

Midterm Exam - Practice**Time allowed: 50 minutes****Open book, open notes****No cell phones****All answers and 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

QUESTION 1. (Short Answer Questions)

a. What does ASCE stand for?

American Society of Civil Engineers.

b. What is ASCE?

ASCE is the professional society for Civil Engineers. It provides continuing education, networking opportunities and technical information.

c. What qualifications does a Engineer-in-Training (EIT) have?

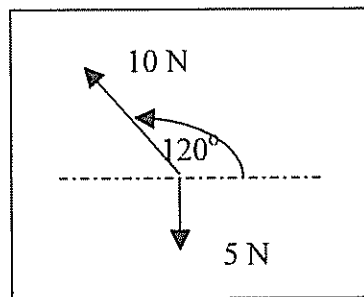
1. Degree from ~~a student~~ an accredited engineering program
2. Completed & passed Fundamentals of Engineering exam.

d. Describe in one or two sentences a sub-discipline of civil engineering?

Structural engineering is the design of buildings and other structures to serve the purpose they were intended.

QUESTION 2.

A 10 N force is applied at 120° to the horizontal. A 5 N 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 10 N force.

$$F_x = 10 \text{ N} \times \cos 120 = 10 \times 0.5 \\ = -5.0 \text{ N}$$

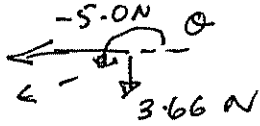
$$F_y = 10 \text{ N} \sin 30 \\ = 10 \times 0.866 \\ = 8.66 \text{ N}$$

- b. Compute the total force in the horizontal and vertical directions for both the 10 N and 5 N forces.

$$F_x = -5.0 \text{ N}$$

$$F_y = 8.66 - 5 = 3.66 \text{ N}$$

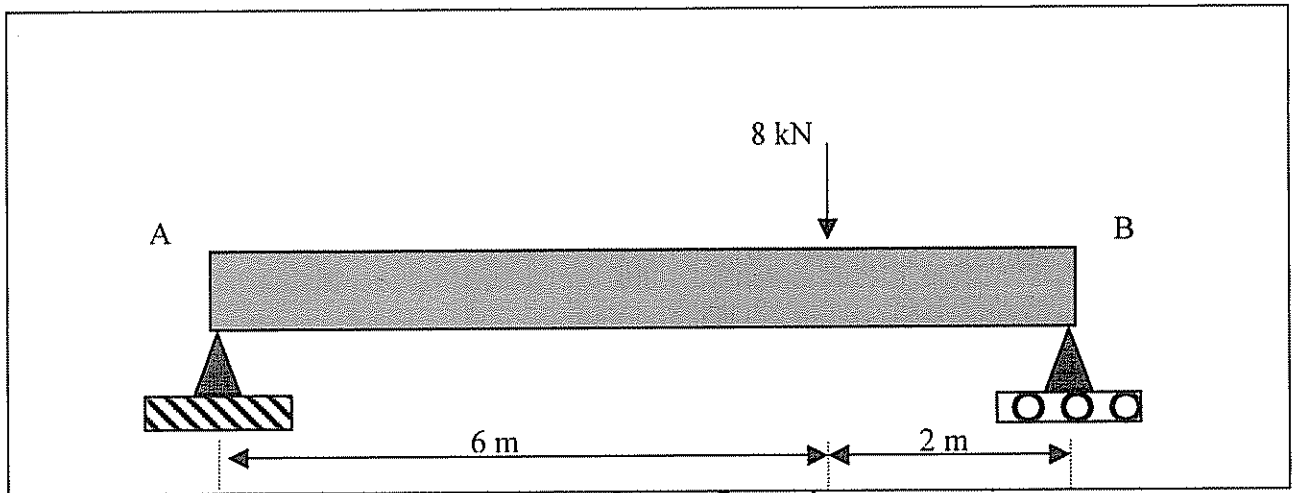
- c. Determine the magnitude and direction of the resultant force.



$$\text{Magnitude: } F = \sqrt{5^2 + 3.66^2} = 6.2 \text{ N.}$$

$$\text{Direction: } \theta = 180 + \tan^{-1} \frac{3.66}{5.0} = 180 + 36.2 = 216.2$$

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

$$H_A = 0$$

iii. Moments about the joint A.

$$\sum M^{\uparrow} = 0 \quad 8 \cdot V_B - 8 \cdot 6 = 0$$

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

$$\begin{aligned} \text{ii) } \Rightarrow \quad V_B &= 6 \text{ kN} \\ V_A &= 2 \text{ kN} \end{aligned}$$

QUESTION 4.

In the case of the improperly designed overhang, one suggested solution is for Sarah and Joe to write a letter to Timmo stating clearly and forthrightly their concerns with the design of the overhang. Would this get Pines (Joe, Sarah and Chris) off the hook? Why or why not? Your answer should reference the ethical responsibilities of engineers.

I am not sure what the answer is legally. However ethically, the letter does not get them off the hook. They are not "holding paramount the health, safety and welfare of the public".

If Timmo chooses not to act, Pines (& Sarah, Joe and Chris) are not ~~acting~~ still responsible for the problem.

QUESTION 4.

Describe three factors a bridge designer should take into account when considering what type of bridge (truss, suspension, arch etc) to use for a particular location. Explain why each factor is important.

Factor 1: Span

Description (one sentence):

Span describes the distance that the bridge has to "cross".

Why is this factor important (one sentence)?

Specific types of bridges are more suitable for long spans than others.

Factor 2: Clearance

Description (one sentence):

Clearance refers to the height above the water, road or other facility under the bridge.

Why is this factor important (one sentence)?

The height above the water, road or other facility is determined by the geometry of the bridge, which in

Factor 3: Foundation condition

turn is influenced by the type of bridge.

Description (one sentence):

The foundation (or soil conditions) at the site determine how the bridge can be anchored.

Why is this factor important (one sentence)?

Some types of bridges eg arches require rigid foundations.

Other factors: environment
aesthetics
loadings (eg traffic).