SECOND EXAMINATION IN SCIENCE 2002/2003

2002/2003(A) (Apr./May.' 2004)

SECOND SEMESTER

(Repeat)

MT 215 - CLASSICAL MECHANICS II

Answer all questions

Time : One hour

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

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

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

(c) $T = \omega y$;

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

A uniform chain of length l and weight W_1 hangs between two fixed points at the same level and a weight W_2 is attached at the mid point of the chain. If the sag at the middle is d, show that the tension of the chain at each fixed point is

$$\left(\frac{d}{2l} + \frac{l}{8d}\right) W_1 + \frac{l}{4d} W_2 .$$

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

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

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 $3a$ and weight W is clamped horizontally at its ends, which are at the same horizontal level. Two concentrated loads, W and $2W$ are placed at the points of trisection of the beam with smaller load near to A. Show that the reaction at A and B are $\frac{95W}{54}$ and $\frac{121W}{54}$ respectively. Find also the bending moment at each points.