THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

APS 1101: PHYSICS

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2012
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*
- *Calculator*

This paper consist of **FIVE** questions in **TWO** sections **A** & **B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question One

a) Define the following terms:
- **(i)** Turbulent flow
- **(ii)** Streamlined flow
- **(iii)** Surface tension
- **(iv)** Archimedes principle
- **(v)** Viscosity **(5 marks)**

b) A tube conveying fluid of relative density 1.2 tappers from 300mm diameter at inlet to 100mm at exit. The volumetric flow rate being $0.12m^3/s$. Determine the velocities at inlet and exit and the pressure at exit. **(7 marks)**

c) (i) Derive the equations of linear motion **(10 marks)**
(ii) Differentiate linear velocity and angular velocity. **(2 marks)**

d) Explain the following terms:

- **(i)** Projectile motion
- **(ii)** Range
- **(iii)** Trajectory
- **(iv)** Time of flight
- **(v)** Circular motion
- **(vi)** Speed **(6 marks)**

SECTION B (Answer any TWO questions from this section)

Question Two

a) Explain the meaning of the following terms giving the SI units of each.
- **(i)** Displacement
- **(ii)** Velocity
- **(iii)** Acceleration **(3 marks)**

b) A car is moving with a velocity of 15m/s accelerates uniformly at the rate of 2m/s, to reach a velocity of 20m/s. Find:
- **(i)** The time taken
- **(ii)** Distance travelled **(6 marks)**

c) Sketch the following graphs:
- **(i)** Displacement time graph showing uniform velocity
- **(ii)** Displacement time graph showing deceleration
- **(iii)** Velocity time graph showing uniform acceleration **(6 marks)**

d) A body is projected vertically upwards at 50m/s. Find:

(i) How high it will go.

(ii) What time elapses before it is at a height 36m. **(5 marks)**

Question Three

a) (i) State Ohm's Law

(ii) Explain any **THREE** factors that affect resistance of a conductor. **(7 marks)**

b) (i) State Lenz's Law

(ii) With an aid of a sketch, describe the principle of operation of an electric motor. **(7 marks)**

c) An alluminium wire 7.5m long is connected in parallel with a copper wire 6m long. When a current of 5A is passed through the combination, it is found that the current in the alluminium wire is 3A. The diameter of the alluminium wire is 1mm. Determine the diameter of copper wire. Resistivity of copper is $0.017\mu\Omega m$; that of the alluminium is 0.028 $\mu\Omega m$ **(6 marks)**

Question Four

a) (i) Define the following terms:

- **i.** Direct stress
- **ii.** Direct strain
- **iii.** Young's modulus
- **iv.** Poisson's ratio

(ii) Stake Hooke's Law **(6 marks)**

b) A bar of 26mm diameter is subjected to a tensile load of 50KN. Calculate the extension of an a 300mm length E = 200 GN/m^2 **(6 marks)**

c) An axial load of 14KN is applied to a bar of cold drawn copper and produces an extension of 0.26mm on a gauge length of 250mm. If the bar is of square section 10mm side and the decrease in thickness is measured as 0.0034mm, find young's modulus and poisson's ratio for copper. **(8 marks)**

Question Five

a) Differentiate the following terms:

(i) Heat and temperature

(ii) Heat capacity and specific heat capacity **(4 marks)**

b) (i) Define thermal conductivity

(ii) Calculate the quantity of heat conducted through $2m^2$ of a brick wall 12cm thick in 1 hour if the temperature of are side 8^oC and the other side is 28^oC (Thermal Conductivity of brick = 0.13 $Wm^{-1} k^{-1}$) **(8 marks)**

c) (i) Define cubic expansivity

(ii) The height of mercury in a barometer provided with a brass scale correct at O^oC is observed to be

749.0mm in an occasion when the temperature is 15ºC and the height of a column of mercury at OºC which would exert an unequal pressure. Assume that the cubic expansitivities

(8 marks)