

There are three (3) questions.

All questions are of equal value (10 marks each).

CLOSED BOOK: textbooks, notes, problems, etc., are not permitted.

Calculators are permitted.

Wherever necessary a FBD must be drawn.

STRAIGHT EDGE IS REQUIRED.

UNDERLINE YOUR ANSWERS.

Answer all questions in the answer booklets provided:

Indicate the Following on the Front of your Answer Booklets

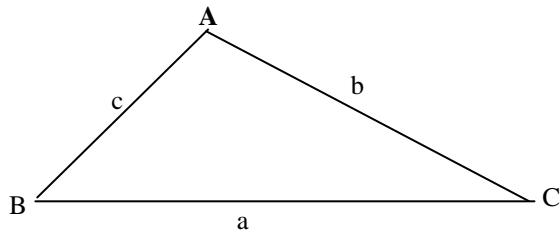
Name : _____

Student Number : _____

RETURN THE QUESTION SHEETS WITH YOUR ANSWER BOOKLET(S)

Distance Education Students: Indicate that you are in the Distance Ed. Class

$$g = 9.8 \text{ m/sec}^2$$



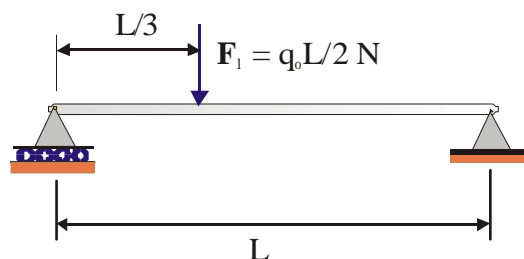
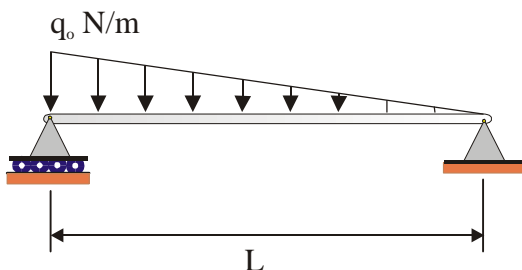
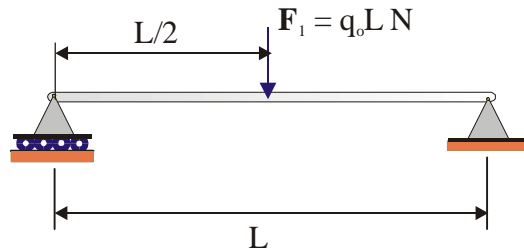
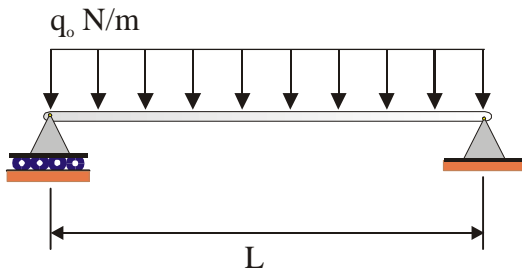
$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

