EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
SECOND EXAMINATION IN SCIENCE - 2012/2013
FIRST SEMESTER (Feb./Mar., 2016)
AM 215 - CLASSICAL MECHANICS II
(PROPER & REPEAT)

Answer all Questions **Time: One hour**

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1. A flexible string is in equilibrium under the action of external force $\underline{F}$ per unit length in space. With usual notations, show that

$$\frac{d\underline{T}}{ds} + \underline{F} = 0.$$

Show also that this is equivalent to

$$\frac{dT}{ds} + F_t = 0, \quad \frac{T}{\rho} + F_n = 0 \quad \text{and} \quad F_b = 0.$$

A string of length ℓ hangs in a limiting equilibrium over rough cylinder of radius a with its axes horizontal. Prove that the greatest length of vertical potion of the string is

$$\frac{\ell - \pi a}{1 + e^{-\mu\pi}} + \frac{2\mu a}{1 + \mu^2},$$

where μ is a coefficient of friction between cylinder and string.

2. If S and M are shearing force and bending moment respectively a 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 const rigidly EI is clamped horizontally at A and is freely supported on a h the same horizontal level as A at a point C, where $BC = l$. The bea 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.