QUIZ 1
Spring 2002-2003
(Wednesday, April 2, 2003)
CIVE311 – STRUCTURES I
CLOSED BOOK, 1 ½ HOURS

Name: Key Key **ID#:** 0000-00000

NOTES

- 2 PROBLEMS 12 PAGES
- ALL YOUR ANSWERS SHOULD BE PROVIDED ON THE QUESTION **SHEETS.**
- TWO EXTRA SHEETS ARE PROVIDED AT THE END
- ASK FOR ADDITIONAL SHEETS IF YOU NEED MORE SPACE.
- SOME ANSWERS MAY REQUIRE MUCH LESS THAN THE SPACE PROVIDED
- ***DO NOT* USE THE BACK OF THE SHEETS FOR ANSWERS.**
- **DRAFT BOOKLET WILL BE PROVIDED; BUT DO NOT USE FOR ANSWERS.**
- **BOTH QUESTION SHEETS AND DRAFT BOOKLET SHOULD BE RETURNED.**

YOUR COMMENT(S)

DO NOT WRITE IN THE SPACE BELOW

MY COMMENT(S)

YOUR GRADE

Problem I: 35 /35
Problem II: 65 /65
Other:

TOTAL: 100 /100

Problem I: *(35 points)*

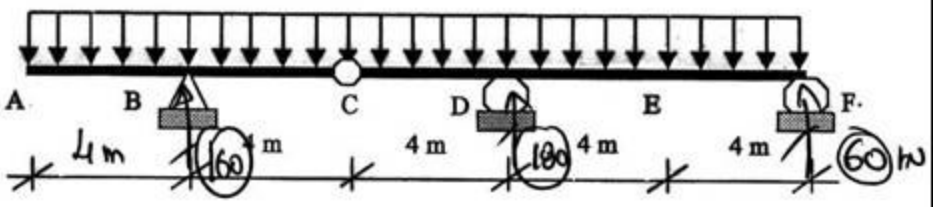
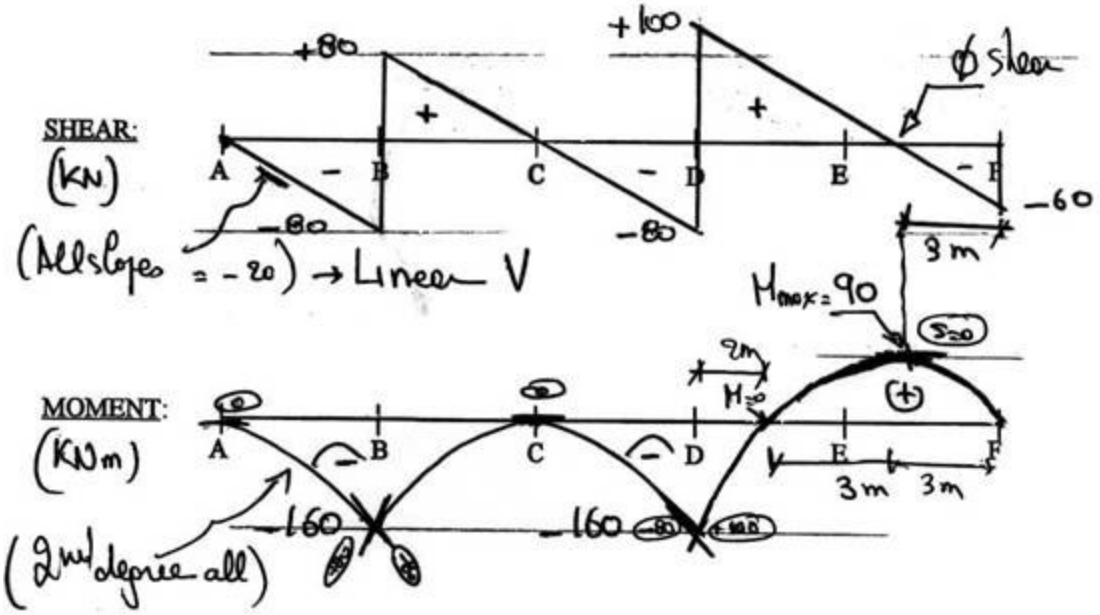
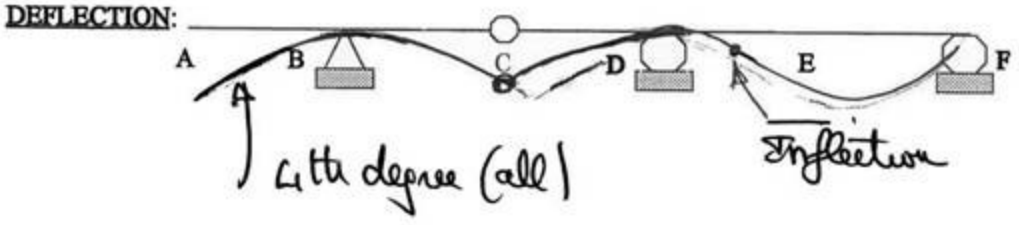


