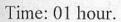
EASTERN UNIVERSITY, SRI LANKA

SECOND EXAMINATION IN SCIENCE - 2005/2006

SECOND SEMESTER (REPEAT)

(MARCH/APRIL 2008)

PH 204 MECHANICS II



Answer ALL Questions



1. A particle of mass m in a central force field F(r) moves with a constant angular momentum L about the force center. Show that the general equation of the particle's orbit is given by

$$\frac{d^2u}{d\theta^2} + u = -\frac{m}{L^2u^2}F\left(\frac{1}{u}\right)$$

where r and θ are the plane polar coordinates of the particle and $u = \frac{1}{r}$.

If the particle describes the orbit

$$\frac{r}{R} = 1 + \cos\theta$$

where R is a constant, find the law of force F(r).

2. State the Newton's law of gravitation. Express the acceleration due to gravity (g), near the Earth's surface in terms of the mass (M) and radius (R) of the Earth. Show that the work done, W in moving a mass m from height h₁ to height h₂, above the Earth's surface in a gravitational force field is given by

$$W = GMm \left(\frac{1}{R + h_1} - \frac{1}{R + h_2} \right).$$

If $(h_1 - h_2)$ is small, show that this expression reduces to the standard form

$$mg(h_2-h_1).$$