UNIVERSITÉ Concordia UNIVERSITY

Faculty of Engineering and Computer Science

ENGR 242/2 T STATICS **Fall 2015**

Test 2 (October 30th, 2015)

Instructions:

1. Time allowed: **75 minutes**.
2. Answer all **four** questions.
3. Any missing data should be reasonably assumed with sufficient explanation.
4. Only non-programmable calculators are permitted.
5. Test includes **seven** pages.
6. Write on both sides of the test, if needed.
7. Draw clear **FBD**, when applicable.

Name: Solution of the test

Student ID: .....

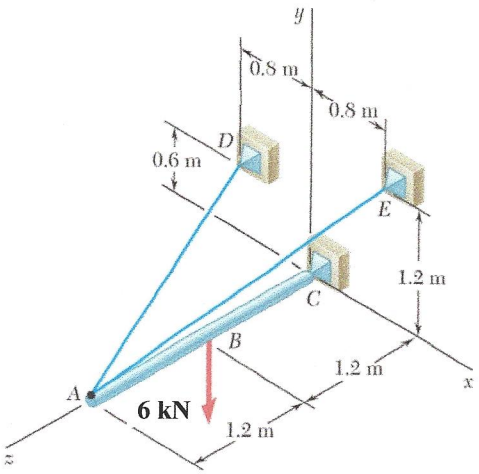
Signature: .....

Question 1 (30 marks)

A 2.4-m boom is held by a ball-and-socket joint at C and by two cables AD and AE. For the loading shown, determine:

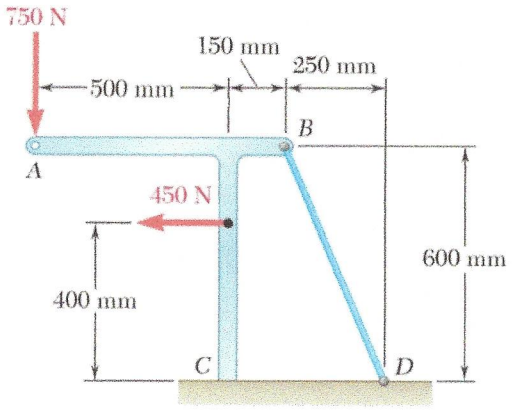
(a) The tension in each cable;

(b) The reaction at C.



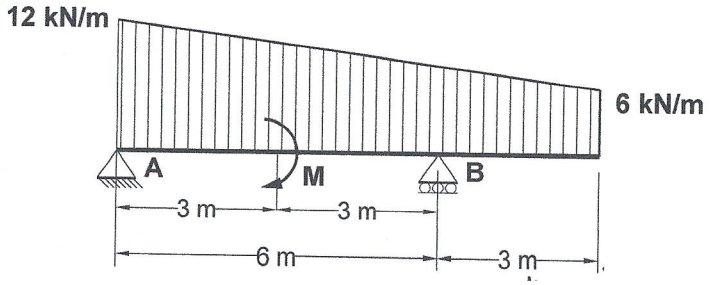
Question 2 (25 Marks)

Knowing that the tension in wire *BD* is 1300 N, determine the reaction at the fixed support *C* of the frame shown.



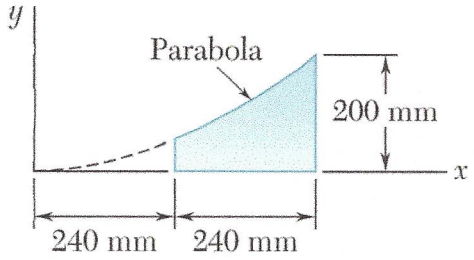
Question 3 (25 Marks)

A beam supports loads as shown where M = 24 kN.m. Determine the reactions at the supports A and B.

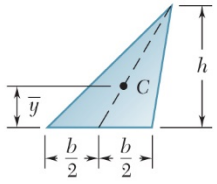
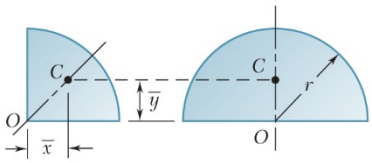
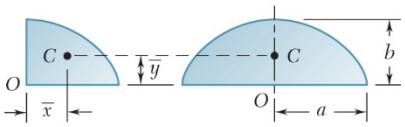
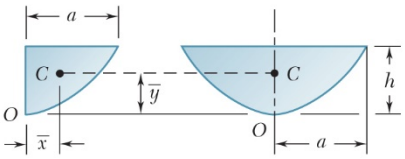
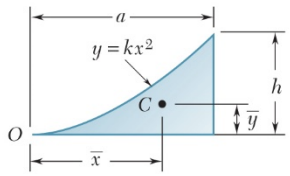
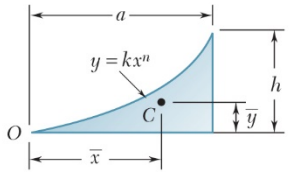
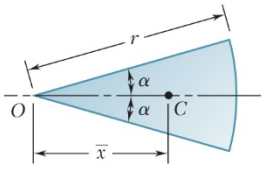


Question 4 (20 Marks)

Determine the centroid of the plane area shown in the figure. The equation of the parabola is $y = k x^2$.



Centroids of Common Shapes of Areas.

Shape		$\bar{x}$	$\bar{y}$	Area
Triangular area			$\frac{h}{3}$	$\frac{bh}{2}$
Quarter-circular area		$\frac{4r}{3\pi}$	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{4}$
Semicircular area		0	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{2}$
Quarter-elliptical area		$\frac{4a}{3\pi}$	$\frac{4b}{3\pi}$	$\frac{\pi ab}{4}$
Semielliptical area		0	$\frac{4b}{3\pi}$	$\frac{\pi ab}{2}$
Semiparabolic area		$\frac{3a}{8}$	$\frac{3h}{5}$	$\frac{2ah}{3}$
Parabolic area		0	$\frac{3h}{5}$	$\frac{4ah}{3}$
Parabolic spandrel		$\frac{3a}{4}$	$\frac{3h}{10}$	$\frac{ah}{3}$
General spandrel		$\frac{n+1}{n+2}a$	$\frac{n+1}{4n+2}h$	$\frac{ah}{n+1}$
Circular sector		$\frac{2r\sin\alpha}{3\alpha}$	0	αr^2