Student's Assessment Number.....

THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

FORM TWO NATIONAL ASSESSMENT

035 ENGINEERING SCIENCE

Time: 2:30 Hours **Year: 2023**

Instructions

1. This paper consists of sections **A, B** and **C** with a total of **ten (10)** questions**.**
2. Answer **all** questions.
3. Section **A** and **C** carry **fifteen (15)** marks each, section **B** carries **seventy (70)** marks.
4. Cellular phones and any unathorized materials are **not** allowed in the assessmenmt room.
5. Write your **Assessment Number** at the top right hand corner of every page.

FOR ASSESSOR'S USE ONLY		
QUESTION NUMBER	**SCORE**	**ASSESSOR'S INITIALS**
1		
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CHECKER'S INITIALS		

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SECTION A (15 MARKS)

Answer **all** questions in this section

1. Choose the correct answer from the given alternatives and write its letter in the box provided.

   i) An electrician wanted to minimize diameter of a wire to a accuracy of 0.01cm. which measuring instrument should be used?

   A. Micrometer crew gauge
   C. Tape measure
   B. Vernier caliper
   D. Engineers caliper

   ii) How can you minimize the friction that leads to unnecessary heat, noise and wear?

   A. By reducing the speed of rubbing surface in contact
   B. By increasing the areas of the rubbing surface in contact
   C. By lubricanting the rubbing surface in contact with grease and oil
   D. By replacing the rubbing surfaces parts with parts of graphite materials

   iii) A form two teacher demostrated practically the upthrust acting on a body and the weight of a liquid it displaces.Which laws was demostrated by the teacher?

   A. The law of buoyancy
   B. The law of floatation
   C. The law of sinking
   D. The law of submerged

   iv) Magesa released an apple of a mass m (kg) to fall freely from a height of h (m).What will be the velocity of an apple just beffore hitting the ground?

   A. mgh
   C. $2gh$
   B. $\frac{2mg}{h}$
   D. $\sqrt{\frac{mg}{h}}$

v) A motor vehicle mechanic set a small troll in motion on a horizontal surface by a force (F) Newtons. He pulled it by ameans of a rope inclined at 30^0 to the horizontal. How would you represent the horizontal force due to force F?

A. $F\ x\ Cos\ 30^0\ N$ C. $F\ x\ Cos\ 60^0\ N$

B. $F\ x\ Sin\ 30^0\ N$ D. $F\ x\ Sin\ 60^0\ N$

vi) Form two students visited a school workshop to learn torque of forces. One of them was assigned to untighten a wheel nut. The student failed to untighten a nut until the teacher gave him a circular pipe. What was the circular pipe for?

A. To increase force

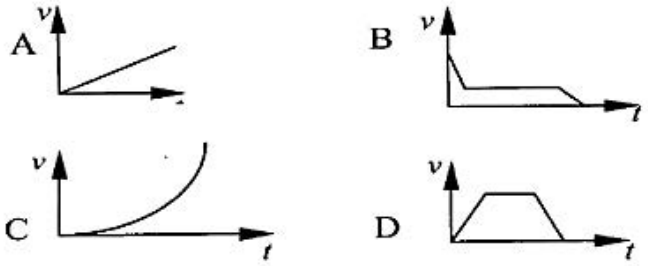
B. To reduce the torque

C. To reduce force

D. To increase the torque

vii) In a racing car competition, a speedo meter of one racing car reads the following values of velocity „v" in time „t" as indicated in the table below:

t(s)	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
v(m/s)	0	12	26	36	48	60	60	60	60	60	50	40	30	20	10	0



Suggest the velocity time graph for the motion of the car.

viii) A person left his car on a full sunlight in a parking lot and went shopping. He came back and found out that the pressure of air inside a car tire is increased. What caused a change of the tyre pressure?

A. Size of air molecules

B. Number of air molecules

C. Speed of air molecules

D. Mass of air molecules

ix) A man uses a hydraulic press to lift a container. If the hydraulic press is frictionless, what will be the mechanical advantage of the press?

A. Greater than velocity ration

B. Equal to velocity

C. Small than velocity ration

D. Twice than velocity ration

x) A student was studying the properties of image formedin a pinhole camera. When he places a candle several centimeters from the hole of the camera, a verry small image was produced on the screen ot the camera. Suggest the adjustment that can be made on the camera or box to produce a magnified image on the screen.

A. To move the candle away from the pin hole

B. To move the box away from the candle

C. To move the box closer to the handle

D. To move the hole larger than the pin hole

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2. Match the electrical parameters in list A with their corresponding components in list B by writting the letter correct response beside the number in the table provided.

LIST A	**LIST B**
i) It allows electric current to pass through human body and metals. ii) It prevents serious electrical shocks iii) It prevents the quantity of electricity. iv) It is a pontential difference between two points. v) It prevents over loading of electric circuit.	A. An electric lamp B. Conductors C. Coulomb D. Earth rod E. Electric current F. Fuse G. Ressistance

List A	(i)	(ii)	(iii)	(iv)	(v)
List B					

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SECTION B (70 MARKS)

Answer **all** questions from this section

3. A uniform beam 4m long, is simply supported at two points A and B. Points A is 0.5m from left-hands ends and the point B is 1.5m from the right_hand end. The beam carries load of 600N at the lefts end, 800N at its centre and 400N at the right end. Determine the magnitude of the suppotr reactions at A and B.

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4. In a sugar indusrty the copper tubes of the boiler are 4.2m long at a temperature of

20^0C. Determine the length of the tube when:

(a) Surrounded only by feed water at 10^0C.

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(b) The boiler is operating and the mean temperature of the tubes rises to 320^0C. Assume the coefficient of linear of expansion of copper to be $17x10^{-6}$K.

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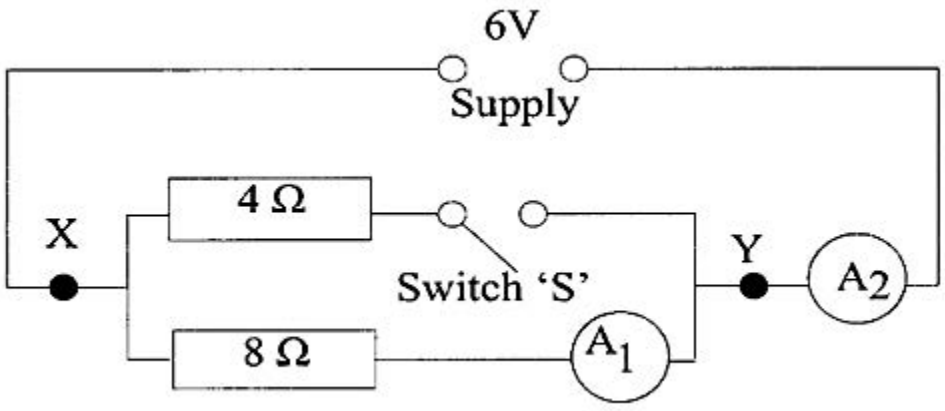
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5. Study careful the Figure given and answer the questions that follow:



(a) When switch „S" is closed, will the current flowing through A_1 be less or

greater than the current flowing through A_2?

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(b) When the switch "S" is opened, why is the current flowing through A_2 is smaller than when the switch is closed?

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(c) Why when the switch "S" is open, the current flowing through ammeter A_1 and A_2 is the same?

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(c) Calculate the equivalent ressistance between point **X** and **Y** is closed.

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6. (a) Why is reccommended to use a spanner of longer stem to loosen a nut on a bolt?

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(b) The lighting gear on a vehicle body is situated 3m from the pivot. If the body contains two loads of 15kN and 7.5 Kn whose centres of gravity are 0.8m and 2m required from the gear to raise the body.

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7. A simple machine raises a load of 120 kg through a distance of 1.2m. The effort applied in the machine is 150N and it moves through a distance of 12m. Determine:
    a) The mechanical advantage.
    b) Velocity ratio.
    c) The efficiency of the machine.
8. A students performed an experiment to measure the density of a solid with an irregular shape by means of measuring cylinder and recorded the results as follows:

    Mass of an irregular solid, m=178g.

    Initial volume of water in the measuring cylinder, V_1=80cm.

    Final volume of water in the measuring cylinder, V_2=80cm.

(a) Draw a net sketch diagram to show the levels of water in the measuring

cylinder:

(i) Before the solid is immersed.

(ii) After the solid is immersed.

(b) Formulate an equation to find the difference in volume V_3 in terms of V_1 and V_2.

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(c) Use the equation you have formed in (b) to find the volume of the irregular

solid.

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(d) Determine the density of the irregular solid.

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9. Two poles were used to support one point of the tent. The forces of the two poles with their angle of inclination to the point of action are 5N at 25^0 and 8N at 112^0 respectively. Determine the resultant force by resolving these forces into horizontal and vertical components.

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SECTION C (15 MARKS)

Answer **all** questions from this section

10. The bus started for rest and in 30 seconds reached a speed of 20m/s. The speed remained steady for 15 second and decrease steadily until the bus stopped in 5 second later.

    (a) Draw a velocity time graph.

    (b) Use the diagram in (a) to calculate;

        (i) The distance covered from start to end of the journey.

        (ii) The acceleration during the motion

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