

Candidate's Examination Number.....

SMZ

ZANZIBAR EXAMINATIONS COUNCIL

FORM THREE ENTRANCE EXAMINATION

054

ENGINEERING SCIENCE

TIME 2:30 HOURS

THURSDAY 30TH NOVEMBER, 2017 am

INSTRUCTIONS TO CANDIDATES

1. This paper consists of sections A, B and C.
2. Answer **ALL** questions in sections A and B and any three (3) questions in section C.
3. All answers must be written in the space provided.
4. Write your examination number on every page of this booklet.
5. Calculators and cellular phones are not allowed in the examination room.
6. Use blue or black pen in writing. The diagrams must be drawn in a pencil

FOR EXAMINER'S USE ONLY					
QUESTION NUMBER	MARKS	SIGNATURE	QUESTION NUMBER	MARKS	SIGNATURE
1			9		
2			10		
3			11		
4			12		
5			13		
6			14		
7			15		
8					
TOTAL					

This paper consists of 18 printed pages.

SECTION A:(10 Marks)
Answer all question in this section

1. Choose the letter of the correct answer and write it below the item number in the table below

i) A radian is the

- | | |
|---|------------|
| A: Angular displacement | B: Degrees |
| C: Angle subtended at the centre by an arc length | |
| D: Ratio of circumference to the radius. | |
| E: Angular distance | |

ii) Which of the units below could be used for kinetic energy?

- | | |
|----------------------|------------------------------|
| A: Joules per second | B: kilogram |
| C: Newton | D: Kilogram meter per second |
| E: Newton x meter. | |

iii) When a car moves around a circular path at constant speed, which of its motion properties is constant throughout?

- | | | |
|-----------------|--------------------|-----------------|
| A: Displacement | B: Velocity | C: Acceleration |
| D: momentum | E: kinetic energy. | |

iv) In a machine the efficiency is less than 100% in practice. This is because

- A: The velocity ratio is greater than mechanical advantage
- B: Mechanical advantage is greater than 1
- C: Velocity ratio depend on friction
- D: Efficiency does not depend on velocity ratio.
- E: The efficiency does not depend on the mechanical advantage.

v) The S.I unit of momentum is

- | | | |
|----------|-----------------------|-------|
| A: Ns | B: kgms ⁻¹ | |
| C: kg/ms | D: Js. | E: kg |

vi) Potential energy and kinetic energy are similar in that

- A: Both produce heat
- B: Both are measured in watts
- C: one is a substitute of the other
- D: Both are forms of mechanical energy.
- E: Both are depending on height.

vii) The area under speed against time graph represents

- A: Displacement
- B: Velocity
- C: Distance
- D: Acceleration.
- E: Retardation

viii) The incorrect statement about force is that

- A: force is a vector quantity
- B: force is a function of mass and acceleration
- C: Force is the rate of change of momentum
- D: force has momentum.
- E: The SI unit is Newton.

xi) The S.I unit of power is

- A: Joule.
- B: Horse power.
- C: Joule second.
- D: Watt.
- E: Coulomb

x) Which of the following three quantities are vectors?

- A: force, work, energy.
- B: Weight, work and power
- C: Velocity, Acceleration and power.
- D: Displacement, velocity and momentum.
- E: Density, distance and velocity

Item number	i	ii	iii	iv	v	vi	vii	viii	ix	x

SECTION B: (30 Marks)

