EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
SECOND EXAMINATION IN SCIENCE - 2012/2013
FIRST SEMESTER (Apr./May, 2015)
AM 215 - CLASSICAL MECHANICS II
(PROPER & REPEAT)

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nswer all Questions

Time: One hour

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1. With the usual notations, obtain the following equations for a common catenary:

   (a) $s = c\tan\psi$;

   (b) $y = c\sec\psi$;

   (c) $T = wy$;

   (d) $y^2 = s^2 + c^2$.

A uniform chain is hung from two points A, B in a horizontal line. Let $AB = 2a$ and let the tension at A be n times that at the lowest point of the chain. Show that the length of the chain is

$$\frac{2a\sqrt{n^2-1}}{ln[n+\sqrt{n^2-1}]},$$

and the sag is

$$\frac{a(n-1)}{ln[n+\sqrt{n^2-1}]}.$$

2. If S and M are shearing force and bending moment respectively at a point of uniformly loaded beam, then prove that

$$\frac{dS}{dx} = \omega \qquad \text{and} \qquad \frac{dM}{dx} = -S$$

where ω is the weight per unit length of the beam.

State the Bernoulli-Euler law of flexure.

A uniform elastic beam AB of length $4l$ and weight w, having flexural rigidly EI is clamped horizontally at A and is freely supported on a knife edge at the same horizontal level as A at a point C, where $BC = l$. The beam carries a load $\frac{15}{16}W$ concentrated at B.

(a) Prove that the magnitude of the bending moment at A is $\frac{Wl}{4}$.

(b) Find the reaction at C and the depth of B below A.