UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMMES:

BSc. Agric. Econ and AgBMgt 1, BSc. Ag.Ed 1, BSc. Agron 1, BSc. An. Sc 1, BSc.

FSNT 1, BSc. Home Econ 1, BSc. Home Econ. Ed 1, BSc. Hort 1, BSc. LWM 1, BSc.

TADM 1

COURSE CODE: LUM 101

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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QUESTION 1

a.

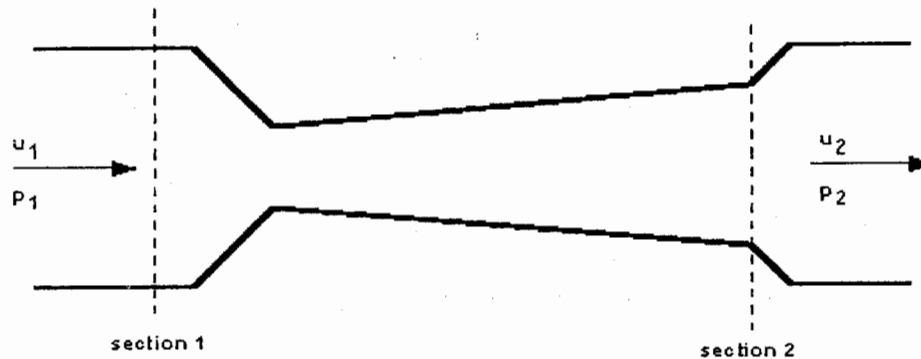
Figure 1: A contracting expanding pipe

A fluid of constant density $= 960kg/m^3$ is flowing steadily through the tube in Figure 1. The diameters at the sections are $d_1 = 100mm$ and $d_2 = 80mm$. The gauge pressure at 1, $p_1 = 200kN/m^2$, and the velocity is $u_1 = 5m/s$. What is the gauge pressure at section 2?   **[15 marks]**

b. A certain airplane has a cruising speed of 200 km/hr relative to the ground when there is no wind. The pilot points the airplane at $40°$ N of W and flies for three hours.

(i)How far north and how far west of his original location is he after the three hours?

(ii) Answer part (a) above if a 50 km/hr wind blows at $30°$ N of E during the trip.

Note: Please make diagrams to support your work.   **[25 marks]**

QUESTION 2

a. Two identical 1.0 kg blocks of copper metal, one initially at temperature $T_1=0^oC$ and the other initially at temperature $T_2=100^oC$, are enclosed in a perfectly insulating container. The two blocks are initially separated. When the blocks are placed in contact, they come to equilibrium at a final temperature T_f. If the specific heat of copper is equal to 420 J/kg K, determine the amount of heat exchanged between the two blocks. **[10 marks]**

b. An electric kettle is rated 1250W, 255V. What is the resistance of the heating element when in use? If electricity is charged at E0.51 per kilowatt-hour and the kettle is used for 30 minutes each day, what does it cost per week?· **[10 marks]**

c. Show how you would measure the density of a solid in a laboratory using the displacement method. **[10 marks]**

QUESTION 3

a. What do you understand by centre of gravity? Using the concept of centre of gravity, outline how you would determine the mass of a uniform rod. **[10 marks]**

b. An iron cube has a volume of $1500cm^3$ and is completely immersed in three different liquids of relative densities 1.0, 0.8, and 0.0015 respectively. Calculate the upthrust in each case. **[10 marks]**

c. State the Ohm's and Kirchoff's law in relation to the science of electricity. **[5 marks]**

d. Show that the specific weight of a fluid is equal to the product of its density and acceleration due to gravity.   **[5 marks]**

QUESTION 4

a. A block of mass 50 kg rests on a sloping board. When the board is raised to make an angle of 20° the block begins to slip. Calculate;

   (i)   The coefficient of static friction between the block and the board.   **[5 marks]**

   (ii)   The amount of force necessary to move the block up the board at a uniform
           velocity. Assume the coefficient of dynamic coefficient is 80% of the
           coefficient of static friction.   **[10 marks]**

b. With the aid of sketches, discuss the differences between a circuit in which the resistances are connected in parallel and that in which they are connected in series.

                                                                              [10 marks]

c. Two heating coils A and B, connected in parallel in a circuit, produce a power of 1W and 24 W, respectively. What is the ratio of their resistances, R_A/R_B when in use?

                                                                              [5 marks]