EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
TERNAL DEGREE EXAMINATION IN SCIENCE - 2012/2013
SECOND YEAR FIRST SEMESTER (July, 2015)
EXT. MT215 - CLASSICAL MECHANICS II
(REPEAT)

---

ver all Questions **Time: One hour**

A flexible string is in equilibrium under the action of external force $\underline{F}$ per unit length. With the 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 uniform heavy string rests on the upper surface of a rough vertical circle of radius a, and partly hangs vertically. Prove that, if one end is at the highest point of the circle, the greatest length of the string that hangs freely is given by

$$\frac{2\mu a + (\mu^2 - 1)ae^{\mu\frac{\pi}{2}}}{\mu^2 + 1}.$$

2. If S and M are shearing force and bending moment respectively at a poi 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 rigidl is clamped horizontally at A and is freely supported on a knife edge at the s horizontal level as A at a point C, where $BC = l$. The beam carries a load 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.