Figure I

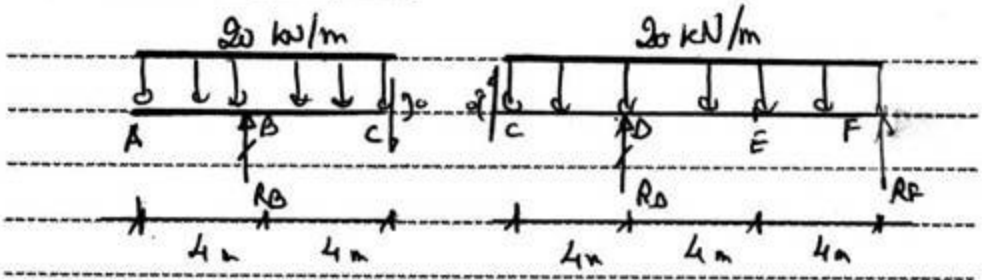
For the beam shown in Figure I, the own weight is neglected.
Your diagrams/sketches should include any feature/value you think is relevant or important.

Let w=20 kN/m
Draw the ***shear*** and bending ***moment*** diagrams and sketch the ***deflected shape***. *(35 points)*





Calculations and/or Diagrams (cont'd):



(ABC) $\sum M_C = 0 \Rightarrow R_B = \frac{20 \times 8^2/2}{4} = 160\,kN \uparrow$

$\sum F_y = 0 \Rightarrow V_C = 0$

(CDEF) $\sum M_F = 0 \Rightarrow R_D = \frac{20 \times 12^2/2}{8} = 60\,kN \uparrow$

$\sum F_y = 0 \Rightarrow R_F = 180\,kN \uparrow$

Draw V (page 2)

Draw M (∩)

Sketch Deflection (∩)

