King Fahd University of Petroleum & Minerals

Department of Civil and Environmental Engineering

CE 201 – Statics

Semester: 142
Examination: Final
Date (Day): May 20, 2015 (Wednesday)
Time: 07:00 – 10:00 p.m.

Section	1	2	3	4	5	6	7
Instructor	Al-Malack	Al-Malack	Chowdhury	Al-Osta	Ahmed	Essa	Al-Attas
Time	07:00	08:00	09:00	10:00	11:00	10:00	11:00
Tick							

Student's Name :
Student's ID :

Problem	Assigned Grade	Earned Grade
1	20 Points	
2	25 Points	
3	25 Points	
4	15 Points	
5	15 Points	
Total	100 (Points)	

Good Luck

Problem 1 (20 Points)

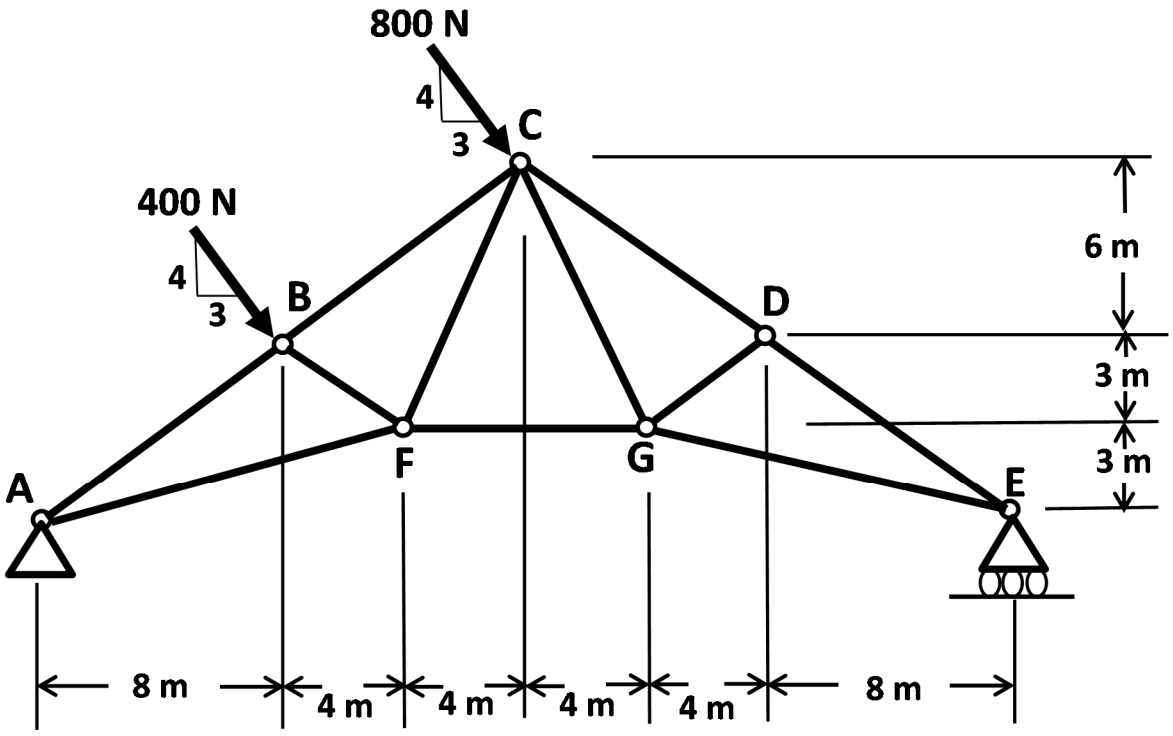
In the truss shown below, determine:

(5 Points) 1. The support reactions at **A** (pin) and **E** (roller).

(10 Points) 3. The force in members **BC and BF** of the truss by the **method of joints**, and indicate whether the member is in tension or compression.

(5 Points) 4. Determine the force in member **CD** of the truss shown below using the **method of sections**. Indicate if the members are in tension or compression.

Note: Show all solution steps



Problem 2 (25 Points)

The beam shown in the figure is supported by pin at A and roller at B.

