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UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: ALL YEAR 1 PROGRAMMES (AGRICULTURE & CONSUMER SCIENCES)

COURSE CODE: ABE102

TITLE OF PAPER: PHYSICS

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

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SECTION 1: COMPULSORY

Question 1

a. State the law of conservation of energy **[5 marks]**

b. Prove the above law by using the following information; a pilot flies an aircraft at an altitude of 20 km and then comes down by 6 km, where he drops a 100 kg bag of maize to a starving community. Calculate the potential and kinetic energy of the bag at the level it was dropped. **[15 marks]**

c. Derive the dimensions for the following;

i. Force

ii. Momentum

iii. Pressure

iv. Energy

v. Power **[10 marks]**

d. A horizontal pipeline increases uniformly in diameter from 75 mm to 150 mm in the direction of water flow. When 85 l/s is flowing through the pipe, a pressure gauge at the 75 mm section reads 2 bars. Determine what the reading of a gauge at the 150 mm section will be, assuming that there are no losses. **[10 marks]**

SECTION 2: ANSWER ANY TWO (2) QUESTIONS

Question 2

a. How much heat is required to raise the temperature of 0.2 kg aluminium from 18 °C to 63 °C, assuming the specific heat capacity of aluminium to be 950 J/kg°C. **[10 marks]**

b. Calculate the total resistance of a circuit having three resistors of 3.5, 2.75 and 4Ω each connected in series. **[10 marks]**

c. If the resistors in (b) above are connected in parallel, what will be the new value for total resistance? **[10 marks]**

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Question 3

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

i. What is the power output of the motor? **[5 marks]**

ii. How many *Watts* are lost through thermal energy? **[5 marks]**

iii. How many *Calories* of thermal energy are developed per second? **[5 marks]**

iv. If the motor operates for 3 hours, how much energy (in MJ and in KWh) is dissipated? **[5 marks]**

b. State the Bernoulli's theorem **[5 marks]**

c. State the Archimedes principle **[5 marks]**

Question 4

A small smooth object slides from rest down a smooth plane of 5 m length and a slope of 30° to the horizontal. Calculate the

i. Acceleration down the plane **[5 marks]**

ii. Velocity at the bottom of the incline **[5 marks]**

iii. Time to reach the bottom of the incline **[5 marks]**

If the same object is then thrown up the plane with an initial velocity of 15 m/s,

iv. How long does it take to come to rest **[7.5 marks]**

v. How far up the plane does the object travel? **[7.5 marks]**