

19 NOVEMBER 2008

UNIVERSITY OF KWAZULU-NATAL

EXAMINATIONS: NOVEMBER 2008

**PGCE/B.Ed.: TECHNOLOGY LEARNING AREA STUDIES:
EDTE604P2/EDTE404P2**

PAPER: P2

DURATION: 3 HOURS

TOTAL MARKS: 200

Internal Examiners: Mr JR Mackay

External Examiner: Mr R Holmes

STUDENTS ARE REQUESTED, IN THEIR OWN INTERESTS, TO WRITE LEGIBLY.

PLEASE NOTE: THIS QUESTION PAPER CONSISTS OF TWENTY-FOUR (24) PAGES. PLEASE SEE THAT YOU HAVE ALL THE PAGES.

INSTRUCTIONS: There are **SEVEN** sections in this exam paper.
Answer **ALL** questions in **ALL** sections.
Answer **ALL** sections **on the question paper**.
(If necessary, use the back of the page and make a note accordingly.)
You may use a calculator.
Grey or coloured pencils may be used for all drawings but
please use a pen for all written text.

STUDENT NUMBER:

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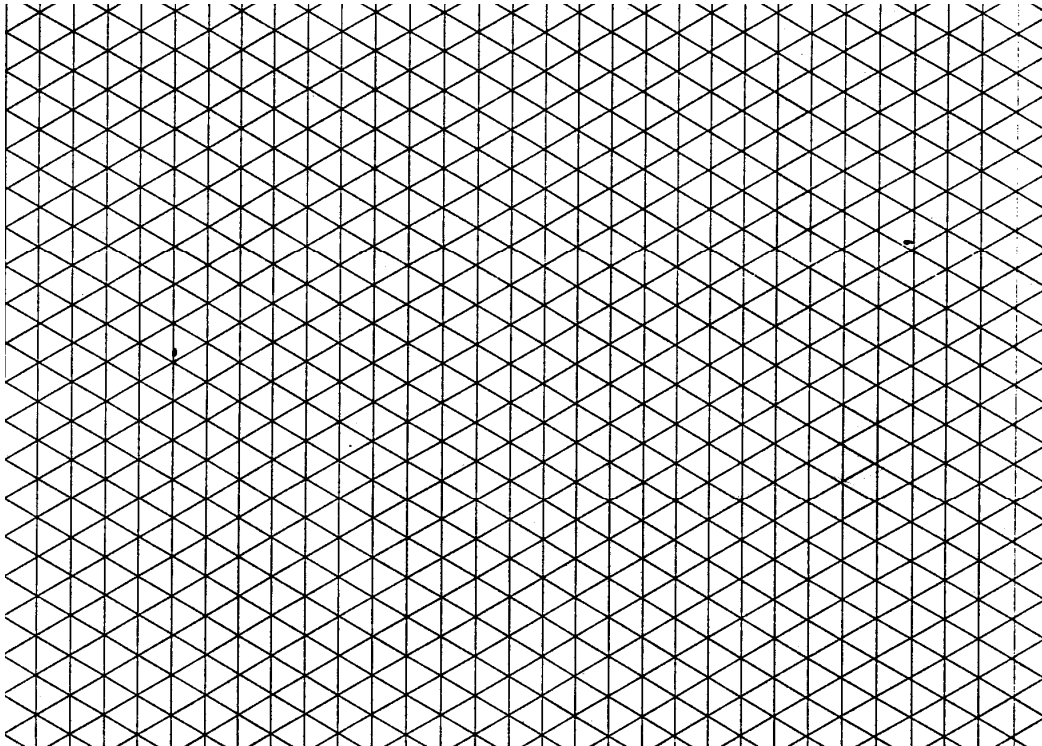
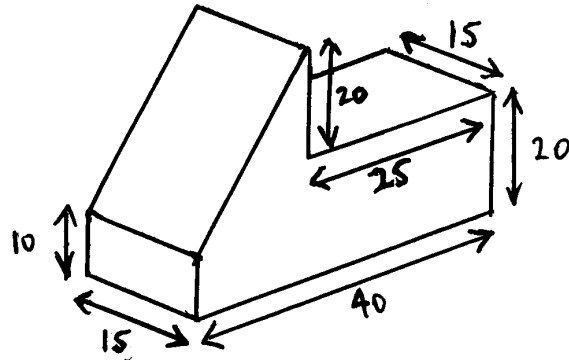
SECTION 1 – Graphical Communication [10 marks]

Question 1.1 [7 marks]

Draw (**accurately**) a development (net) for a rectangular box with the following dimensions: 50 mm x 40 mm x 60 mm. The box should have opening lids on both 50 mm x 40 mm ends. You should also show whatever glue flaps, side flaps and lid flaps are necessary.

Question 1.2 [3 marks]

The sketch shown below has been drawn neither accurately nor to scale. On the isometric grid provided, draw an **accurate isometric** projection of the sketch, using the dimensions labelled on the sketch (in millimetres).



SECTION 2 – Structures and Materials [25 marks]

Question 2.1 [4 marks]

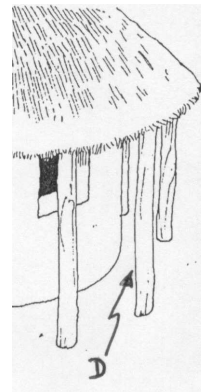
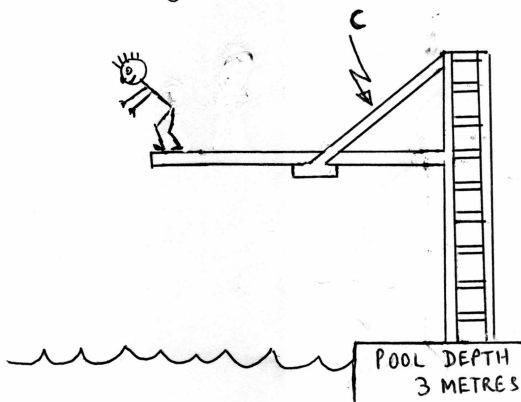
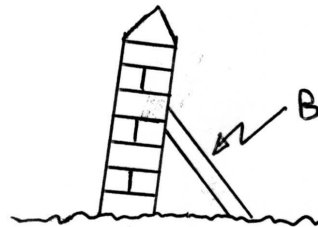
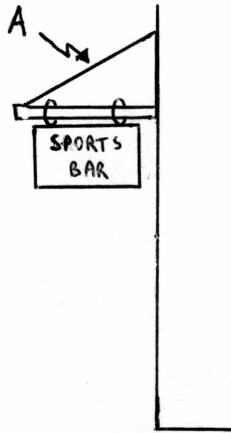
Explain the difference between a static force and a dynamic force. Use appropriate examples to illustrate your explanation.

Question 2.2 [4 marks]

In destruction testing, one applies forces to a structure until it either **breaks** or **buckles**. Explain the difference between these two terms. Use appropriate examples to illustrate your explanation.

Question 2.3 [4 marks]

Classify each of the structural members shown below (labelled A, B, C and D) as a tie, strut or guy and, in **each** case, **briefly** explain your reasoning.



A –

B –

C –

D –

Question 2.4 [5 marks]

2.4.1 What does it mean if a structure is said to be “stable”? (1)

2.4.2 State **one** way of making a structure more stable and describe a classroom activity that would illustrate this method to a learner. (4)

Question 2.5 [3 marks]

State the **type of strength** exhibited by:

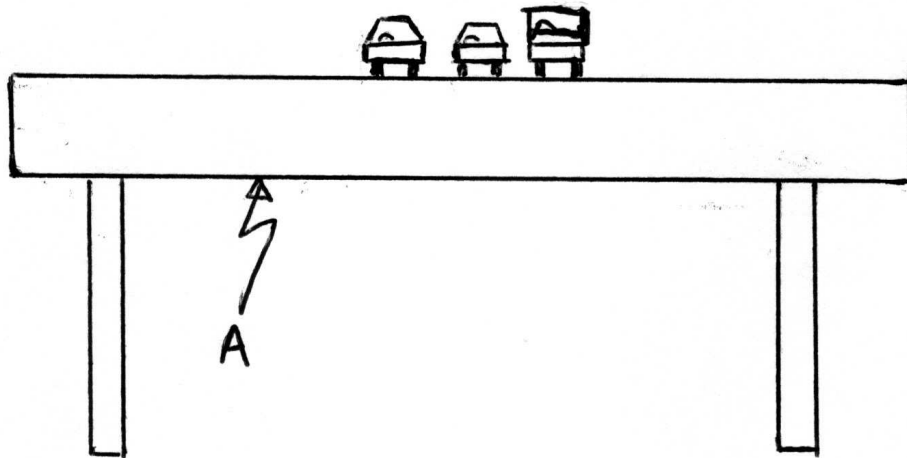
2.5.1 a metal cable holding up a telephone pole. (1)

2.5.2 a lintel above a doorway. (1)

2.5.3 the legs of a chair on which you are sitting. (1)

Question 2.6 [5 marks]

- 2.6.1 A concrete beam is shown below (labelled A), supporting a load. If you wanted to reinforce this beam using steel rods, draw **on the diagram below** where the reinforcing rods should be located. (1)



- 2.6.2 Explain why you chose this location for the reinforcing rods in 2.6.1. (4)

SECTION 3 – Systems and control (mechanical systems) [50 marks]

Question 3.1 [3 marks]

Explain what is meant by “input”, “process” and “output” in a mechanical system.
Use a common mechanical system to illustrate your point.

Question 3.2 [5 marks]

3.2.1 Describe how the Egyptians made the transportation of heavy blocks easier,
before the invention of the wheel. (2)

3.2.2 Describe a classroom activity (including the materials you would use) that
would illustrate to learners how this method makes transportation of logs
easier. (3)

Question 3.3 [3 marks]

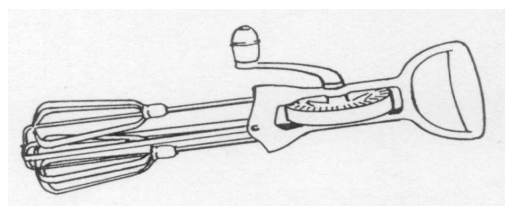
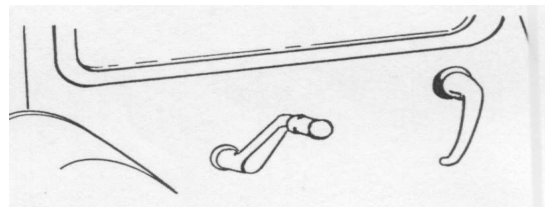
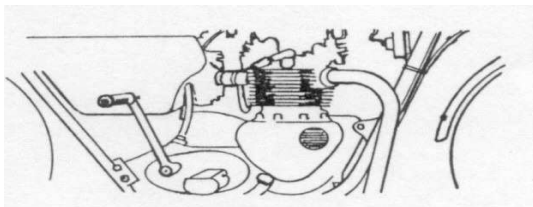
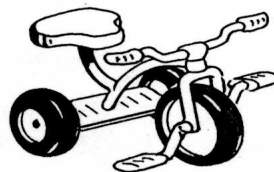
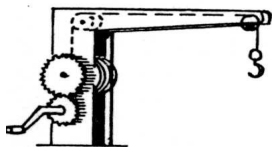
3.3.1 State which class of lever **always** gives a mechanical advantage. (1)

3.3.2 Briefly explain **why** the class of lever you chose in 3.3.1 **always** gives a mechanical advantage.

(2)

Question 3.4 [3 marks]

Indicate (using a circle) one example of a crank in **each** of the drawings below.



Question 3.5 [8 marks]

Write down brief instructions you would give to learners to **make a simple** pulley, **and to demonstrate** that, for a simple pulley, *Effort=Load*. If necessary, use a labelled sketch to illustrate your instructions. In your instructions, **also include** a list of **materials** and **tools** that learners would require for this task.

Question 3.6 [3 marks]

In belt-drive pulley systems, one of the biggest problems is slippage of the belt. State three solutions to this problem.

Question 3.7 [4 marks]

3.7.1 Sketch a **gear** system that changes rotational motion into linear motion. (2)

3.7.2 State the name of the gear system shown in 3.7.1. (1)

3.7.3 State a common application of the system shown in 3.7.1. (1)

Question 3.8 [4 marks]

You are using a lever to lift a load. The distance from you to the fulcrum is 2 metres while the distance from the load to the fulcrum is 0.25 metre.

2.1.1 To lift a load of 1600 N, calculate the force you would have to exert.

(3)

2.1.2 If the maximum distance your hand can travel is 2 metres, calculate the maximum distance you can lift the load.

(1)

Question 3.9 [5 marks]

You want to move your new tumble drier (which has a weight of 3000 N) into your 5th floor flat (15 metres above ground level). The block of flats has no lift but you have a balcony with a place to install a pulley. You are capable of exerting a force of 500 N.

- 2.2.1 Calculate the size of the compound pulley (i.e. the number of falls) you would have to buy.

(2)

- 2.2.2 For the pulley you chose in 2.2.1, calculate the length of rope that you will have to pull through your hands (if you were standing at a fixed point) in order to lift the tumble drier on to your balcony.

(3)

Question 3.10 [4 marks]

On a belt-pulley system, a drive pulley spins at 100 rpm. The driven pulley, which has a diameter of 6 cm, spins at 200 rpm. Calculate the diameter of the drive pulley.

Question 3.11 [4 marks]

You have a drive gear with 60 teeth attached to an axle that turns at 1000 rpm. You wish to use this to turn another axle at 4000 rpm. Calculate the number of teeth on the driven gear.

Question 3.12 [4 marks]

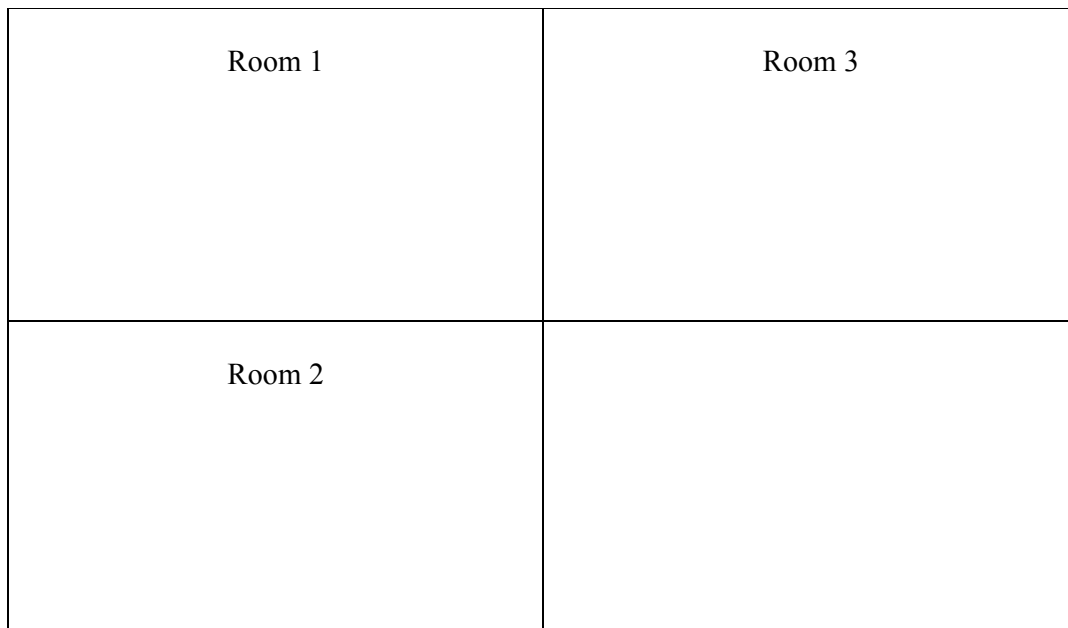
Describe a classroom activity that could be used to demonstrate mechanical advantage in a hydraulic system to learners.

SECTION 4 – Systems and control (electrical systems) [50 marks]

Question 4.1 [21 marks]

A three roomed house needs to be electrified in such a way that each room has a light hanging from the ceiling with a switch on the wall. Two of the rooms need to have fans and the two fans need to be controlled separately. There must be a main switch that controls the whole circuit. In addition, the lights need to have their own control and the fans need to have their own control switch.

- a) Draw a circuit diagram that could be used to electrify the house.
- b) The diagram below shows a three roomed house. Draw a wiring diagram for the house, showing the positions of the lights, the fans and all the switched, including the power supply.

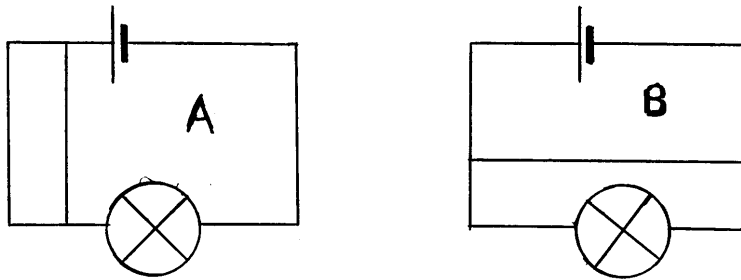


Question 4.2 [3 marks]

Name **three** types of energy into which electrical energy can be converted. For **each** type of energy, give an **example** of a common application of this conversion.

Question 4.3 [2 marks]

Two circuits are shown below (labelled A and B).



State in which of these circuits the cell would go “flat” in the shortest time. **Explain** your answer.

Question 4.4 [4 marks]

4.6.1 Using standard electrical symbols, sketch a circuit that could be used by learners to test whether various materials were electrical conductors or insulators.

(2)

4.6.2 Explain how learners would use the circuit in 4.6.1 to test whether a particular material were an electrical conductor or an insulator.

(2)

Question 4.5 [6 marks]

Design a circuit that will control a motor in such a way that the direction of rotation can be changed, the speed of rotation can be increased or decreased and the motor can be switched on and off.

Question 4.6 [6 marks]

You are given three resistors. When you hold them horizontally in your hand, the colours you see from left to right are as follows:

Resistor A: Yellow-purple-yellow-gold

Resistor B: Green-blue-black-gold

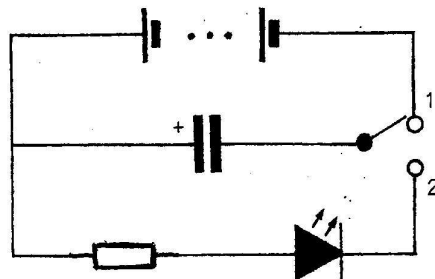
Resistor C: Gold-brown-red-red

Use the table below to ascertain the value of each of these resistors.

Colour	Figure value	
Black	0	A -
Brown	1	
Red	2	
Orange	3	B -
Yellow	4	
Green	5	
Blue	6	C -
Purple	7	
Grey	8	
White	9	

Question 4.7 [4 marks]

Consider the circuit shown below.



4.10.1 Describe what happens when the SPDT switch is moved from position 1 to position 2. (2)

4.10.2 Suggest two changes that could be made to the circuit to increase the duration (i.e. length of time) of the event you described in 4.10.1. (2)

Question 4.8 [4 marks]

Draw the symbols for the following electronic components and give one use of each.

a) LDR

b) Transistor

SECTION 5 – Processing [25 marks]

Question 5.1 [5 marks]

Describe the steps you would take to make either jam or decorative candles

Question 5.2 [4 marks]

List four tests one could perform when comparing different fibres/fabrics.

Question 5.3 [4 marks]

Sketch a pattern (not to scale) for a rectangular pencil case to be made from a fabric.
The pencil case should have left/right and front/back symmetry.

Question 5.4 [2 marks]

Name two types of fastener that can be used on textile products.

Question 5.5 [10 marks]

Describe with the aid of a flow diagram the industrial process for the manufacture of either paper or bread.

SECTION 6 – Technology and the technology learning area

[25 marks]

Write a short essay (1½ -2 pages) in which you discuss the challenges facing Technology educators in the classroom, and suggest how these challenges can be overcome.

SECTION 7 – Technology, society and the environment [15 marks]

Learning Outcome 3 for the Technology Learning Area is sub-divided into three categories: Indigenous Technology and Culture; Impact of Technology; and Bias in Technology. Choose **one** of these categories and describe (in about 1 page) how you would integrate it into Technology lessons.