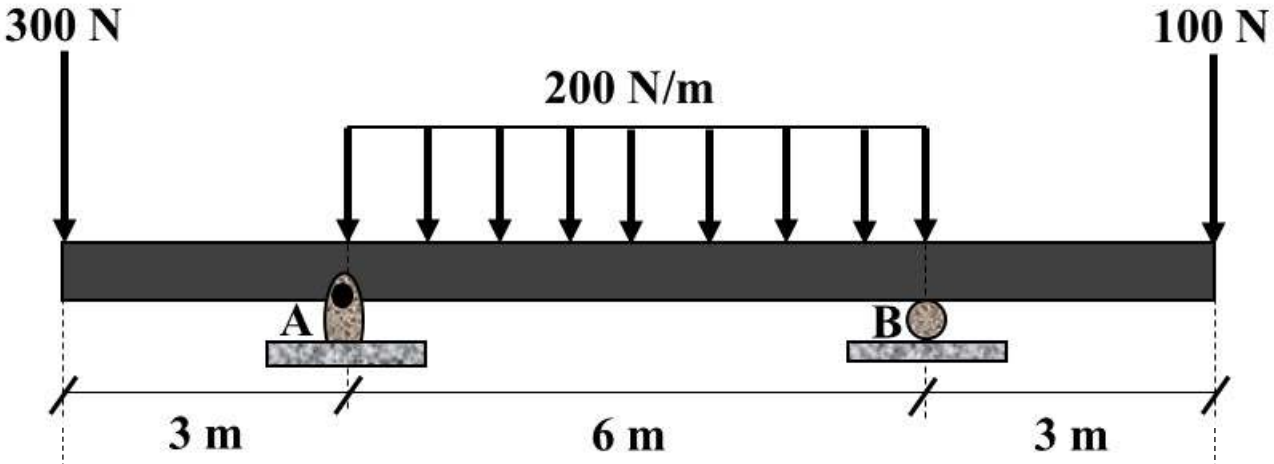
(5 Points) 1) Determine the support reactions at A and B

(10 Points) 1) Determine the equations for the shear force and bending moment.

(10 Points) 2) Draw the shear force and bending moment diagrams.

Develop the equations on **page 5** and draw the diagrams on **this page**.

Note: Show all solution steps

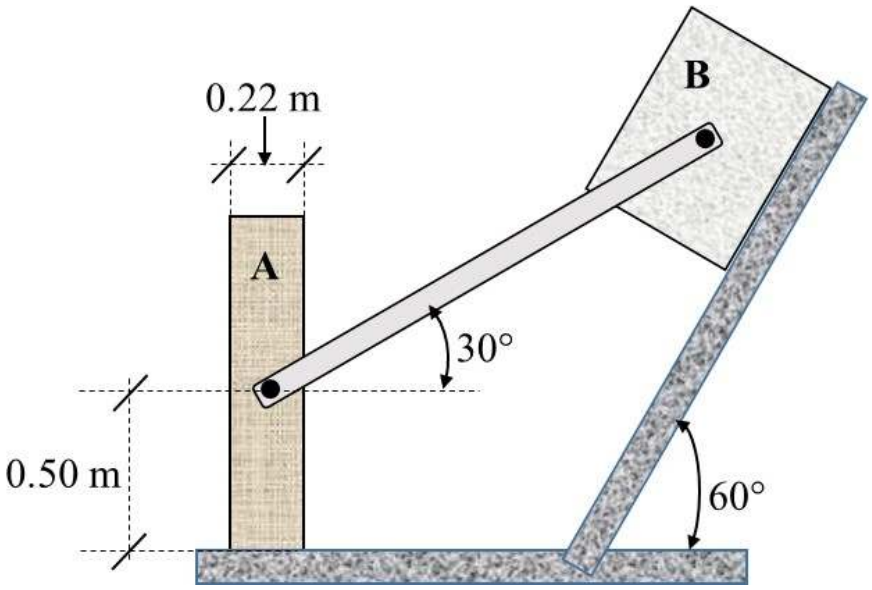


Problem 3 (25 Points)

Referring to the following figure, block A weighs 40 kN and B weighs 30 kN. If $\mu = 0.20$ under B.

