MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL AND ELECTRONICS ENGINEERING

CERTIFICATE IN MECHANICAL ENGINEERING

CERTIFICATE IN CIVIL ENGINEERING

SUPPLEMENTARY EXAMINATION

BCE BT 111: PHYSICS

DATE: 30/8/2017 **TIME: 2:00 – 4:00 PM**

INSTRUCTIONS:

Answer question one and any other two questions

Use **1. g = 9.81ms^{-2}**

2. Density of mercury = 13.6 g cm^{-3}

SECTION A

QUESTION ONE (30MARKS)

a) i) State the principle of moments.

ii) A 10N weight is placed on 10cm mark of a 150 N uniform meter rule. Calculate the distance of the pivot from the center of the meter rule. (4 marks)

b) i) Define the following terms and give their SI units:

1. Force

2. Pressure (3 marks)

ii) A block of weight 100N measures 2mm by 3mm by 7mm. Calculate the minimum pressure it can exerted in Nm^{-2}. (5 marks)

c) i) State the one difference between speed and velocity.

ii) A car travelling at 20 kmh^{-1} accelerates uniformly at 1.5 m^{-2}. Calculate its Velocity in ms^{-1} after 5 seconds. (4 marks)

d) i) Define Power

ii) By pulling a block of mass 25 kg through a distance of 500 m, a boy found out that he took 10 minutes. Calculate the power he develops. (5 marks)

e) i) Define Friction

ii) Distinguish between static and dynamic friction. (3 marks)

SECTION B

QUESTION TWO (20MARKS)

a) Define

i. Velocity

ii. Acceleration (4 marks)

b) A car runs at a constant speed of 10 ms^{-1} for 200 seconds then accelerates uniformly to a speed of 30ms^{-1} for 40 seconds. This speed is maintained for 400 seconds before it decelerates uniformly to rest in 50 seconds.

i. Draw a Velocity time graph for the journey. (5 marks)

ii. Calculate its average velocity (3 marks)

c) Distinguish between scalar and vector quantities. Give one example in each case. (4 marks)

d) A body moving at 15 ms^{-1} accelerates at 2.5 ms^{-2} for 250 seconds. Calculate the distance covered by the body. (4 marks)

QUESTION THREE (20 MARKS)

a) A 5N weight placed on 20cm mark of a uniform meter-rule balances an object X hanging from 70 cm mark.

i. Draw a diagram for the set up

ii. Calculate the weight of the object. (8 marks)

(Take moments about 50cm mark)

b) What is meant by relative density of a substance (3 marks)

c) Calculate the mass of mercury block given that its dimensions are 10cmx12cm and height 4cm. (4 marks)

d) A uniform bar 5 m long and mass 20 kg rests on two sharp edges placed at 50cm and 150cm respectively from the ends. Calculate the reaction forces at the edges. (5 marks)

QUESTION FOUR (20MARKS)

a) Distinguish between work and Energy (4 marks)

b) An Engine raises a load of 500 kg from a mine which is 100 m deep. If the load is raised in 10 minutes, calculate the power of the engine. (3 marks)

c) Define coefficient of friction. (4 marks)

d) Name a device for whose working friction is essential (3 marks)

e) Name two disadvantages of friction (3 marks)

f) Use a diagram to show the types of forces for an object of weight W placed on an inclined plane. (3 marks)

QUESTION FIVE (20 MARKS)

a) State the Law of Conservation of Energy (3marks)

b) A body of Mass is 5 kg is raised to a height of 50 m above the ground. It is then dropped to the ground.

Calculate its velocity just before it strikes the ground. (3marks)

c) A second year student who has a mass of 70 kg runs up a flight of 50 stairs each 200 mm high in 20 seconds. Calculate

i. Total work done in raising his own weight (3 marks)

ii. Useful average power he develops (4 marks)

d) Distinguish between mass and weight (4 marks)

e) An object of mass 5 kg is moving with a velocity of 20 ms^{-1}. Calculate its kinetic energy. (3 marks)