Problem II: *(65 points)*

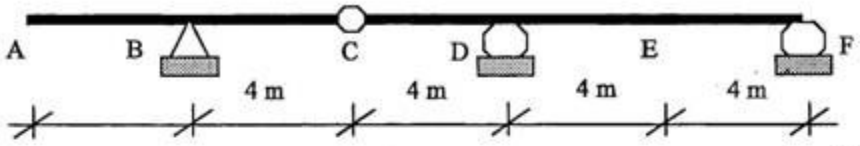
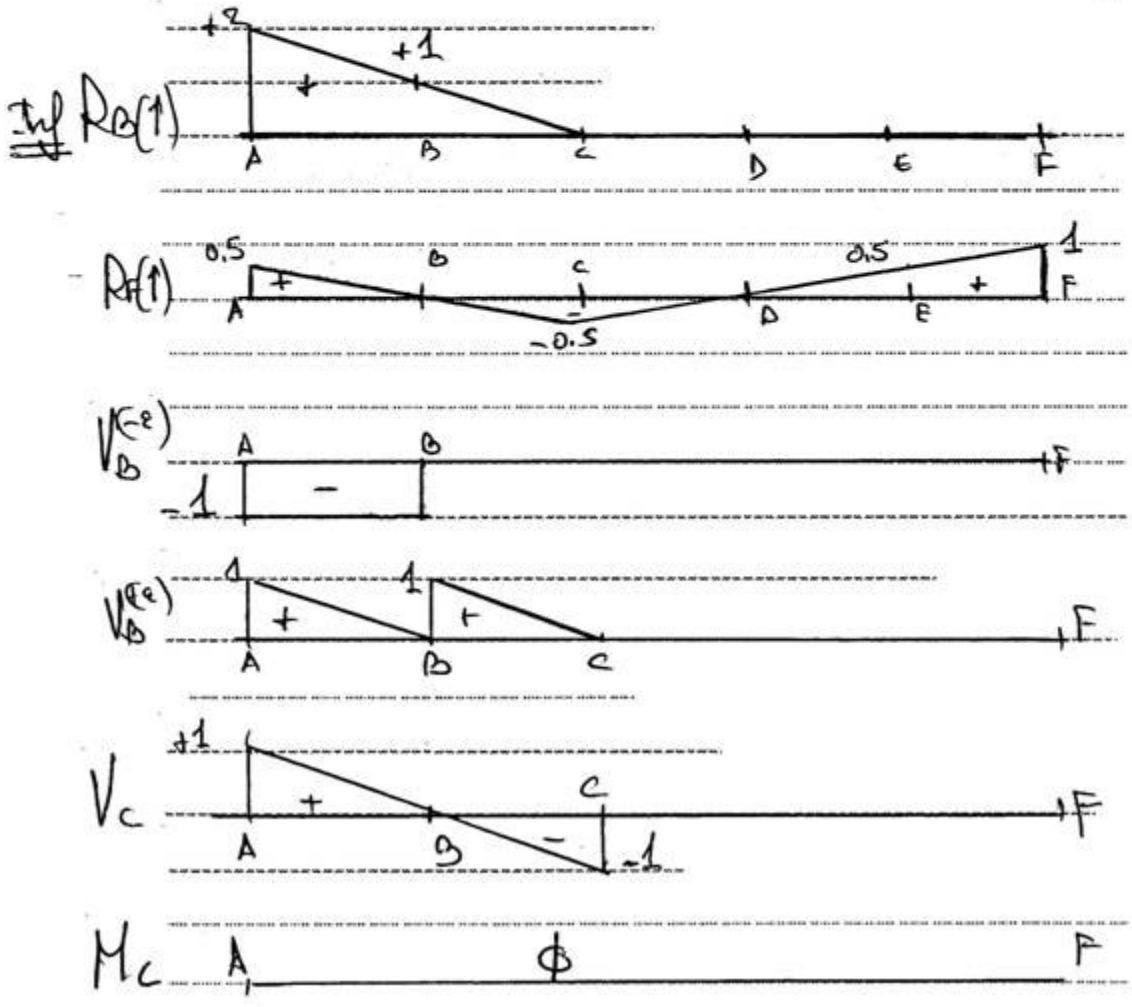


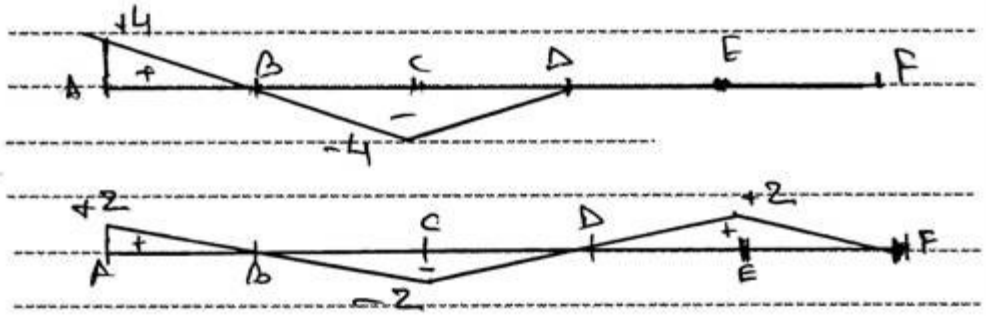
Figure II

1 Referring to Figure II, draw the influence lines for R_B, R_F, V_B, V_C, M_C, M_D, and M_E. *(40 points)*

Calculations and Diagrams:

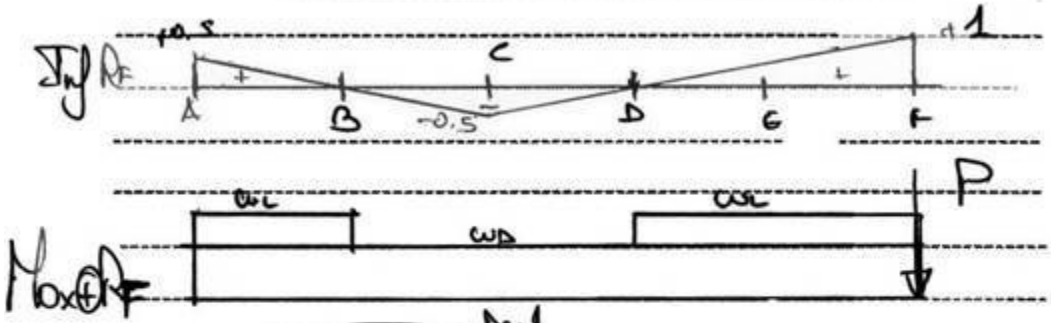


Calculations and Diagrams (cont'd):



