



MACHAKOS UNIVERSITY
University Examinations 2018/2019

SUPPLEMENTARY/SPECIAL EXAMINATION FOR DIPLOMA IN ELECTRICAL
ENGINEERING
EED106 MECHANICAL SCIENCE

DATE: September 2019

TIME: 2 HOURS

INSTRUCTIONS

1. This examination contains **FIVE** questions
2. You are required to attempt **THREE** questions.
3. **QUESTION ONE** is **COMPULSORY** and contains **30 MARKS**. The remaining **FOUR** questions contain **20 MARKS** each.

MECHANICAL SCIENCE

TIME 2HRS

ATTEMPT QUESTION ONE AND ANY OTHER TWO QUESTIONS.

1.a) define the following terms

- i) Stress
- ii) Kinetic Energy
- iii) Power

(6mks)

b) a body having a mass of 30kg is supported 50m above earth's surface.

- i) Calculate the potential energy of the body
- ii) If the body is allowed to fall freely, calculate its potential and kinetic energies when the body is 20 m above the ground and just before it touches the ground. (14mks)

c) a wagon of mass 4 tonnes is pulled on a horizontal frictionless track. After five minutes it is observed that the amount of power used is 8.2 kW, calculate:-

- i) The average work done
- ii) The distance travelled

(10mks)

2.a) define the following terms

- i) Polygon of forces
- ii) Resultant of force
- iii) Equilibrium

b) the following horizontal forces act at a point:-

50N in direction due east

80N in direction due south

30N in direction 20° north of west.

Calculate the values and direction of the fourth force necessary to maintain equilibrium.

(14mks)

3 a) define the following terms

- i) Stress
- ii) Strain
- iii) Shear strength

(6 mks)

b) A steel brake rod is 1.2 m long and is subjected to a maximum load of 4.5 kN. If the extension of the rod is not to exceed 0.384 mm, determine

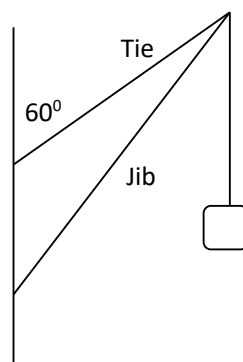
- i) The maximum stress produced in the rod
- ii) A suitable diameter for the rod.

Modulus of elasticity for steel = 200 GN/m^2

(14 mks)

4.a vehicle of total mass 1600kg increases its speed uniformly from 36km/h to 72km/h by the action of an average accelerating force of 2.4kN. By how much will its kinetic energy have increased during the acceleration shown that this increases in kinetic energy is equal to the work done by the accelerating force. (20mks)

5(a) A jib crane carries a load of 200 kg as shown. Use Lamis theorem to determine the forces acting in the jib and tie (7 mks)



20⁰

200 kg

- (b) Horizontal steel beam of uniform cross-section 4 m long rests on two Supports, one at the end of beam and the other at a distance of 1 m from the other end of the beam. The mass of the beam is 80 kg. Calculate the outward reactions at the supports. (13 mks)