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	
Total	100	
Remarks		

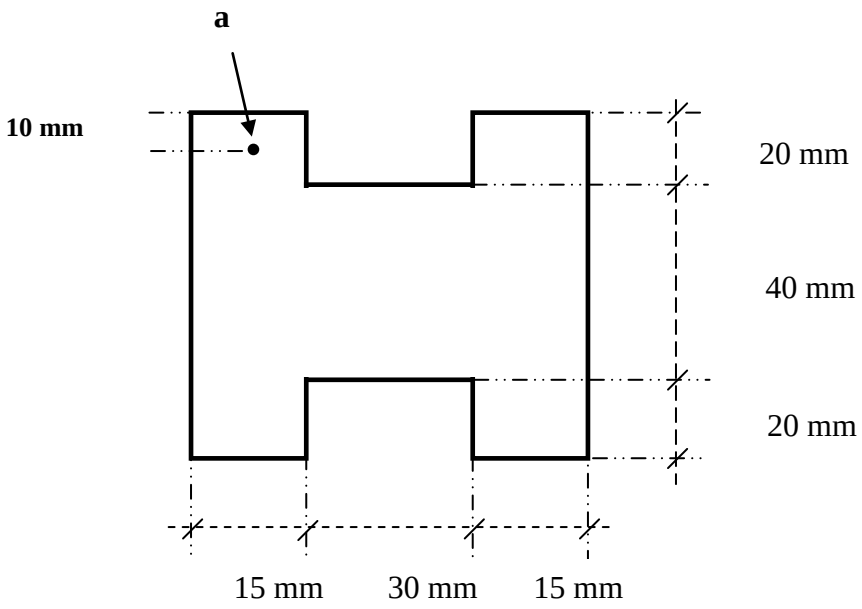
Notes:

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.

a) Determine the moment of inertia about the neutral axis.
b) Determine the shear stress at point a.
c) 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* GPa**

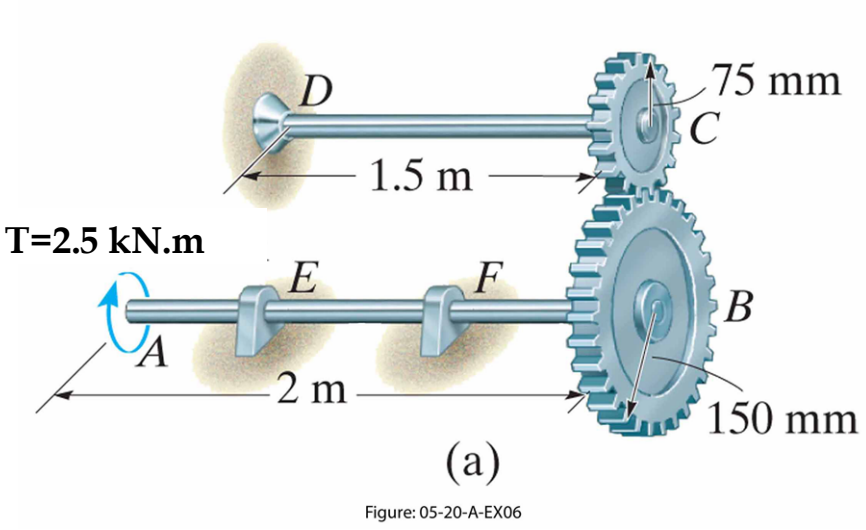


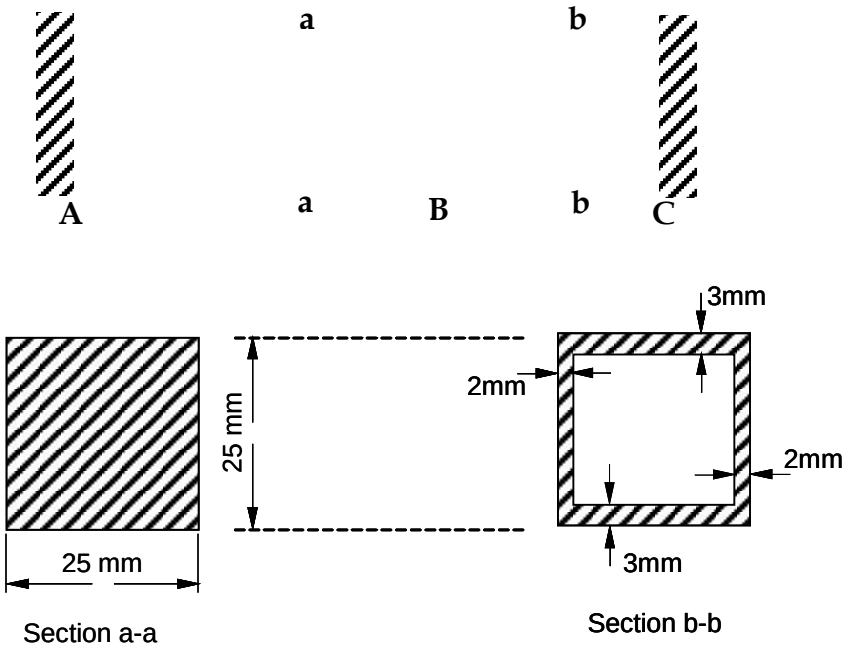
Figure: 05-20-A-EX06

Problem # 2

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

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

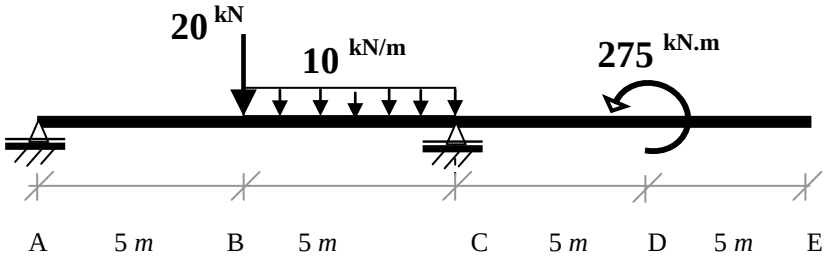
$G_{steel} = 75\ GPa$



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 $A_y = 50$ kN (↑).



Problem # 4