EASTERN UNIVERSITY, SRI LANKA
SECOND EXAMINATION IN SCIENCE - 2005/2006
FIRST SEMESTER(Auguest/September.'2007)
MT 215 - CLASSICAL MECHANICS II

Answer all Questions **Time: One hour**

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01. (a) With the usual notations, prove the following for a common catenary:

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

ii. $y = c\sec\psi$. [30 marks]

(b) A balloon is moored to a rope whose length is a and weight w per unit length. The upper and lower ends of the rope are inclined at an angle α and β, respectively to the horizontal. Prove that the height of the balloon above the ground is

$$a\sin\left(\frac{\alpha+\beta}{2}\right)\sec\left(\frac{\alpha-\beta}{2}\right).$$

Further, find that the horizontal thrust of the air on the balloon. [70 marks]

02. (a) State and prove **Clapeyron's Equation**. [50 marks]

(b) A heavy uniform elastic rod rests on five supports which are in a horizontal line. Two of the supports are ends of the rod. One is at the middle point and two bisects the distance between the middle point and the ends. Show that the bending moment at the center and at each of the support next to its are $\frac{Wl}{56}$ and $\frac{3Wl}{112}$, where W is the weight of the rod and $4l$ is the length of the rod. Further, find the ratio of reactions on the points of supports .

[50 marks]