

بسم الله الرحمن الرحيم

King Fahd University of Petroleum & Minerals

DEPARTMENT OF CIVIL ENGINEERING

Second Semester 1432-33 / 2011-12 (112)

**CE 203 STRUCTURAL MECHANICS I**

**Major Exam 2**

Tuesday, April 24, 2012 7:00-9:15 P.M.

Student Name	Family					First			
ID No. (9 Digits)									

CIRCLE YOUR COURSE--SECTION NO.							
Section #	2	3 & 9	4 & 6	5	7	8	10
Instructor	Hamdan	Altayyib	Khathlan	Suwaiyan	Salah	Ali	Saeid

**Summary of Scores**

Problem	Full Mark	Score
1	20	
2	20	
3	20	
4	20	
5	20	
<b>Total</b>	<b>100</b>	
<b>Remarks</b>		

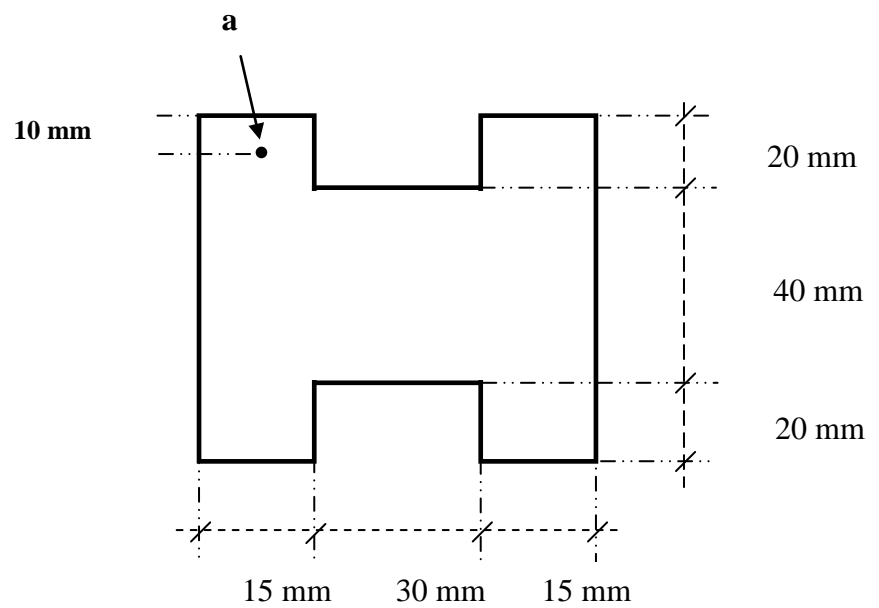
**Notes:**

1. A sheet that includes selected Basic Formulae and definitions is provided with this examination.
2. Write clearly and show all calculations, FBDs, and units.

## Problem # 5

The beam with the shown cross-section is subjected to a vertical shear force of 20 kN.

- Determine the moment of inertia about the neutral axis.
- Determine the shear stress at point a.
- Determine the maximum shear stress and indicate where it acts.



## Problem # 1

In the assembly shown below, determine the maximum shear stress in shaft  $AB$  and shaft  $CD$ . Also, determine the angle of twist of *gear B* and the angle of twist of *end A*.

Note that shaft  $AB$  has a diameter of 30 mm and Shaft  $CD$  has a diameter of 25 mm.  $E$  and  $F$  are smooth bearings.