2. Let w_D=20 kN/m (dead load); w_L=10 kN/m and P=20 kN (live loads)
   - Compute the maximum absolute values for R_F. *(10 points)*
   - Compute R_F for dead load only and compare with ~~Question 1~~ Problem I. *(5 points)*

Calculations and Diagrams:



Max ⊕ R_F

$= \underbrace{20 \times (0.75 \times 4)}_{\text{Dead}} + 10\left(\frac{0.5 \times 4}{2} + \frac{1 \times 8}{2}\right) + 20 \times 1$

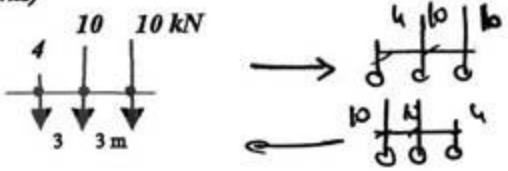
Max ⊕ R_F = **130 kN ↑** = Max Absolute R_F

(> |Max ⊖ R_F| or Min ⊕ R_F, by inspection)

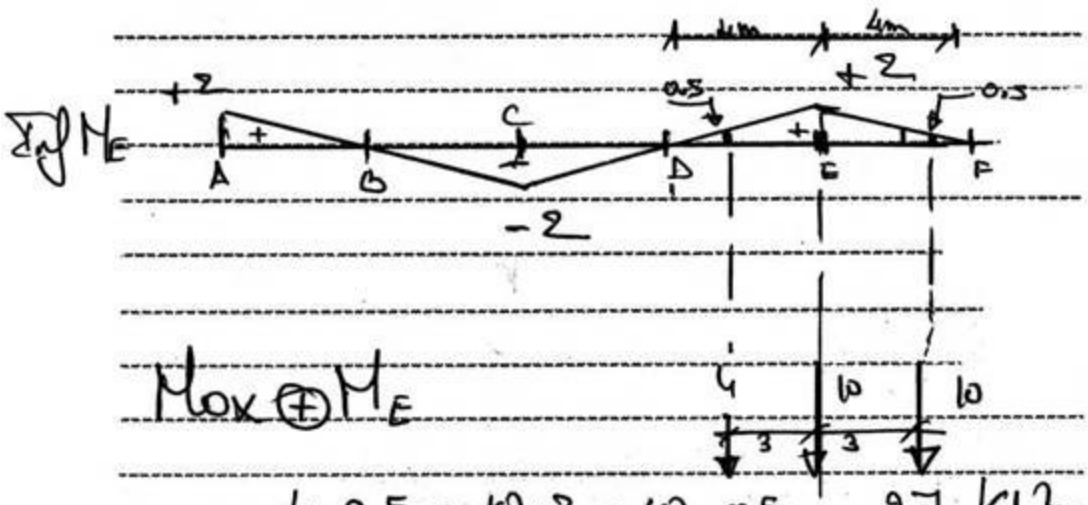
Due to W_D only:

R_F = 60 kN ↑ Same as in Problem I ✓

3. Compute the maximum absolute values for M_E for the following truck moving load, which can travel in either directions. *(10 points)*



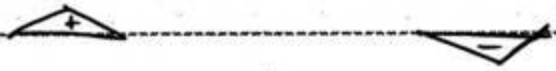
Calculations and Diagrams:



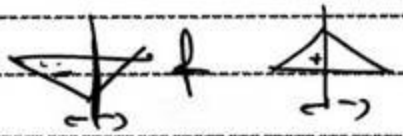
$M_{ox} \oplus M_E$

$= 4 \times 0.5 + 10 \times 2 + 10 \times 0.5 = 27$ kNm

Notes. • $M_{ox} \oplus M_E = M_{ox} \ominus M_E$.



• Also



Symmetrical ⇒ ⟶ ⟵ are the same

$M_{ox} \pm M_E = 27$ kNm