



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING
(DME)

EME 2152
MECHANICAL ENGINEERING SCIENCE

SPECIAL/SUPPLEMENTARY EXAMINATIONS
SERIES: OCTOBER, 2014
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

-Question **ONE** is **COMPULSORY** questions
-Attempt any other **TWO** questions
This paper consists of **3 PRINTED** pages

QUESTION ONE (COMPULSORY)

- (a) A missile is projected vertically upwards with an initial velocity of 80m/s. Determine the time for it to reach a height of 200 m with no resistance experienced. **(2 marks)**
- (b) (i) Four forces act at a point as follows; 1kN due E; 4kN at 45° N of E; 3kN due N; 5kN 50° S of W. Determine the magnitude and direction of the resultant force.
- (ii) An aircraft increases its speed from 160km/h to 960 km/h in one minute. If the acceleration is constant determine its value and the distance travelled in this time. **(12 marks)**
- (c) (i) A load of 20 tonnes is pulled along a horizontal track by a force at 47° to and above, the track. If the coefficient of sliding friction is 0.6. Determine the friction force.
- (ii) A body moves in a circular path of radius 10 m. In an interval of 0.5 s the radius from the centre of the circle to the body sweeps out an angle of 18° . Determine the average angular velocity and the average linear speed of the body. **(16 marks)**

QUESTION TWO

- (a) A block of metal having a mass of 65kg requires a horizontal force of 155 N to drag it at a constant speed along a horizontal floor.
- Determine:
- (i) The coefficient of friction
- (ii) The angle of friction **(8 marks)**
- (b) A lifting machine has a velocity ratio of 4 can lift a load 185kg when the effort applied is 460 N.
- Determine:
- (i) The efficiency
- (ii) The effort required to overcome friction at this load.
- (iii) The work done against friction when the load is lifted 4 m. **(12 marks)**

QUESTION THREE

- (a) A force of 60 N acts horizontally. Resolve this force into two components one of which acts at an angle of 40° above the horizontal and the other at 20° below the horizontal. Determine the value of each component. **(8 marks)**
- (b) It requires a horizontal forces of 375 N to drag a truck of mass 300 kg at uniform speed along a level truck. Determine the force required to move the truck if the force is inclined at 40° to the horizontal and is:
- A push into the truck
 - A pull away from the truck **(12 marks)**

QUESTION FOUR

- (a) A motor vehicle hauls a trailer at 75km/h when exerting a steady pull of 800 N. Determine
- The work done in 20 min.
 - The power required. **(8 marks)**
- (b) A vertical load is 100 N is supported by Two chains, A and B in the same vertical plane. The force in A is 50 N and acts in a line at 30° to the horizontal plane at 120° to the 100 N load. Determine the force in chain B and the angle between A and B **(12 marks)**

QUESTION FIVE

- (a) A train of total mass 100 tonnes is traveling at 90 km/h on level track. The rolling resistance to motion is 10000 N. Determine:
- Resisting force required to stop the train in one minute
 - The braking effort required. **(8 marks)**
- (b) A force P acts on a body at an angle θ to a horizontal line Ox. P, together with a pull of 1.5 kN at 30° to and below, Ox, has the same effort of a force of 5kN at 45° to, and above Ox. Determine the magnitude of P and the angle θ **(12 marks)**

