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 119: ENGINEERING SCIENCE II

DATE: 30/5/2017 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS

- ***This paper consists of FIVE questions***
- ***Question ONE is Compulsory***
- ***Answer any other TWO questions***

1. a) Define the following terms-:
   i. Acceleration
   ii. Displacement
   iii. Coefficient of friction
   iv. Angle of friction (4 marks)

   b) A body of weight 300 N is lying on rough horizontal plane having a coefficient of friction of 0.3. Find the magnitude of the force which can move the body acting at an angle of 25^0 with horizontal (8 marks)

   c) A train has a uniform acceleration of 0.2 m/s^2 along a straight track. Calculate-:
   i. The velocity after an interval of 16s from stand still
   ii. Time required and distance covered to attain a velocity of 50 km/h
   iii. Time taken for the velocity to increase from 30km/h to 50 km/h and the distance travelled during that time (18 marks)

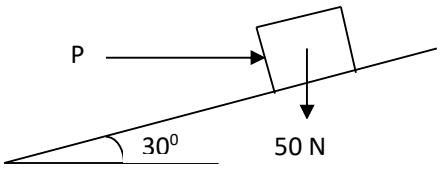
2. a) State at least four laws of dry friction (4 marks)

b) A body resting on rough horizontal plane required a pull of 180 N inclined at 30^0 to the plane just to move it. It was found that a push of 220 N inclined at 30^0 to the plane just moves the body. Determine the weight of the body and the coefficient of friction. (16 marks)

3. a) A wheel initially at rest is subjected to a constant angular acceleration of 2 rad/s^2 for 50s. Calculate the angular velocity attained and the number of revolutions the wheel makes in that time. (10 marks)

b) A cricket ball is thrown vertically upwards at a velocity of 20 m/s. Calculate the time taken to reach the maximum height attained. Assume g = 9.81 m/s^2 and the air resistance to be negligible. (10 marks)

4. A body of weight 50 N is at rest on an inclined plane. A force P is applied horizontally as shown below. If $\mu = 0.4$. Find the range of values of P over which the body will remain at rest. (20 marks)



5 During road test a car starting from rest attains a speed in first gear of 23.4 km/h in 3s. Second gear is then engaged and the car reaches a speed of 64.4 km/h in a time 4s. Third gear is then engaged and the car reaches a speed of 112.7 km/h in a time of 5s. The car is then brought to rest from 112.7 km/h in a time of 4.8s. Calculate -:

i. The acceleration of the car in all the three gears and the retardation

ii. The total time taken for the test

iii. The total distance covered during the test (20 marks)