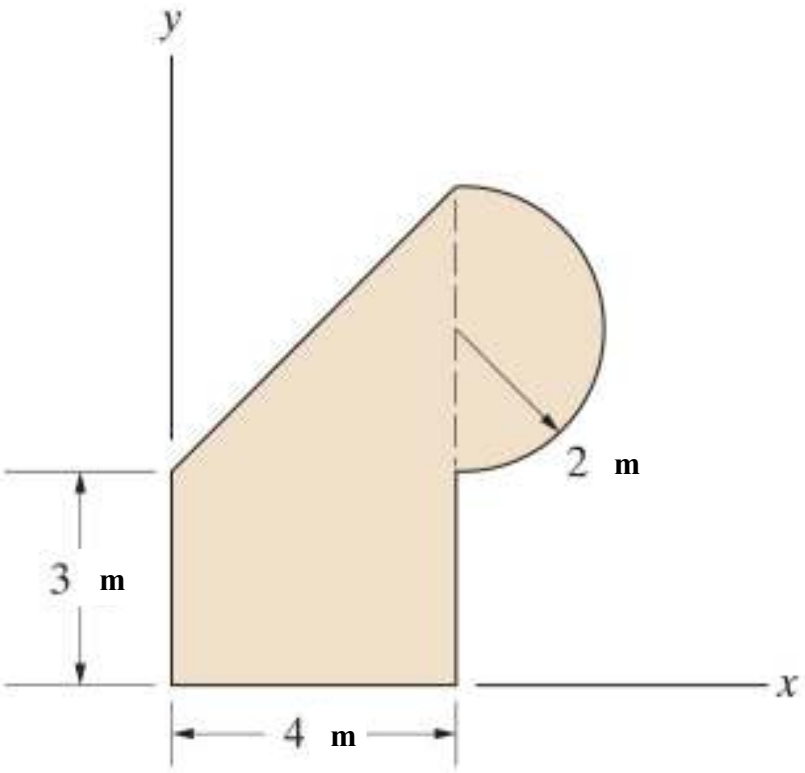
1. Compute the minimum coefficient of friction under A to prevent motion.
2. Determine if Block A remains in equilibrium.

Note: Show all solution steps



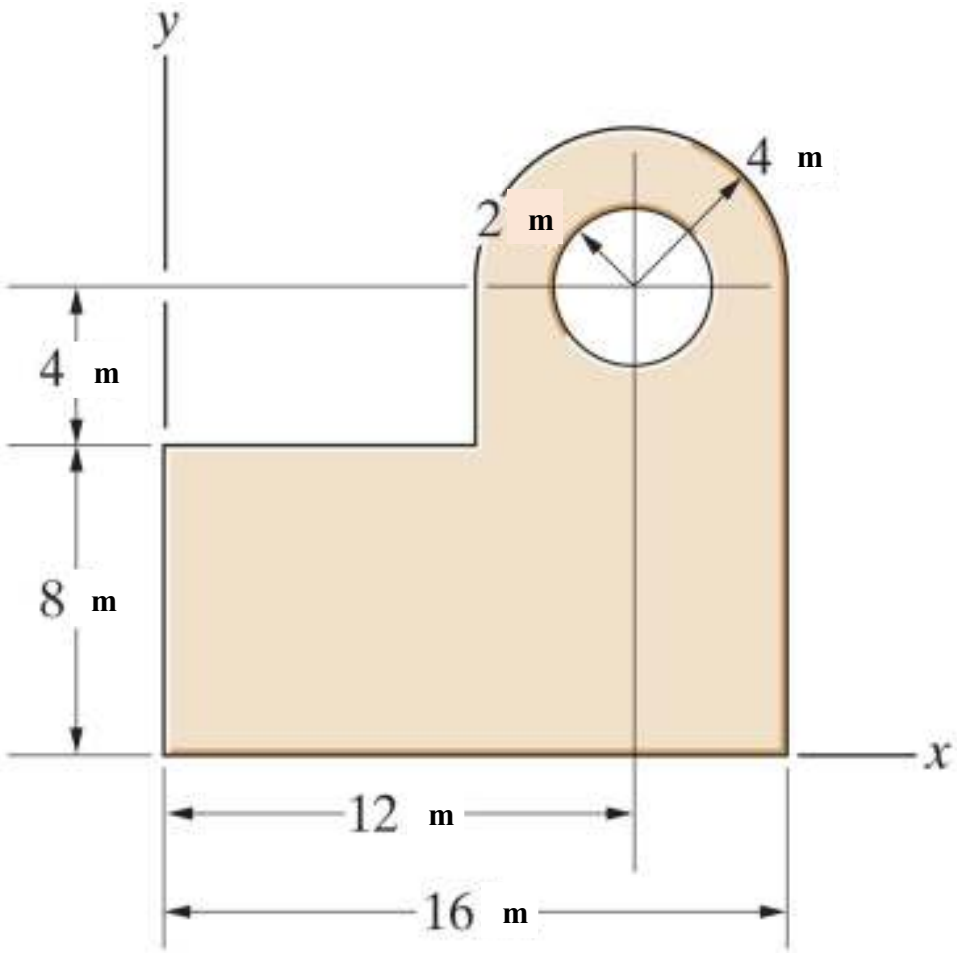
Problem 4 (15 Points)

