

SOLUTION
(Rough draft)

CIEG 125

Introduction to Civil Engineering
Fall 2005

Midterm Exam – Monday October 24, 2005

Time allowed: 50 minutes

Open book, open notes

No cell phones

All answers should be on these pages. Use the backs of pages if necessary, but clearly identify which question your work is associated with.

GRADING SHEET – MIDTERM

NAME: MCNEIL

		Points awarded	Max points
Question 1. (20 points)	a) b) c) d)		4 4 6 6
Question 2. (20 points)	a) b) c) Magnitude Direction		5 5 5 5
Question 3. (25 points)	a) Free body diagram b) Equilibrium Equations c) Forces		5 10 10
Question 4. (20 points)	Response Rationale Relationship to code of ethics		5 5 10
Question 5. (15 points total)	Factor 1 Factor 2 Factor 3		5 5 5
TOTAL			100

(-5)
didn't know problem

QUESTION 1. (Short Answer Questions)

a. Why should you get civil engineering related work experience during college?

Work related experience during college exposes you to the different branches of civil engineering. It also indicates to prospective employers that you have been in a "real" work environment and have been committed/motivated to find a relevant position.

b. What is Chi Epsilon?

It is the Civil Engineering honor society.

c. What qualifications does a Professional Engineer have?

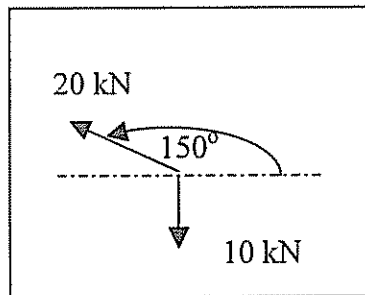
- 1) Graduate of an accredited engineering program
- 2) Passed Fundamental of Engineering (FE exam)
- 3) Work under a PE for several years (varies by state)
- 4) Passed the PE exam

d. At Thanksgiving your aunt will ask you "So, what is Civil Engineering?". What is your one or two sentences response?

Civil Engineering is the design, construction and operation of buildings and facilities that are often large in scale and/or used by many.

QUESTION 2.

A 20 kN force is applied at 150° to the horizontal. A 10 kN weight hangs vertically from the same point. The following free body diagram represents the two forces.



a. Compute the horizontal and vertical components of the 20 N force.



$$F_x = -20 \cos 30 = -20 \times 0.866 = -17.32 \text{ kN}$$

$$F_y = 20 \sin 30 = 10 \text{ kN}$$

- b. Compute the total force in the horizontal and vertical directions for both the 20 kN and 10 kN forces.

