



**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**

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**QUESTION 1**

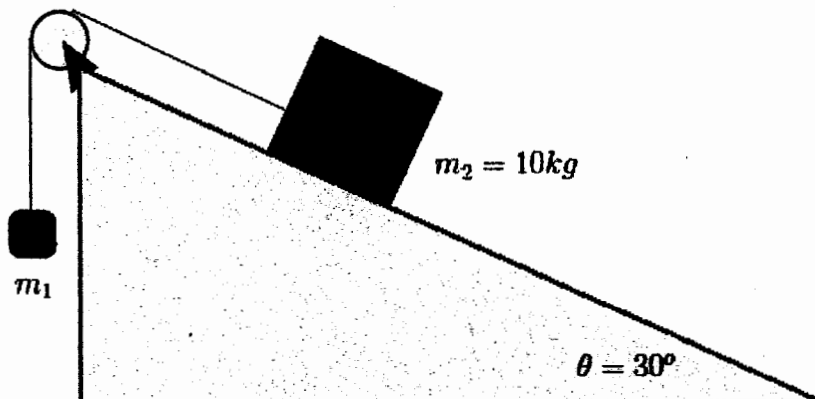
- a. The power  $P$  delivered to a pump depends on the specific weight  $w$  of the fluid pumped, the height  $h$  to which the fluid is pumped, and the fluid flow rate  $q$ .
- Determine the dimensions of each of the parameters (in Table). [8 marks]
  - Use dimensional analysis to derive the equation for power. [7 marks]

<b>Variable</b>				
<b>Dimension</b>				

- b. Cheetahs are, for short distances, the fastest land animals. In the course of a chase, cheetahs can also change direction very quickly. Suppose a cheetah runs straight north for 5.0 s, quickly turns, and runs 300 m west. If the magnitude of the cheetah's resultant displacement is 335 m,
- What is the cheetah's displacement and; [5 marks]
  - What is the velocity during the first part of its run? [5 marks]
- c. A prismatic object 8 cm thick by 8 cm wide by 16 cm long is weighed in water at a depth of 20 cm and found to weigh 11 N. What is its weight in water? [15 marks]

**QUESTION 2**

- a. Consider the Figure below, let the coefficient of static friction between the block and the incline be 0.4.



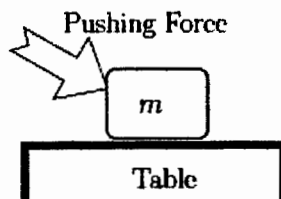
- (i) What range of masses can the hanging block have if the system is to be in static equilibrium? [10 marks]
  - (ii) What is the range of tensions that the string will have if the system is in static equilibrium. [10 marks]
- b. A certain car combines conventional diesel engine and an electric direct-current motor. The power delivered by the motor is  $32 \text{ kW}$ . If the resistance of the car's circuitry is  $\leftarrow$ , find the current drawn by the motor. [10 marks]

**QUESTION 3**

- a. A light bulb in a flashlight is labelled  $2.4 \text{ V}$ ,  $0.7 \text{ A}$ . Find the equivalent resistance and the current if three of these light bulbs are connected in parallel to a standard C size  $1.5 \text{ V}$  battery. [10 marks]
- b. What is the pressure at the bottom on the sea-bed  $18.0 \text{ m}$  below the surface? [5 marks]
- c. A stainless steel jar of  $0.15 \text{ kg}$  mass contains  $0.3 \text{ kg}$  of water at  $30^\circ\text{C}$ ,  $0.05 \text{ kg}$  of ice is used to quickly cool the water for drinking. Assuming the specific heat capacity of steel and water is  $500 \text{ J/kg}^\circ\text{C}$  and  $4200 \text{ J/kg}^\circ\text{C}$ , respectively, and given that the latent heat of fusion for ice is  $320000 \text{ J/kg}$ , calculate the final temperature of the water when it is due for drinking. [15 marks]

**QUESTION 4**

- a. Consider a block (initially at rest) of mass  $5 \text{ kg}$  on a table top. Assume that the surface is frictionless. Let a pushing force of  $50 \text{ N}$  directed at an angle of  $30^\circ$  below the horizontal act on the block.



- (i) Find the acceleration of the block. **[10 marks]**
- (ii) Find the (normal) force that the table exerts on the block. **[5 marks]**
- b. A group of students need to cross a river in the shortest time. The water in the river flows downstream at a speed of 10 m/s. The boat has a maximum speed of 20 m/s. In what direction should the students head the boat? **[15 marks]**