

The Open University of Sri Lanka
B.Sc /B.Ed Degree Programme
Applied Mathematics - Level 04
APU2142/APE4142 – Newtonian Mechanics I
No Book Test (NBT) - 2015/2016



Duration :- One Hour

Date:- 13. 11. 2016

Time:- 2.30 p.m. - 3.30 p.m.

Answer All Questions.

1. A particle falls from rest under gravity through a stationary cloud. The mass of the particle increases by accretion from the cloud at a rate which at any time is mkv , where m is the mass and v is the speed of the particle, and k is a constant. Show that, after the particle has fallen a distance x ,

$$kv^2 = g(1 - e^{-2kx})$$

and find the distance the particle has fallen after time t .

- 2 A uniform rod AB of mass m and length $2a$ is free to rotate in a vertical plane about a fixed smooth horizontal axis L . The axis L is perpendicular to the rod and passes through the point P of the rod, where $AP = \frac{3a}{4}$.

- (a) Find the moment of inertia of the rod about L .

The rod is held at rest with B vertically above P and is slightly displaced.

- (b) Find the angular speed of the rod when PB makes an angle θ with the upward vertical.
- (c) Find the magnitude of the angular acceleration of the rod when PB makes an angle θ with the upward vertical.
- (d) Find in terms of g and a only, the angular speed of the rod when the force acting on the rod at P is perpendicular to the rod.