Locate the centroid (x, y) of the below area. **Use the below table in your solution**.

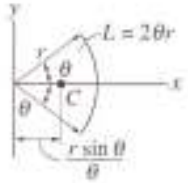
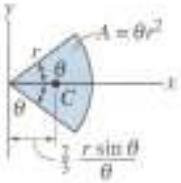
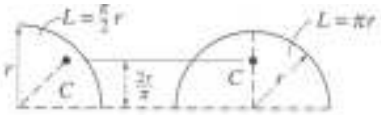
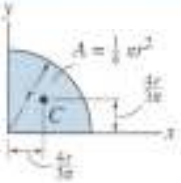
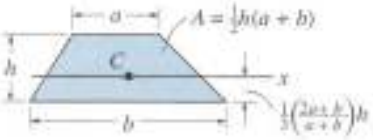
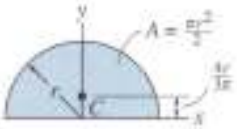
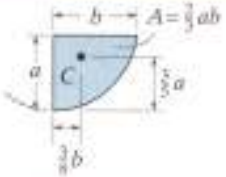
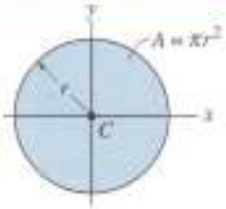
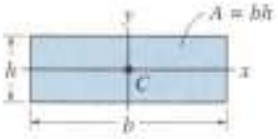
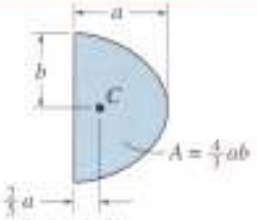
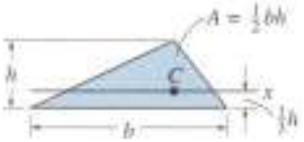


Problem (15 Points)

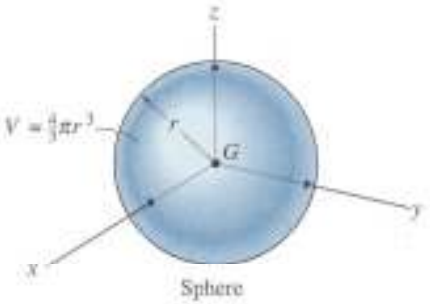
Determine the moment of inertia of the below area about the x-axis (Ix). **Use the below table in your solution**.