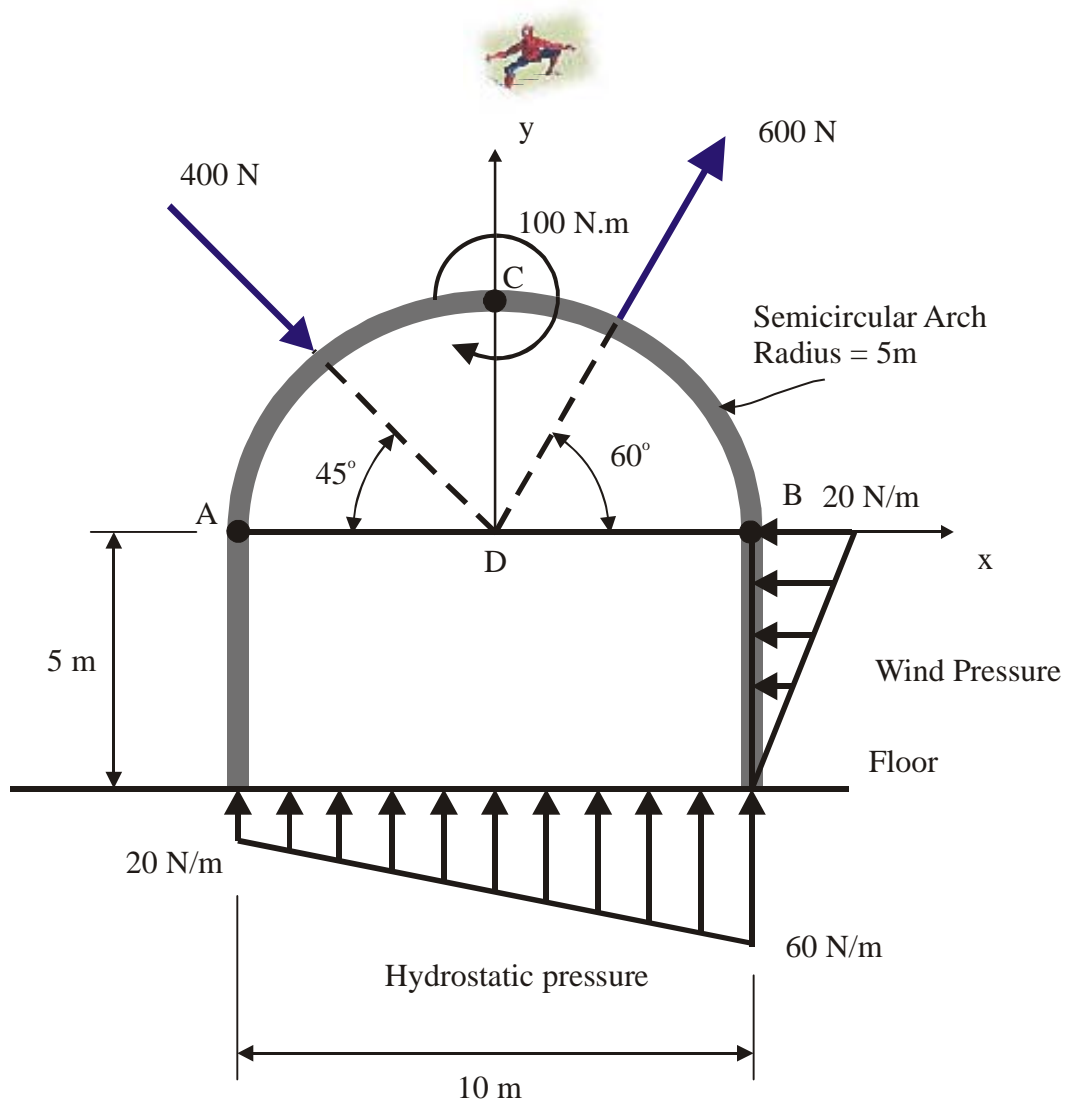
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QUESTION 1

A building with a semicircular arch roof having a radius of 5 m has 400 N and 600 N loads applied to the roof as shown in the figure. There is also a $100\text{ N}\cdot\text{m}$ clockwise couple-moment acting on the roof. There is a distributed wind pressure load and a distributed hydrostatic pressure load. For the given loading:

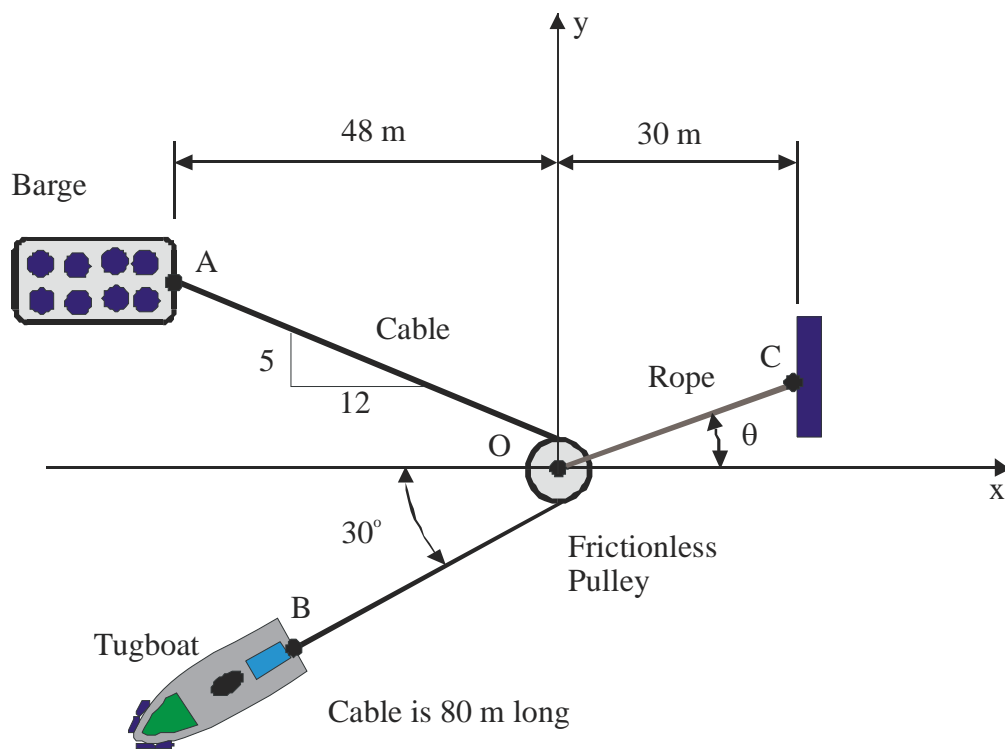
Determine the equivalent force-couple at point A .

