EASTERN UNIVERSITY, SRI LANKA
SECOND EXAMINATION IN SCIENCE - 2007/2008
FIRST SEMESTER(Dec./Jan.,2008/2009)
MT 215 - CLASSICAL MECHANICS II
(PROPER & REPEAT)

Answer all Questions

Time: One hour

Q1. (a) Using the standard equations (without proof) for the equilibrium at any point on a perfectly flexible string, show that

$$s = c \tan \psi,$$

where the notations s, c and ψ are defined as in the usual way.

(b) A rough rigid wire is in the form of catenary with parameter c. It is fixed in a vertical plane with its directrix in horizontal and vertex above. A uniform heavy chain of length l is in limiting equilibrium with one end at the vertex of the wire. If $l^2 + c^2 = 1$, prove that

$$l = c \tan \left[\frac{1}{\mu} \ln \left(\frac{1}{c} \right) \right].$$

Q2. (a) State **Bernoulli-Euler law of flexure** of an elastic beam and use it to show that

$$M = \pm \, EI \frac{d^2y}{dx^2},$$

where M is the bending moment at any point of the beam given by the equation $y = y(x)$ and E and I are the Young modulus and moment of inertia of the beam about the central line, respectively.

(b) A uniform beam AB of length $2l$ and weight w per unit length is clamped horizontally at A. A weight W is suspended from B. Show that the deflection at B is

$$\frac{2l^3}{3B}(4W + 3lw),$$

where B is the flexural rigidity.