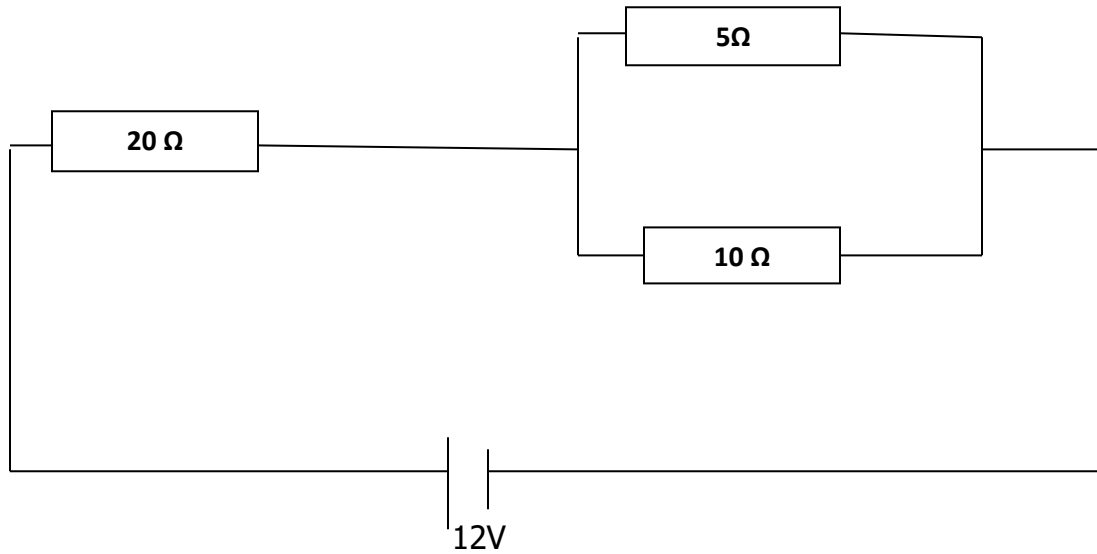
Answer ALL questions in this section.

2: a) State the second Newton's law of motion.

b) Name any three (3) fundamental quantities with their respective units.

3: How much power is present when a force of 500 N is applied to an object with a mass of 100 kg that is moving at 6 m/s?

4: Study the circuit diagram below and then



Calculate

i) Total resistance (in ohm)

ii) Current through each resistor.

[illegible]

5: a) Define the term angular acceleration.

b) Write down the formula that can be used to calculate an angular acceleration.

6: Give three (3) differences between mass and weight of an object.

7: a) List down any four (4) effects of force.

b) When an object is total immersed in water, its weight is recorded as 3.1N. If its weight in air is 4.9N, calculate the upthrust acting on this object.

8: a) Distinguish between a moment and momentum.

b) A saloon car of mass 1000kg is moving with a velocity of 60km per hour.

What is its momentum?

9: a) Define the term acceleration.

b) An object is initially moving at 15m/s to the right. Eight second later it is moving at 5m/s to the left. During those eight seconds, calculate the object's acceleration.

10: a) Define the term temperature.

b) Name any four (4) forms of energy.

11: a) State the Archimedes principle.

b) In which class of levers does the wheel barrow belong to?

SECTION C :(60 Marks)

Answer any three (3) questions.

12.

a) Give differences between velocity ratio and mechanical advantage.

b) If a block and tackle pulley system consists of three pulleys. What is its velocity ratio?

c) An effort of 150N is applied to a pulley system is able to lift a load of 750N through a vertical distance of 1.2m. If the effort moves a distance of 7.2m. Determine,

i) The mechanical advantage of the system.

ii) The efficiency of a machine.

13: a) Define the following terms,

i) . Angular displacement

ii) Angular velocity

b) The block is lifted from rest until the angular velocity of the drum is 16rad/s after 4s. What is its average angular acceleration?

c) A rope is wrapped many times around a drum of radius 20 cm.

i) What is the angular velocity of the drum if it lifts the bucket to 10m in 5s?

ii) What is the frequency of revolution of the drum?

14. a) State the Newton's third law of motion.

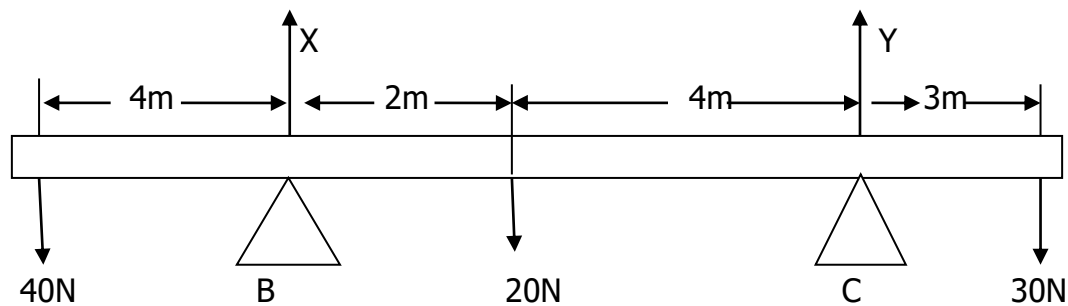
- b) A body move from rest and accelerated at the rate of 2m/s^2 for 3s.
It maintains the velocity reached for 280s. Draw a velocity time graph for the motion (on a graph paper)
- c) A car of mass 1000kg travelling at 36km/h is brought to rest over a distance of 20m. Find
- i) The average retardation.