**Figure 1**

QUESTION 2

A tugboat is pulling a barge with a 80 m long cable in the configuration shown in the figure. The cable is attached to the barge at A and wraps around a frictionless pulley and is attached to the tugboat at B . (Neglect the radius of the pulley.) The pulley is attached to the dock by the rope OC . The cable breaks when the tension in the cable reaches 1000 N . Determine the tension in the rope OC and the angle θ at the instant the cable breaks.

- By means of a graphical solution (state the scale that you are using),
- By trigonometry (using sine and/or cosine rules) and
- By rectangular components.

**Figure 2**

QUESTION 3

Two masses are suspended from cables as shown in the figure. Determine the tension in each cable (cables AB , BC and CD) and the mass m that is suspended at C if the system is in equilibrium in the configuration shown.

Use $g = 9.8 \text{ m/sec}^2$

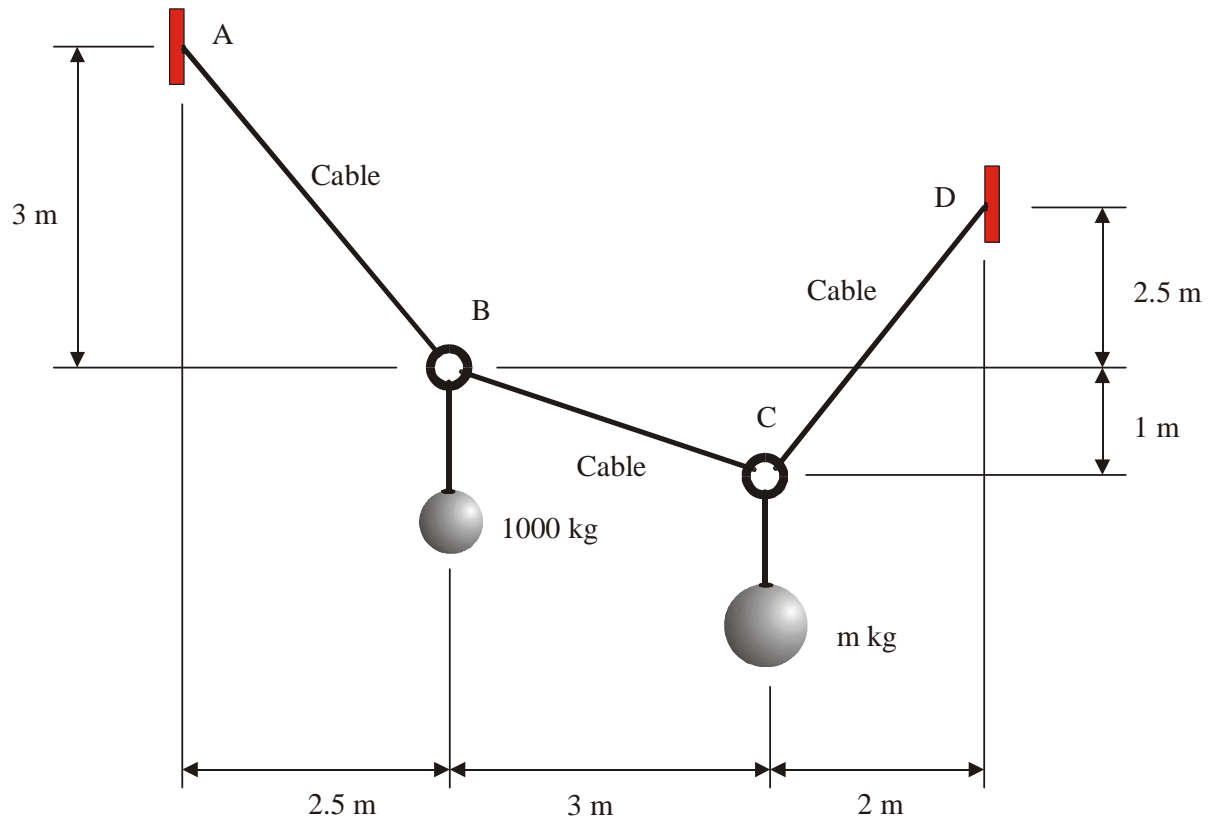


Figure 3