PRESIDENT'S OFFICE

REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

FORM FOUR MIDTERM EXAMINATION

031 **PHYSICS**

Time: 3:00 Hours

Instructions

1. The paper consists of sections A, B and C with a total of eleven (11) questions
2. Answer All questions in section A and B and two (2) questions from section C
3. Communication devices and any unauthorized materials are not allowed in the examination room
4. Non-programmable calculators and mathematical tables may be used
5. Write your examination number on every page of your answer booklet(s)
6. Where necessary the following constants may be used:
   i. Acceleration due to gravity, g= 10m/s
   ii. Specific heat capacity of copper=390J/kg C-1
   iii. Pie ,π=3.14
   iv. The speed of sound in air=330m/s
   v. Linear expansivity of steel=11x10^{-6}/K)
   vi. Specific latent heat of fusion of ice=336J/K

SECTION A: (16 Marks)

1. For each of the items (i)-(x) choose the correct answer from the given alternatives and write its letter besides the item number in answer booklet provided. **(10 Marks)**
   i. Which one represents fundamental forces?
      A. Compressional, torsional, and frictional force
      B. Gravitational, torsional and frictional force
      C. Nuclear, gravitational and electromagnetic force
      D. Stretching, attraction and repulsion force
      E. Viscosity, frictional and restoring force
   ii. Why do scientists prefer sending the rocket to mars from the moon rather than from the earth?
      A. The gravitational attraction of the moon is large than the earth
      B. The moon is close to the mars
      C. The moon's shape is smooth compared to the earth
      D. The gravitational constant of the moon is less than that of the earth
      E. The moon is at higher position compared to the earth
   iii. The position of the Centre of gravity of an object has a significance influence in its;
      A. Elasticity
      B. Plasticity
      C. Stability
      D. Rigidity

E. Elastic limit

iv. Which process is involved in producing reverberation?
A. Refraction
B. Multiple reflection
C. Interference
D. Diffraction
E. Reflection

v. Which of the following is the correct weight of a body of mass 48g when placed on the moon's surface?
A. 0.480N
B. 4.8N
C. 0.080N
D. 0.048N
E. 80N

vi. When a car moves around a circular path at constant speed, which of its motion properties is constant throughout the journey.
A. Displacement
B. Velocity
C. Acceleration
D. Momentum
E. Kinetic energy

vii. A boy walks at a speed of 5m/s towards a plane mirror. The boy and his image in the mirror are moving;
A. Towards each other at a speed of 5m/s
B. Away from each other at a speed of 5m/s
C. Towards each other at a speed of 10m/s
D. Away from each other at a speed of 10m/s
E. Towards each other at a speed of 20m/s

viii. How much heat energy is given out by a copper block of 40g mass when it cools from 1840ºC to 40ºC?
A. 28008J
B. 2800J
C. 2808J
D. 288J
E. 28080J

ix. When charging a body by friction the particles transferred are:
A. Protons
B. Nuclei and protons
C. Nuclei
D. Electrons
E. Electrons and protons

x. A blue t-shirt absorbs all the colours of the white light falling on it except blue. In red light the blue t-shirt looks;
A. Red B. Blue C. Black D. White E. Blue-black

2. Match the items in list A with those in list B by writing the letter of the correct response besides the corresponding item number in the answer booklet;

List A	List B
i. The ratio of distance moved by effort to the distance moved by the load	A. Simple pulley
ii. The ratio of the load raised steadily by a machine when an effort or force is applied	B. Combination pulley
iii. A fixed wheel with a rope passing round a groove in the wheels circumference	C. Efficiency
iv. The ratio of work output to the work in put x 100%	D. Lever
v. Consists of a rigid bar that moves about a fixed point	E. Mechanical advantage
vi. A simple machine that can pull a heavy load along a sloping surfaces.	F. Single fixed pulley
	G. An inclined plane
	H. Velocity ratio

SECTION B (54 Marks)

Answer all questions in this section

3. (a) i. State the laws of reflection (02 marks)
   ii. State four characteristics of image formed by a plane mirror (02 marks)
   (b) A telescope of 5m diameter with a reflector of focal length 18.0m is used to focus the image of the sun. Using the distance of the sun from the earth as $1.5x10^{11}$m and diameter of the sun $1.4x10^{9}$m, calculate;
      i. The position of the image of the sun (2.5 marks)
      ii. Diameter of the image of the sun (2.5 marks)

