MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR CERTIFICATE IN
MECHANICAL ENGINEERING
MEC PR-112: PHYSICS

DATE: 31/5/2017   **TIME: 2:00 – 4:00 PM**

INSTRUCTIONS

This paper consists of two sections. Section __A__ is compulsory, and then answer any other two questions from section __B__

SECTION A: COMPULSORY.

1.   a)   What is physics?   (2 marks)

       b)   State the purpose of the following in engineering   (10 marks)

             i.   Engineer's caliper

             ii.   Vernier caliper

             iii.   Micrometer screw gauge

             iv.   Beam balance

             v.   Volumetric glassware

       c)   Draw a vernier caliper, label all the parts showing a reading of 5.34cm. (9 marks)

       d)   Draw a micrometer screw gauge with a reading of 0.562cm.   (9 marks)

SECTION B: ANSWER ANY TWO QUESTIONS

2.   a)   Define the following   (8 marks)

             i.   Force

             ii.   Mass

             iii.   Inertia

             iv.   Momentum

b) Calculate the force required to produce an acceleration of 3m/s2 on a motor vehicle having a mass of 1100kg. If the initial velocity of the vehicle is 12m/s, what will be the final velocity if this force is applied for 5s? (6 marks)

c) A valve and tappet assembly fitted to an overhead camshaft engine has a mass of 200g. At a given engine speed, the force to open the valve is 250N. Calculate the acceleration of the valve under conditions. (6 marks)

3. a) Define the following stating their S.I. units (6 marks)

    i. work

    ii. energy

    iii. power

b) State any four forms of energy (4 marks)

c) Calculate the work done by a mason in lifting a stone of mass 15kg through a height of 2.0m. (Take g=10N/Kg $^{-1}$) (5 marks)

d) A body of mass 5Kg is supported 12m above the ground. Determine the potential energy possessed by the body due to its position with respect to the ground

(5 marks)

4. a) Define the following terms in motion stating S.I. units

    i. Displacement

    ii. Speed

    iii. Velocity

    iv. Acceleration (8 marks)

b) A body covers a distance of 10m in 4 seconds. It rests for 10 seconds and finally covers a distance of 90m in 6 seconds. Calculate its average speed. (7 marks)

c) The velocity of a body increases from 72Km/h to 144Km/h in 10 seconds. Calculate its acceleration. (5 marks)

5. a) State five laws of friction. (10 marks)

b) A wooden box of mass 30Kg rests on a rough floor. The coefficient of friction between the floor and the box is 0.6.

    i. Calculate the force required to just move the box

    ii. If a force of 200N is applied to the box, with what acceleration will it move? (take g=10m/s-^{2}) (10 marks)