- ii) The average braking force in Newton.

15. a) Write down the conditions for equilibrium when a body is acted upon by a number of parallel forces.

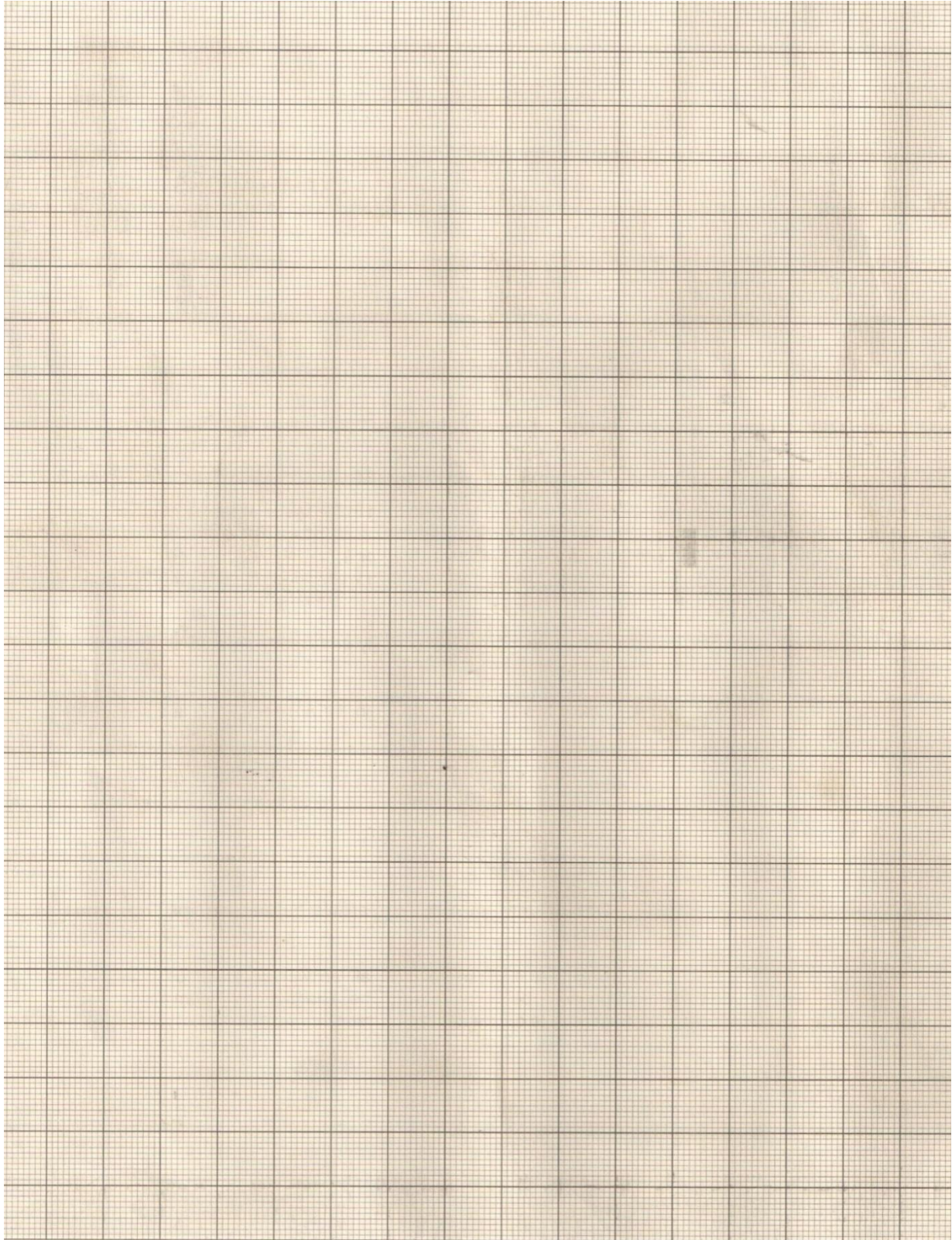
b) State the principle of moment.

c) A light beam with supports at B and C has loads of 40N, 20N and 30N placed as shown in the figure below. Calculate reactions X and Y.



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