

# TECHNICAL UNIVERSITY OF MOMBASA

AMA 4214 CLASSICAL MECHANICS

2015/2016

## END OF SEMESTER TWO YEAR TWO EXAMINATION FOR THE DEGREE OF MATHEMATICS AND COMPUTER SCIENCE

### QUESTION ONE (30MARKS) COMPULSORY

- a) A particle moves on a circle of radius  $R$  with a constant angular acceleration  $\alpha$ . If the particle starts from rest, find the
- Angular velocity
  - Tangential velocity
  - Tangential acceleration
  - Magnitude of acceleration (5mks)
- b) Two cars A and B are travelling in the same direction with constant velocities  $V_A$  and  $V_B$  respectively. When car A is a distance  $d$  behind B the brakes on A are applied causing a deceleration at a rate  $a$ . demonstrate that in order for the cars to collide, it is necessary that  $V_A - V_B \geq \sqrt{2ad}$  (5mks)
- c) A car of mass 1000kg moves uphill along a street inclined at  $30^\circ$  to the horizontal. Determine the force which the car must produce to move with
- Uniform acceleration (3mks)
  - An acceleration of  $0.2m/s^2$  (2mks)
- Neglect the effect of friction
- d) Show that for a conservative force field, the work done in moving a particle from points  $p_1$  to  $p_2$  is equal to the change in potential energy. (5mks)
- e) Prove that the torque on a particle is equal to the true rate of change in its angular momentum (5mks)
- f) Find the potential associated with a uniform force field. (5mks)