QUIZ 2
Spring 2006-2007
(Wednesday May 9, 2007)
CIVE311 – STRUCTURES I
CLOSED BOOK, 1 & 1/2 HOURS

Name: _____   **ID#:** _____

NOTES

- 1 PROBLEM – 4 QUESTIONS - 12 PAGES.
- ALL YOUR <u>ANSWERS</u> SHOULD BE PROVIDED ON THE QUESTION SHEETS.
- **ONE <u>EXTRA</u> SHEET IS PROVIDED AT THE END.**
- **ASK FOR <u>ADDITIONAL</u> SHEETS IF YOU NEED MORE SPACE.**
- SOME ANSWERS MAY REQUIRE <u>MUCH LESS</u> THAN THE SPACE PROVIDED.
- *DO NOT* USE THE <u>BACK</u> OF THE SHEETS FOR ANSWERS.
- <u>DRAFT</u> BOOKLET WILL BE PROVIDED; BUT DO NOT USE FOR ANSWERS.
- BOTH QUESTION SHEETS AND DRAFT BOOKLET SHOULD BE <u>RETURNED</u>.
- <u>CHECK BOXES</u> ARE TO CONFIRM THAT YOU HAVE SOLVED A QUESTION.

YOUR COMMENT(S)

_____

_____

DO NOT WRITE IN THE SPACE BELOW

MY COMMENT(S)

_____

_____

YOUR GRADE

QUESTION 1:_ _ /15
QUESTION 2:_ _ /55
QUESTION 3:_ _ /10
QUESTION 4:_ _ /20
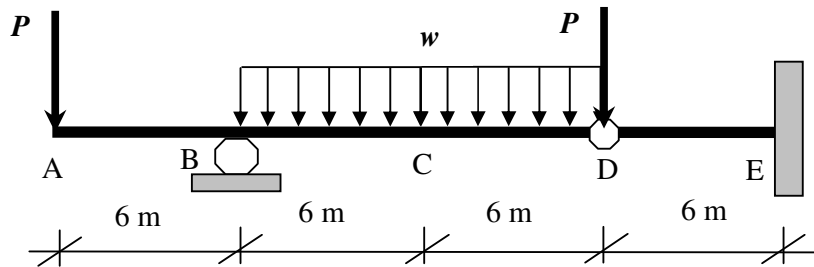*Other: _ _ _*
_____

TOTAL: /100

Problem I/I:

Figure I

Referring to Figure I:
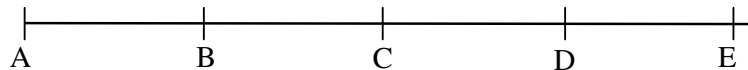$EI=2,000,000$ kN.m^2 throughout the beam (except in Question 4).
$w=20$ kN/m and $P=10$ kN throughout the problem (except in Question 4).
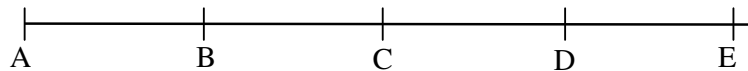Neglect the own weight of the beam.

1. Compute the **_reactions_** (forces and moments) in the beam, and draw the **_shear_** and bending **_moment_** diagrams. *(15 points)*

SHEAR:

MOMENT:

Calculations and/or Diagrams:

2. USING THE MOMENT-AREA METHOD

Based on the moment diagram in question 1, sketch a ***reasonable deflected shape***. (2 *points*) ☐

In what follows, you can calculate slope and deflections in the order you find suitable.

Compute the ***slopes θ*** and vertical ***deflections v*** at all points A, B, C, D, and E. (*35 points*) ☐

Compute the ***maximum downward deflections:***
  (i)   between D and E. (*5 points*) ☐
  (ii)   between B and D. (*10 points*) ☐

Based on the results obtained, neatly/clearly sketch the ***final deflected shape*** and show the results obtained. (3 *points*) ☐

INITIAL DEFLECTION
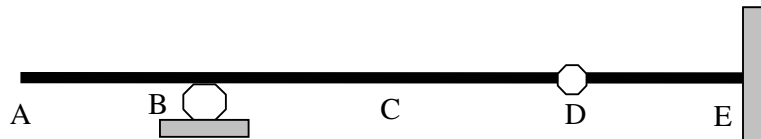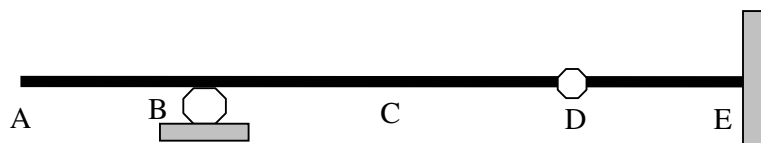
A   B   C   D   E

FINAL DEFLECTION

A   B   C   D   E

Calculations and/or Diagrams:

Calculations and/or Diagrams (cont'd):

Calculations and/or Diagrams (cont'd):

Calculations and/or Diagrams (cont'd):

3. USING THE CONJUGATE BEAM METHOD

Show the ***conjugate beam***, and explain how you would compute slopes and deflection of the beam in <u>Figure I</u>. *(10 points)*

<u>Calculations and/or Diagrams:</u>
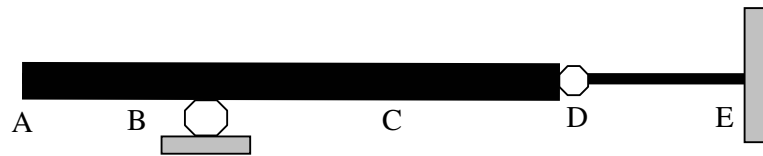
4. Let *w*=20 kN/m and *P*=0.

For the same beam as in <u>Figure I</u> (with *w* only), and assuming member AD (Case 1) or member DE (Case 2) to be very stiff, sketch the expected ***deflected shape*** of the beam for each of the cases as shown below. (NO CALCULATIONS) (*10 points*)

Using the simplest and quickest approaches possible, calculate:
- (i)   Case 1: the ***deflections v*** at points A and D. (5 points)
- (ii)   Case 2: the ***deflections v*** at points A and C. (5 points)

<u>DEFLECTION for Case 1</u>

<u>DEFLECTION for Case 2</u>

Calculations and/or Diagrams:

EXTRA SHEET 1/1: Continued from page _____

Name: _____   **ID#:** _____

Calculations and/or Diagrams: