

ENGINEERING SCIENCE 2
5155

SOUTH WEST REGIONAL MOCK EXAMINATION
TECHNICAL AND VOCATIONAL EDUCATION EXAMINATION

THE TEACHERS' RESOURCE UNIT (TRU)
Cellule d'appui à l'action Pédagogique

IN COLLABORATION WITH
En collaboration avec

THE REGIONAL INSPECTORATE OF PEDAGOGY AND
THE SUBJECT TEACHERS' ASSOCIATIONS (STA)

AFTERNOON 24 MARCH 2026

INTERMEDIATE LEVEL

Specialty Name and Acronym	All Specialties
Subject Title	ENGINEERING SCIENCE
Subject Code No.	5155
Paper No.	2

Mobile phones are NOT allowed in the examination room.

Duration: Two and a Half Hours

INSTRUCTIONS TO CANDIDATES

Paper two carries 60 % of the total mark.

Attempt ANY six questions.

You are reminded of the necessity for good English and orderly presentation in your answer.

All rough work should be done in your answer booklet.

You are allowed to use drawing instruments and scientific electronic calculators.

Where necessary take acceleration due to gravity, $g = 10 \text{ m s}^{-2}$.

Turn Over

1. a) A car of mass 1000 kg travels round a circular track of radius 100 m at a speed of 10 m/s.

i) State the name of the force that keeps the car in circular track.

(1 mark)

Calculate:

ii) The acceleration of the car.

(2 marks)

iii) The size of the force needed to cause the acceleration.

(2 marks)

iv) Give a reason why when roads are wet, cars sometimes slide out of the road when moving round a bend.

(1 mark)

v) What modification could be made on the road to prevent the car from sliding out of the road.

(1 mark)

b) i) Define Density?

(1 mark)

ii) A measuring cylinder contains 60 cm^3 of water. A metal block of mass 163.8 g is completely immersed in the water and the reading on the cylinder is found to increase to 81 cm^3 . Calculate the density of the block.

(3 marks)

c) Keldy and Meldy sit on opposite sides of a see saw of negligible weight and it balances horizontally. If Meldy weighs 400N and sits 2.7 m away from the pivot as shown in Figure 1 below.

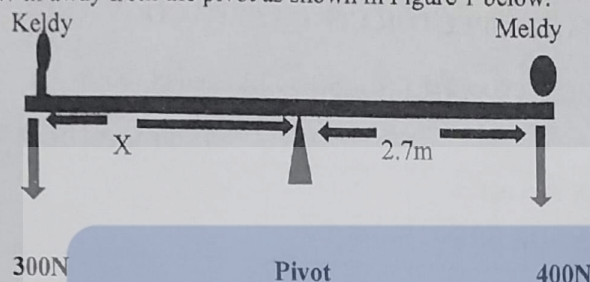


Figure 1

i) State the principle of moments.

(2 marks)

ii) Calculate the distance X.

(2 marks)

2. a) State ohm's law.

(2 marks)

b) Figure 2 shows a network of 3 resistors connected to a battery of E. m. f. 28 V

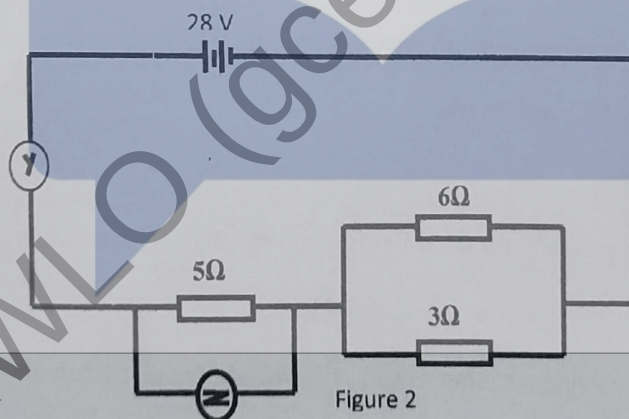


Figure 2

i) Name the meters labeled Y and Z.

(2 marks)

ii) What property of Meter Y enables it to be connected as shown?

(1 mark)

Calculate:

iii) The total resistance in the circuit.

(3 marks)

iv) The reading of meter Y.

(2 marks)

v) The reading of meter Z

(2 marks)

c) Figure 3 is an example of a logic gate.

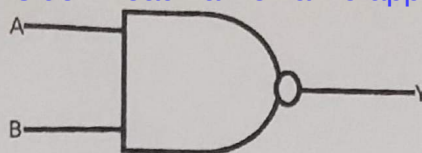


Figure 3

- i) Name the logic gate.
- ii) Draw the truth table.

(1 mark)

(2 marks)

3. a) Define Elastic limit?

(2 marks)

b) A spring of length 2.1 m obeys Hooke's law when a force of 60 N is applied on it. Suppose the extension of the spring is 0.1 m.

i) State Hooke's law.

(2 marks)

ii) Calculate the extension when a force of 100 N is now applied.

(2 marks)

iii) Determine the new length.

(2 marks)

iv) Sketch a force – extension graph of the spring, indicating the elastic limit.

(3 marks)

c) State 2 reasons why plastics are used in constructing water pipes?

(2 marks)

d) State with a reason which of the following metals: Aluminum, Gold and iron is used for making Jewelleries.

(2marks)

4. a) An element is represented as: $^{19}_{9}X$

i) Name the element.

(1 mark)

ii) Write the electronic configuration.

(2 marks)

iii) Determine the number of neutrons.

(2 marks)

b) Consider the compound C_2H_4 and C_2H_6

i) State the name of the compounds.

(2 marks)

ii) To which homologous series does each of the compounds belong?

(2 marks)

iii) Calculate the molecular mass of the compounds. (R.A.M: C=12, H=1)

(4 marks)

c) i) What are isotopes.

(1 mark)

ii) Give an example of an element within the first 20 elements of the periodic table that exhibits the isotope nature.

(1 mark)

5. a) State the precautions needed in an industry to protect:

i) The head

ii) The feet

iii) The eyes.

(3 marks)

b) i) Define work

(1 mark)

A girl of mass 40 kg runs up a flight of stairs to the second floor of a building which is located 12 m above the ground floor in 7s. Calculate:

ii) The work done by the girl to reach the second floor. (Use $g = 10 \text{ m/s}^2$)

(3 marks)

iii) The power of the girl.

(2 marks)

c) Figure 4 shows a simple pulley system used to raise a load of 500 N unto a storey building by applying a force of 200 N.

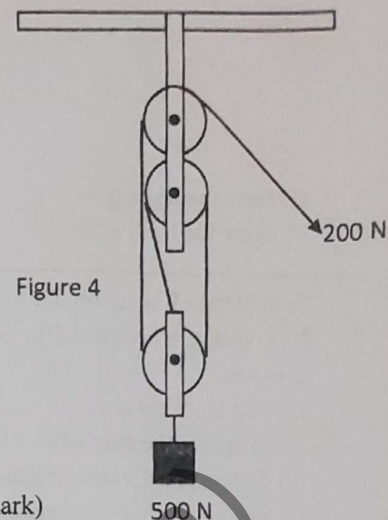
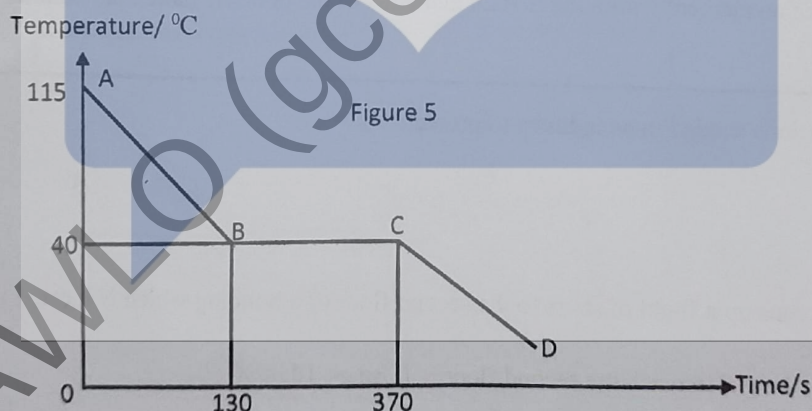


Figure 4

- i) What is the velocity ratio of the pulley system. (1 mark)
- ii) Calculate the mechanical advantage of the pulley system. (2 marks)
- iii) Determine the efficiency of the pulley system. (2 marks)
- iv) Name one other example of a simple machine that can be used to lift a load. (1 mark)

6. a) i) State 3 ways through which a hot body can lose heat to the environment. (3 marks)
- ii) A metal rod is held in the hand. The other end is put into fire. State and explain how heat travels from the fire to the hand. (2 marks)
- b) Figure 5 shows the cooling curve of a 0.8 kg of a gaseous substance at 115°C losing heat at a constant rate.
 - i) In what state is the substance at each of the regions AB and CD of the cooling curve? (2 marks)
 - ii) Explain why the temperature along BC is constant even though heat is applied? (2 marks)
 - iii) If the substance is losing heat energy at the rate of 600 J/s , determine the heat of vaporization of the substance. (2 marks)
- c) What is the range of a clinical thermometer? (1 mark)
- d) i) What is Pollution? (1 mark)
- ii) State 2 causes of pollution. (2 marks)



7. a) State Snell's laws of refraction. (2 marks)
- b) A convex lens of focal length 30 cm is used to form a real image on a screen 90 cm from the lens. Calculate:
 - i) The object distance. (2 marks)
 - ii) Draw a diagram to show how the image is formed. (3 marks)
- c) i) State Faraday's laws of electromagnetic induction. (1 mark)

A transformer is constructed with a primary coil of 400 turns and a secondary coil of 200 turns.

- ii) If the primary coil is connected to 240 V a. c mains, determine the secondary voltage. (2 marks)

- iii Calculate the efficiency of the transformer if the primary current is 3 A and the secondary current is 5 A. (3 marks)
- d) Differentiate between a P-type and N-type semi-conductor. (2 marks)

8. a)

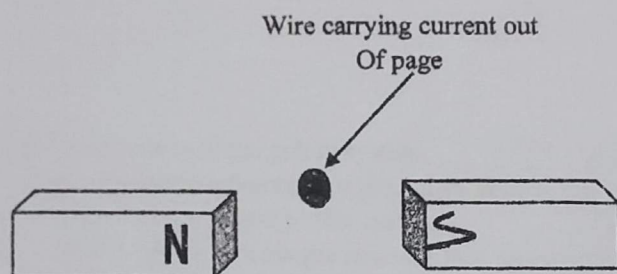


Figure 6

A straight wire carrying current is placed in between the poles of a magnet as shown in Figure 6.

- Copy Figure 6 without the wire and draw the magnetic field pattern produced by the magnets. (2 marks)
 - Draw the field pattern for wire alone carrying current out of the page. (1 mark)
 - Copy the diagram and draw the combined field pattern, indicating the direction of the magnetic force. (3 marks)
- b) A ship sonar sends down a sound of frequency 6000 Hz into water in a sea, at a point which is 1000 m deep. The echo is heard 4 s later.
- Which wave phenomenon is responsible for echoes? (1 mark)
 - Calculate the speed of sound in water. (3 marks)
 - State a factor which affects the speed of sound in Water. (1 mark)
- c) i) Define Global warming? (1 Mark)
- State one factor that causes global warming. (1 mark)
 - What are Non-biodegradable substances? (1 mark)
 - State one example of Non-biodegradable substances. (1 mark)

END