$$G = 75 \text{ GPa}$$

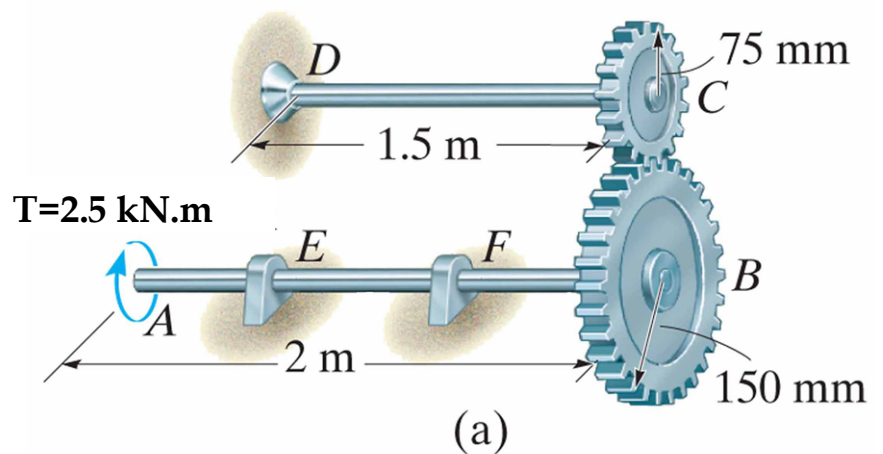


Figure: 05-20-A-EX06

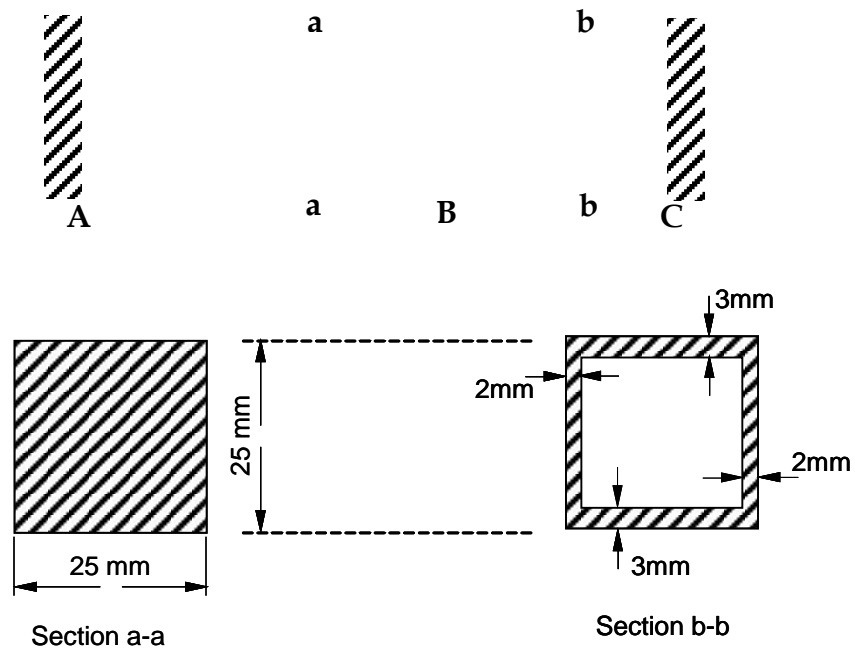
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## Problem # 2

The shaft is made from two segments: AB is a solid square section, and BC is a hollow thin section.

- Determine the maximum shear stress in the whole shaft and indicate its location.
- Determine the angle of twist at B.

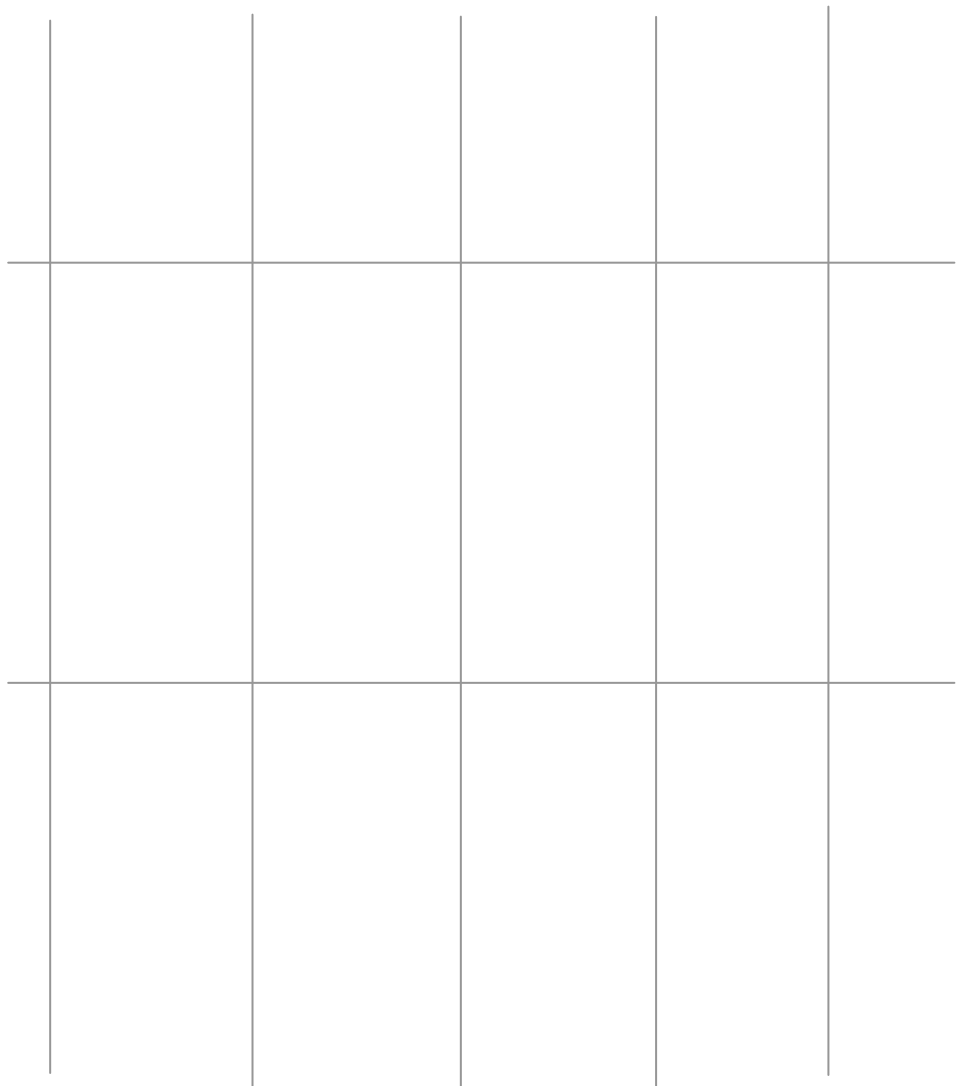
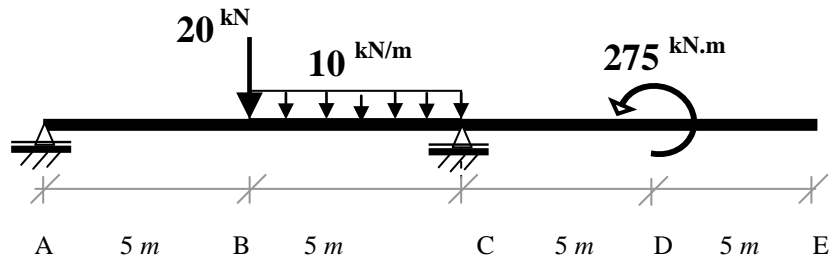
$$G_{steel} = 75 \text{ GPa}$$



### Problem # 3

Use the graphical method (*i.e.* areas summation) to draw shear force diagram (SFD) and bending moment diagram (BMD) for beam ABCDE.

**Note:** Reaction  $A_y = 50 \text{ kN}$  ( $\uparrow$ ).



## **Problem # 4**