



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

SUPPLEMENTARY EXAMINATION FOR
CERTIFICATE IN ELECTRICAL ENGINEERING
CERTIFICATE IN BUILDING AND CIVIL ENGINEERING

EPC 101: APPLIED SCIENCE I - PHYSICS

DATE: SUPPLIMENTARY

TIME:

INSTRUCTIONS: Answer question ONE and any other TWO questions.

SECTION A

QUESTION ONE (30MARKS) (COMPULSORY)

- a) A uniform half meter rule is freely pivoted at 15 cm mark and balances horizontally a body of mass 40 g hung from 2 cm mark.
- i) Draw a clear force-diagram of the arrangement. (3 marks)
 - ii) Calculate the mass of the meter rule. (3 marks)
- b) i) Name three types of forces force. (3 marks)
- ii) Force of 500 N is applied to an area of 100 m^2 . Calculate the pressure exerted on the area in Nm^{-2} . (5 marks)
- c) A car travelling at 36 ms^{-1} accelerates uniformly at 1.5 m^2 ; calculate its velocity in kmh^{-1} after 5 seconds. (4 marks)
- d) i) Define Power. (2 marks)
- ii) By pulling a block of mass 30 kg through a distance of 400 m, a boy found out that he took 10 minutes. Calculate the power he develops. (5 marks)

- e) Distinguish between static and dynamic frictions. (3 marks)
- f) State two disadvantages of friction (2 marks)

SECTION B

QUESTION TWO (20MARKS)

- a) State the law of conservation of energy. (2 marks)
- b) Explain the meaning of kinetic and potential energies. (3 marks)
- c) With an aid of a diagram, explain the energy changes in a swinging pendulum bob. (6 marks)
- d) A body of mass 2 kg is dropped from a height of 20 m above the ground. Calculate:
 - i) Potential energy at 20 m.
 - ii) Kinetic energy half way.
 - iii) Velocity just before it strikes the ground. (9 marks)

QUESTION THREE (20 MARKS)

- a) State the Principle of moments. (3 marks)
 - b) Show clearly how you can determine the mass of an apple fixed 20 cm from one end and 100 g mass fixed at 90 cm mark. Take the pivot at 50 cm mark. (5 marks)
 - c) What is meant by density of a substance (3 marks)
 - d) Calculate the mass of air in a room of floor dimension 10 m x 10 m and height 4 m (4 marks)
- (Density of air = 1.26 kgm^{-3})
- e) A uniform bar of 5 m long and mass 15 kg rests is hung using two vertical wires at 50 cm and 150 cm respectively from the ends. Calculate the tension forces at the wires. (5 marks)

QUESTION FOUR (20MARKS)

- a) Define the terms work and energy (4 marks)
- b) A student of mass 70 kg runs up 70 stairs cases each 20 cm high in 4 minutes. Calculate the power he develops. ($g = 9.81 \text{ N/Kg}$) (3 marks)
- c) An object of mass 3 kg is pulled with a force of 200 N, 30° to the horizontal to a distance of 20 m.

- d) i) Draw a diagram for the set up.
ii) Calculate the work done. (10 marks)
- e) Draw a diagram to show all the forces of an object placed on a flat horizontal bench. (3 marks)

QUESTION FIVE (20 MARKS)

- a) Define pressure. (3 marks)
- b) A rectangular block of metal has a force of 2.7 N and measures 2 cm by 3 cm by 4 cm. Calculate the greatest pressure it can exert. (4 marks)
- c) Explain how density of an irregular solid can be determined using clearly labelled diagram. (10 marks)
- d) Calculate the volume of an object of mass 0.3 kg and volume 100 cm^3 in kg m^{-3} . (3 marks)