THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**CONSTRUCTION TECHNICIAN PART I
YR 1 SEM II**

APC 1102: PHYSICS

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
  - *Answer booklet*
  - *Calculator*
This paper consists 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 clearly shown
This paper consists of **FIVE** printed pages

SECTION A (COMPULSORY)

Question 1

a) Give the dimensions of each of the following quantities
    (i)   Force
    (ii)   Speed/velocity
    (iii)   Density   (6 marks)

b) State the Laws of moments   (1 mark)

c) The figure 1 below shows a metre rule of weight 1.00N, suspended from two spring balances. A load is attached to the extreme right-hand end C. The spring balance attached to the extreme left-hand end of the role (A) reads 0.25N. The spring balance attached at B, a distance x from the right-hand end reads 1.25N

Fig. 1

What is the weight of the load and the value of the distance x   (7 marks)

d) Give any **THREE** different applications of moments   (3 marks)
e) Explain the following types of forces
    (i)   Upthrust
    (ii)   Friction
    (iii)   Gravitational   (3 marks)

SECTION B (Answer any TWO questions from this section)

Question 2

a) Define the following terms:
    (i)   Centre of gravity
    (ii)   Equilibrium   (4 marks)

b) Study the following diagram (figure 2) showing three similar objects on an incline base.

Fig 2

Using all the necessary illustrations including arrow direction, describe the stability of each of the objects A, B, C   (9 marks)

c) Give the symbols of each of the following common series used in electric circuits
   (i)   Variable resistors
   (ii)   Capacitor
   (iii)   Fuse
   (iv)   Earth/ground
   (v)   Rheostat   (5 marks)

d) A battery circulates charge road a circuit for half a minute. If the current in the circuit is 5000mA, what quantity of charge passes through the battery   (2 marks)

Question3

a) Define the following terms:
   (i)   Conduction
   (ii)   Radiation
   (iii)   Correction   (3 marks)

b) Calculate the pressure under a girls foot in pascal if her mass is 33.6kg and the area of her shoe is 158cm^2.   (2 marks)

c) (i) State the **TWO** laws of moments   (2 marks)
   (ii)   The figure below shows a uniform plank AB. The plank is 5.0m long and is pivoted at O, where AO is 2.0m. A boy of weight 600N sits with his centre of gravity vertically above point C which is 1.0m from O, as shown in the diagram. The plank is in equilibrium. Calculate the weight of the plank   (3 marks)

B

Fig 3

d) With the help of a diagram, describe how a borehole machine works   (4 marks)

e) Define the term hookes Law   (1 mark)

f) When a load of 12N is applied to a steel spring, it produces an extension of 80mm without exceeding the elastic limit of the spring. Calculate the weight of an object, which when hung from the same spring, produces an extension of 60mm   (2 marks)

g) Three resistors are connected in a circuit as shown below
        Fig. 4

Calculate the following:
    (i)   Combined resistance

    (ii)   Current across each resistors R_1, R_2, R_3 (4 marks)

Question 4

a) Using illustrations, describe the **THREE** properties of a liquid pressure   (6 marks)

b) Calculate the heat required to convert 5kg of ice at -20°C into steam at 100°c. The specific heat capacities of water and ice are respectively, 4200 and 2100J/kgK; the specific latent heat of fusion of ice is 340000J/kg and the specific latent heat of vaporization of water is 2.3 x 10^6 J/kg.
                    (10 marks)

c) Define the following terms:
    (i)   Voltmeter
    (ii)   Charge
    (iii)   Amperes
    (iv)   Resistors   (4 marks)

Question 5

a) A space craft of total mass 1000kg is travelling round the earth in a circular orbit of radius 12000km at constant speed. The gravitational field strength at that distance from the earth's centre is 3N/kg.

    (i)   What is meant by gravitational field strength?   (2 marks)
    (ii)   The astronaut in the spacecraft has weight and yet feels weightless. Explain   (3 marks)
    (iii)   How big is the force towards the centre of the earth acting on the spacecraft?   (2 marks)
    (iv)   Calculate the speed of the space craft   (3 marks)

b) Highlight any **FIVE** applications of conduction convection and radiation in the field of Building and Civil Engineering   (5 marks)

c) What is surface tension?   (2 marks)

d) Describe some of the effects of surface tension in the field of building and civil engineering.
                                                             (3 marks)