Geometric Properties of Line and Area Elements

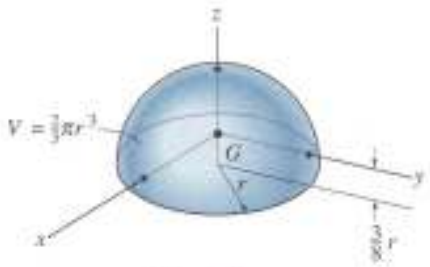
Centroid Location	Centroid Location	Area Moment of Inertia
 Circular arc segment	 Circular sector area	$I_x = \frac{1}{4}r^4(\theta - \frac{1}{2}\sin 2\theta$ $I_y = \frac{1}{4}r^4(\theta + \frac{1}{2}\sin 2\theta$
 Quarter and semicircle arcs	 Quarter circle area	$I_x = I_y = \frac{1}{16}\pi r^4$ $I_{x'} = I_{y'} = \frac{1}{16}\pi r^4$
 Trapezoidal area	 Semicircular area	$I_x = \frac{1}{8}\pi r^4$ $I_y = \frac{1}{8}\pi r^4$
 Semiparabolic area	 Circular area	$I_x = \frac{1}{4}\pi r^4$ $I_y = \frac{1}{4}\pi r^4$
 Exparabolic area	 Rectangular area	$I_x = \frac{1}{12}bh^3$ $I_y = \frac{1}{12}hb^3$
 Parabolic area	 Triangular area	$I_x = \frac{1}{36}bh^3$

Center of Gravity and Mass Moment of Inertia of Homogeneous Solids



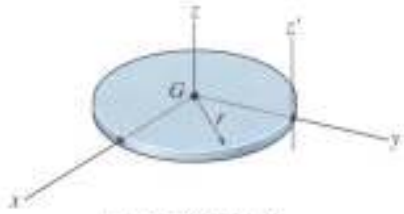
Sphere

$I_{xx} = I_{yy} = I_{zz} = \frac{2}{5}mr^2$



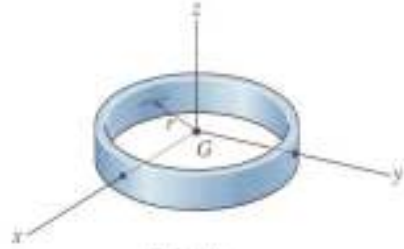
Hemisphere

$I_{xx} = I_{yy} = 0.259mr^2 \quad I_{zz} = \frac{2}{5}mr^2$



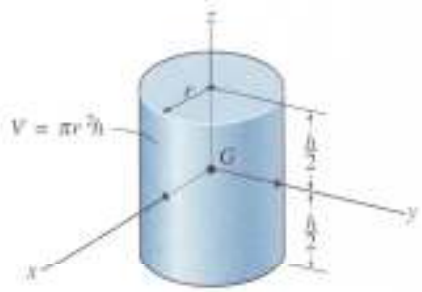
Thin Circular disk

$I_{xx} = I_{yy} = \frac{1}{4}mr^2 \quad I_{zz} = \frac{1}{2}mr^2 \quad I_{zz'} = \frac{3}{4}mr^2$



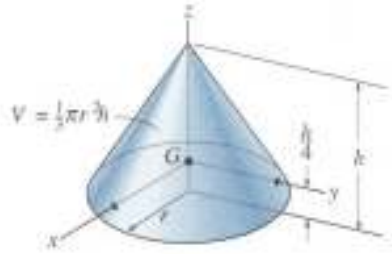
Thin ring

$I_{xx} = I_{yy} = \frac{1}{2}mr^2 \quad I_{zz} = mr^2$



Cylinder

$I_{xx} = I_{yy} = \frac{1}{12}m(3r^2 + h^2) \quad I_{zz} = \frac{1}{2}mr^2$

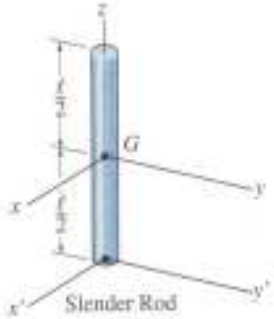


Cone

$I_{xx} = I_{yy} = \frac{3}{80}m(4r^2 + h^2) \quad I_{zz} = \frac{3}{10}mr^2$

Thin plate

$I_{xx} = \frac{1}{12}mb^2 \quad I_{yy} = \frac{1}{12}ma^2 \quad I_{zz} = \frac{1}{12}m(a^2 + b^2)$



Slender Rod

$I_{xx} = I_{yy} = \frac{1}{12}ml^2 \quad I_{x'x'} = I_{y'y'} = \frac{1}{3}ml^2 \quad I_{z'z'} = 0$