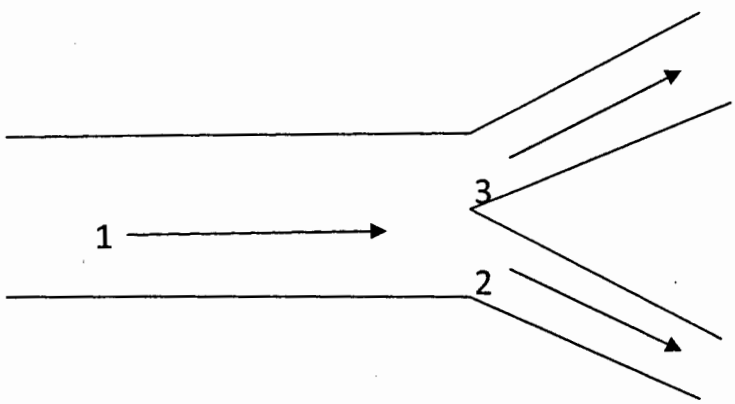
QUESTION 1.:

(a) Describe the difference between the following types of fluid flow:-

(i) Turbulent and laminar flow **[5 marks]**

(ii) Uniform and non-uniform flow **[5 marks]**

(b) Below is a pipe system as shown in the diagram, starting with a pipe 1 (50mm) with water flowing at a velocity of 2.0m/s and the pipe branches to pipe 2 (40mm) and pipe 3 (60mm) pipe. The 40mm pipe takes 30% of the flow.



(i) Calculate the flow rates in each pipe **[10 marks]**

(ii) Calculate the velocities in the 40mm and 60mm pipes

(c) What is – **[10 marks]**

(i) Absolute pressure? **[5 marks]**

(ii) Gauge pressure? **[5 marks]**

QUESTION 2.:

(a) State Bernoulli's Equation as used in fluid hydraulics **[15 marks]**

(b) Write the e4xpressions or equations for determining the following:

(i) Density **[5 marks]**

(ii) Specific weight **[5 marks]**

(iii) Specific gravity **[5 marks]**

QUESTION 3.:

(a) An electric motor which has 95% efficiency uses 20A at 110V

(i) What is the power output of the motor? **[10 marks]**

(ii) How many watts are lost in thermal energy? **[10 marks]**

(b) Briefly describe what is meant by buoyancy in fluid mechanics **[10 marks]**

QUESTION 4.:

(a) Differentiate between the following terms with the aid of diagrams:- **[10 marks]**

(i) Pipes in series **[2.5. marks]**

(ii) Pipes in parallel **[2.5. marks]**

(iii) The equivalent pipe **[5 marks]**

(b) Give an expression for calculating minor losses in a pipe system when there are three different sizes of pipes in the system used **[5 marks]**

(c) State Manning's formulas as used for pipe and open channel flow and state what each term means **[5 marks]**