MURANG'A UNIVERSITY COLLEGE

(A constituent college of Jomo Kenyatta University of Agriculture and Technology)

SCHOOL OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATIONS 2015/2016 ACADEMIC YEAR
END OF SEMESTER EXAMINATIONS
EE 1108, PAS 019: PHYSICS

DATE: 15th DEC 2015 TIME 2HRS

SECTION A: ANSWER ALL QUESTIONS FROM THIS SECTION

Question 1

(a) Express the following areas in M^2 and give your answer in standard form

(1) 9000 cm^2 (11) 0.05cm^2 (2marks)

(b) The volume of mercury thread in a capillary tube is 1cm^3 .If the length of the mercury thread is 1m.Calculate the radius of the base of the capillary tube. (4marks)

(c) A block of glass of mass 187.5g is 5.0cm long, 2.0cm thick, and 7.5cm high. Calculate the density of the glass in kg/m^3 (4marks)

(d) A swimming pool appears 1.5m deep if the refractive index of water is 4/3.Calculate the real depth of the water in the pool. (3marks)

(e) Water at 20^0c falls over a waterfall of height 10.0mCalculate the rise in temperature of water at the bottom of the waterfall if 80% of the potential energy at the top of the waterfall is converted into heat energy at the bottom of the waterfall.(take specific heat capacity for water to be 4200j/kgc) (5marks)

(f) A metal sphere of mass 1kg is thrown against a wall with a velocity of 5ms^{-1} the sphere rebounds with a velocity of 1ms^{-1}.If the time of impact is 0.002s find the average force experienced by the sphere during the impact. (4marks)

(g) Dry steam is passed into a well lagged copper can of mass 250g contains 400g of water and 50g of ice at 0^0c.The mixture is well stirred and the steam supply cut off when the temperature of the can and its contents reaches 20^0c Neglecting heat losses find the mass of steam condensed. Specific heat for water and copper are 4.2and 0.4 j/gc Specific latent heat of vaporization of steam is

2260j/g and specific latent heat of fusion of ice is 336j/g
(4marks)

(h) Construct a ray diagram showing the arrangements of the lenses in a compound microscope (4marks)

SECTION B: ANSWER ANY TWO QUESTIONS FROM THIS SECTION.

Question 2

(a) Bronze is made by mixing molten copper and tin .If 100kg of the mixture contains 80% by mass copper and 20% by mass tin calculate the density of bronze.(density of copper is 8900kg/m^3 and density of tin is 7000kg/m^3) (6marks)

(b) (1) Define the term mechanical advantage (M.A) of a machine (1mark)

(11) A screw jack has a velocity ratio of 314 and an efficiency of 40%. An effort of 25N is exerted on the handle of the jack. Determine the maximum load that can be raised (3marks)

(iii) If the load is raised upwards at a constant speed of 0.2 ms^{-1} What is the power output of the jack (3marks)

(c) (i) A block of mass 20kg slides down a plane inclined at 30^0 with the horizontal. The co-efficient of friction between the plane and the block is 0.3 Calculate the frictional force between the two surfaces. (4marks)

(ii) Give three ways in which friction can be reduced. (3marks)

QUESTION 3

(a) A tube of mass 75g and cross-sectional area of 25cm^2 floats upright in a liquid of density 0.8g/cm^3.Determine the length of the tube submerged (4marks)

(b) A boy catches a cricket ball of mass 0.14kg which has a velocity of 20m/s calculate

(i) The momentum of the ball
(ii) The average force used by the boy's hands to stop the ball in
(a) 0.5 seconds
(b) 0.01seconds

(iii) Explain why stopping the ball in 0.01 seconds hurts the boy but stopping it in 0.5 seconds does not. (10marks)

(c) An object is placed in front of a converging lens of focal length 12cm. Find the nature , position and magnification of the image when the object distance is

(i) 16cm

(ii) 8cm (6marks)

QUESTION 4

(a) State the principle of moments (2marks)

(b) Two men are carrying a heavy ladder which weighs 1000N and is 3.2m long .One man hold it at the end while another man supports it at a point 0.8m from the other end Calculate the load supported by each man. (10marks)

(c) An electric motor rated 2.5kw is used to lift bales of hay to a store in a dairy farm . A single bale has a mass of 5kg.If the store is 4 meters above the ground how many bales can the motor raise in 2 minutes. (8marks)

Q5 (a) Define the following terms and state their SI units

(i)Specific heat capacity

(ii)Specific latent heat of fusion (4marks)

(b) Calculate the heat required to convert 5kg of ice at -20^0c into steam at 100^0c given

Specific heat capacity for water and ice are 4200 and 2100 j/kgc. Specific latent heat of fusion of ice is 340,000j/kg.And specific latent heat vaporization of water is 2.3×10^6j/kg (6marks)

(c) How much heat is needed to change the temperature of a steel tank which contains 800kg of water from 12^0c to 92^0c. The tank has a mass of 100kg .The specific heat capacity of steel is 0.5kj/kgc and the specific heat of water is 4.2 kj/kgc (5marks)

(d)Explain why people in cold places wear woolen black coats while in hot places they wear white clothes (5marks)