THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

DCC 09A, DBC 09A, CTI 09A

SEMESTER EXAMINATIONS

APRIL/MAY 2010 SERIES

PHYSICS 2

TIME: 2 HOURS

Instructions to Candidates

This paper consists of **FIVE** Questions.
Answer Question **ONE** and any other **TWO** Questions.

Question ONE

(a). By use of graphs, discuss variation of temperature gradient along a:

(i). Lagged bar
(ii). Unlagged bar

(8 Marks)

(b). Define the following terms:

(i) Heat
(ii) Temperature
(iii) Specific heat capacity
(iv) Heat capacity

(4 Marks)

(c). The temperature of 4m long wire rod rises from 20ºC to 45ºC. If increase in length obtained or expansion is 0.34mm.

Calculate:

(i). Linear expansivity of the wire.
(ii). Volume expansivity of the wire.
(iii). Area expansivity of the wire.

(4 Marks)

(d). (i). State Hooke's Law.

(ii). Explain how Hooke's Law is related to young modulus.

(iii). 0.45kg mass of a body is hung from the end of a wire 2.4m long of diameter 0.3mm.

If the young modulus for the material of the wire is 1.2 x 10´´Pa. Calculate extension produced.

(6 Marks)

(e). A body is thrown at 30º to the horizontal with an initial velocity of 500m/s. Calculate:

(i). Horizontal range
(ii). Maximum height reached
(iii). Time taken to reach maximum height.

(8 Marks)

Question TWO

(a). Explain deformation behavior of materials at the atomic level using.

(i). Elastic Strain
(ii). Plastic Strain

(12 Marks)

(b). The tradition methods of making metals stronger and stiffer all involves obstructing dislocation movement by barriers i.e. pockets of disorder in the lattice. Explain **THREE** types of barriers that may be considered.

(8 Marks)

Question THREE

(a). A solid is heat till it changes to liquid and then to gas. Sketch a graph of temperature verses heat supplied. Name points and section on the graph.

(7 Marks)

(b). The volume of liquid passing through a pipe per second V depends on the following:

(i). $\eta - Coefficient\ of\ Viscosity$
(ii). $v - Radius\ of\ the\ pipe$
(iii). $\frac{P}{L} - Pressure\ gradient$

Write a dimension equation relating V, η, v *and* $\frac{p}{L}$.

Show that $V = \frac{\pi r^4 P}{8\eta L}$ given that the value for dimension constant is equals to $\frac{\pi}{8}$.

(13 Marks)

Question FOUR

(a). State **THREE** effects that take place on a body when it gains heat Energy.

(3 Marks)

(b). Compare a fully immersed body with a partially immersed body interms of uptrust, density volume of displaced liquid. **(7 Marks)**

(c). State the **TWO** general conditions for equilibrium. **(4 Marks)**

(d). (i). Define the following terms:

(i). Speed
(ii). Velocity
(iii). Acceleration
(iv). Heat

(4 Marks)

(e). State:
(i). **THREE** Newton's Laws of Motion.
(ii). Principle of conservation of momentum.

(6 Marks)

Question FIVE

(a). A rocket develops an initial thrust of 3.3×10^8N and has a lift off mass of 2.8×10^6kg. Find the initial acc of the rocket at lift off. Take g = $10ms^{-2}$.

(5 Marks)

(b). $100cm^3$ of mercury (Hg) in a glass vessel is heat from 25°C to 100°C. The Real volume expansivity of mercury is $1.82 \times 10^{-4}°C^{-1}$ and Linear expansivity of glass is $8 \times 10^{-6}°C^{-1}$.

Calculate:
(i). Reel expansion of Hg.
(ii). Apparent expansion of Hg.

(8 Marks)

(c). Define:

(i). Strain
(ii). Stress

(2 Marks)

(d). Draw a graph of stress verse strain for a Ductile material and on its indicate the following sections and points:

(i). Elastic deformation
(ii). Plastic deformation
(iii). Yield point
(iv). Ductile fracture

(5 Marks)