$$F_x^{\text{total}} = -17$$

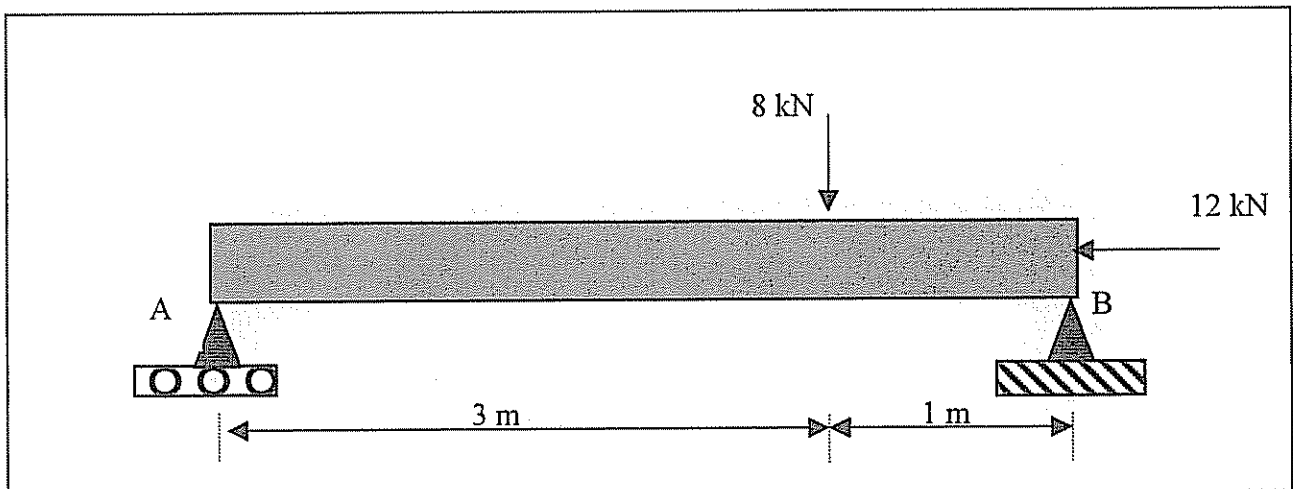
$$F_y^{\text{total}} = \phi$$

- c. Determine the magnitude and direction of the resultant force.

$$\vec{F}^{\text{total}} = -17$$

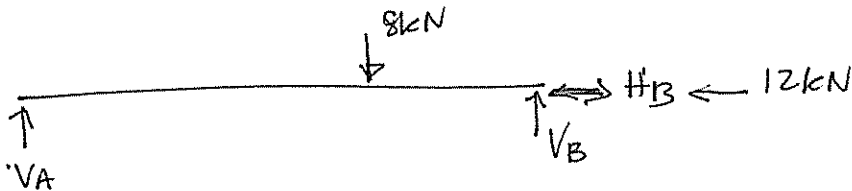
at 180° to the horizontal

QUESTION 3.



Assume the beam in the above diagram is weightless.

- a. Draw the free body diagram for the beam



b. Write the equilibrium equations for

i. The forces in the vertical direction.

$$V_A + V_B = 8 \text{ kN}$$

ii. The forces in the horizontal direction

$$H_B - 12 \text{ kN} = 0$$

iii. Moments about the joint A.

$$8 \text{ kN} \times 3 \text{ m} - V_B \times 4 \text{ m} = 0$$

c. Compute the reactions at A and B by solving the equations above

$$H_B = 12 \text{ kN} \quad \text{from ii)}$$

$$V_B = 6 \text{ kN} \quad \text{from iii)}$$

$$V_A = 2 \text{ kN} \quad \text{from i)}$$

QUESTION 4.

Note: Chris and Joe are the main characters in an ongoing story. See pages 25-29 (Chapter 3).
Chris submitted the report on the safety of the structure for a steel mill in Mifflinburg, Pennsylvania. He is not sure what his boss, Joe, did with the report. What are Chris' responsibilities in the context of the code of ethics?

This is a difficult interest. What ~~stays~~ this is not an unsafe issues but Joe's actions may not be in the best interest of the public.

eg "Engineers shall avoid all conduct or practice that deceives the public." (NSPE Code of ethics) is an issue because Chris is avoiding his responsibility to the employees. However Chris may not serve anyone by stepping out of line - Joe may fire him, he probably would not save the plant.

There are many ways to answer this question. Below is one answer.

QUESTION 5.

In selecting the design for the Indian River Bridge Inlet, describe three factors that DelDOT took into account. Explain why each factor is important.

Factor 1: Public Input

Description (one sentence):

DelDOT conducted an elaborate public involvement issue to ~~understand the~~ get public input.

Why is this factor important (one sentence)?

This factor is important to understand the transportation needs, environmental sensitivities and aesthetic interests of the community.

Factor 2: Large Clear span for boats/shipping

Description (one sentence):

The currents in the channel are tricky for navigation.

Having a large clear span is important for boats to get through easily & safely.

Why is this factor important (one sentence)?

Factor 3: No piers ^{in channel to eliminate} ~~for~~ scow.

Description (one sentence):

Currents cause scow at the bridge piers which in turn can make the bridge unsafe.

Why is this factor important (one sentence)?

Inspecting for scow², correcting scow is expensive.