4. (a) imagine that friction suddenly vanishes. How would life be affected? Four points (4 marks)
   (b) A tree trunk of length 44m is pivoted at 12m from one of its ends. It is balanced when a 1500N solid is hung 8m from the pivot. Calculate the weight of the tree trunk. (5 marks)

5. (a) Explain why is it so dangerous to throw a package while standing in a floating boat. (03 marks)
   (b) A block and tackle system of five pulleys is used to raise a load 500N steadily through a height of 20m. The work done against friction is then 2000J. Calculate the force required to operate this machine. (06 marks)

6. (a) A metal pipe which is 1m long at 40ºC increases in length by 0.3% when carry a steam at 100ºC. Find the coefficient of expansion of a metal. (05 marks)
   (b) How much heat is needed to change 340g of ice at 0ºC to water at 0ºC? (04 marks)

7. (a) i. Distinguish between longitudinal and transverse waves (02 Marks)
   ii. What is an echo? (02 marks)

   (b) A sound is set out from the ship and it's reflection from the floor of the ocean returns 0.4seconds later. Assuming that the velocity of sound in water is 1500m/s, how deep is the ocean? (05 marks)

8. (a) Regardless of a lot of sustainable energy we have in Tanzania still the government opt to construct Mwalimu Nyerere hydroelectric power plant as one of the sustainable energy sources. Give four (4) reasons for this option. (04 marks)

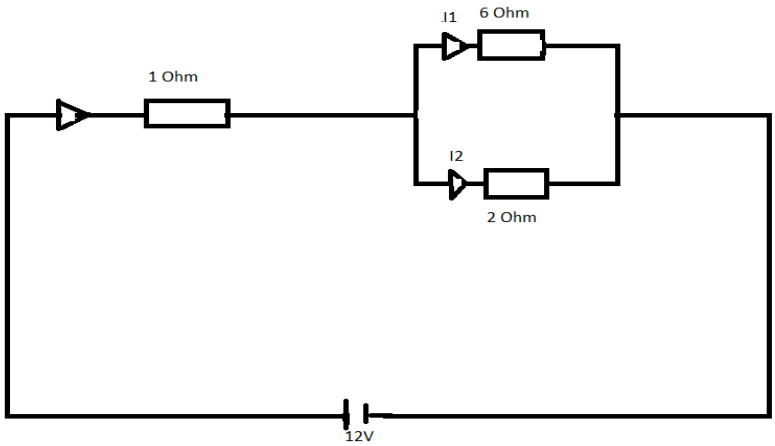
   (b) An increase in temperature to the environment has become a global problem. Analyze five (5) solutions for this problem. (05 marks)

SECTION C: (30 marks)

Answer only two (2) questions

9. (a) three capacitors with capacitances of 15μF,25μF and x are configured in a circuit such that the equivalent capacitance is 7μuF.
      i. Identify the type of arrangement of capacitors (1 mark)
      ii. Determine the capacitance of capacitor x (03 marks)

(b) Study the electrical circuit arrangement in figure below then answer the questions that follow;



i. Calculate the current flowing in each of the three resistors (03 marks)
ii. Find the potential difference across each resistors (03 marks)

(c) The following table shows some of the electrical appliances found at home

Appliances	Power rating
Bulb	250W
TV set	500W
Electrical heater	3KW
Electrical iron	2KW

Assuming that TANESCO charges electrical energy at a rate of Tsh 80/= per unit. Calculate the total cost of running these appliances if all are switched on a single day from 6:00pm to 11:00 pm (05 marks)

10. (a) what happens to a current carrying conductor when placed in a magnetic field? (03 marks)
(b) Sketch magnetic lines of force for current carrying solenoid (04 marks)
(c) A current of 0.6A is passed through a step up transformer with primary coil of 200 turns. Current of 0.1A is obtained in the secondary coil. Find the,
i. Number of secondary turns (04 marks)
ii. Secondary voltage if primary voltage is 240V mains (04 marks)

11. (a) Give reasons for the following
i. The fundamental frequency of a string may alter during the day (03 marks)
ii. Notes of the same pitch played on a violin and flute sound differently (02 marks)

(b) The frequency obtained from the plucked string is 400Hz when the tension is 2N, Calculate;
i. Frequency when the tension is increased four times (05 marks)
ii. Tension needed to produce a note of frequency 500Hz. (05 marks)