UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION PAPER

PROGRAMMES:

BSc. ABE 1, BSc. Agric. Econ and AgBMgt 1, BSc. Ag.Ed 1, BSc. Agron 1, BSc. An. Sc 1, BSc. An. Sc 1 (Dairy Option), BSc. COS 1, BSc. COSE 1, BSc. FSNT 1, BSc. Hort 1, BSc. TADM 1

COURSE CODE: ABE 101

TITLE OF PAPER: PHYSICS

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS

DO NOT OPEN THIS PAPER UNTIL PERMISION HAS BEEN GRANTED BY THE CHIEF INVIGILATOR

QUESTION 1

a. Explain the characteristics of 'Current' and how it differs between a Series circuit and a Parallel circuit. **[5 marks]**

b. Explain the conditions of equilibrium. **[5 marks]**

c. A 40 kg box is motionless. Tired out, you push it with force 100 N to try to start it moving. The coefficient for static friction between the floor and the box is $\mu = 0.45$.

(i) Compute μF_N. **[5 marks]**

(ii) Will the box move? **[5 marks]**

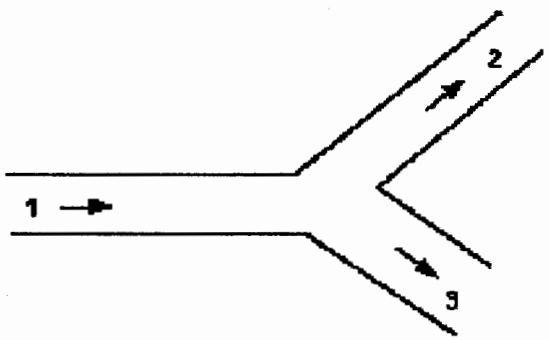
(iii) What is the magnitude of the force of friction acting on the box in this situation? **[10 marks]**

(iv) What is the moral of this problem? **[5 marks]**

d. State the Archimedes principle and discuss its relevance in agriculture. **[5 marks]**

QUESTION 2

a. In the figure below, if *pipe 1* is 50 mm in diameter with a mean velocity of 2 m/s; *pipe 2* is 40.0 *mm* in diameter, and takes 30% of total discharge; *pipe 3* has a diameter of 60.0 *mm*. What are the values of discharge and mean velocity in each pipe? **[15 marks]**



b. A cup containing 0.25 *kg* of water at 22.0 °C is placed in a microwave oven. After 60 *s* the temperature of the water is found to be 50 °C.

(i) How much heat flowed to the water? **[5 marks]**

(ii) What was the average power delivered to the water? **[10 marks]**

QUESTION 3

a. Given that the velocity v of a liquid leaving a nozzle depends upon a pressure drop p and the density ρ. Using dimensional analysis, show that a relationship between v, p, and ρ can be established. **[5 marks]**

b. A rock is thrown vertically upward with an initial speed of 100.0 *m/s* (assume symmetry). At the same instant another rock is thrown vertically downward from the top of a 280.0 *m* cliff with an initial speed of 40.0 *m/s*, neglecting air friction,

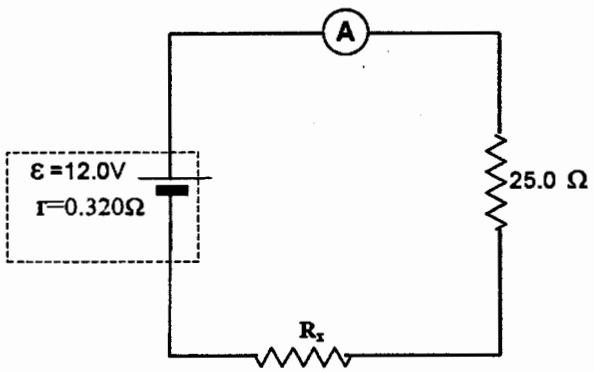
i. Find the time when the rocks pass each other **[10 marks]**

ii. Find the height above the ground at which the rocks pass each other **[5 marks]**

iii. When are the speeds of the rocks the same? **[10 marks]**

QUESTION 4

a. The diagram below shows an electrical circuit which consists of an unknown resistor R_x connected in series with a 25.0Ω resistor and a battery of emf of 12.0 V and internal resistance 0.32Ω. An ammeter connected in the circuit reads 200 *mA*.



i. A voltmeter is connected across the battery when the circuit is closed. What is its reading? **[5 marks]**

ii. Calculate the value of the unknown resistor R_x. **[5 marks]**

iii. Calculate the rate at which energy is used by the 25.0Ω resistor. **[10 marks]**

b. State the principle of conservation of energy and explain how this principle is applied when a ball is thrown vertically upwards. **[10 marks]**