CIEG 125 **Introduction to Civil Engineering**
Fall 2005

Final Exam - Practice **Time allowed: 2 hours**
Open book, open notes
No cell phones **Bring your calculator**
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 – FINAL .

NAME: Sue - Draft.

		Points awarded	Max points
Question 1. (14 points)	a) b) c) d) e)		2 2 2 2 6
Question 2. (12 points)	a) Free body diagram b) Equilibrium Equations c) Forces		2 6 4
Question 3. (15 points)	Summary Recommendation Rationale		3 6 6
Question 4. (13 points)	a) Calculation b) Comparison Interpretation		5 5 3
Question 5. (10 points)	a) Gantt Chart b) Critical Path c) Duration		5 3 2
Question 6 (12 points)	a) b) c) d) e) f)		2 2 2 2 2 2
Question 7 (12 points)	a) Cash Flow Diagram b) Calculation Interpretation		5 5 2
Question 8 (12 points)	a) Advantages b) Disadvantages c) Assessment		4 4 4
TOTAL			100

QUESTION 1. (Short Answer Questions)

a. What does ABET stand for?

Accreditation Board for Engineering and Technology.

b. Why is it important to have a degree in Civil Engineering from an ABET accredited program?

A degree from an (ABET) accredited program is required for professional registration (and to sit the FE exams).

c. What are the benefits of joining the ASCE student chapter?

1). Networking
2) Awards membership fees for joining.

d. Describe a sub-discipline of civil engineering in which civil engineers interact with other engineers from other disciplines?

Traffic engineers work with electrical engineers on signals and other devices - particularly intelligent transportation systems.

e. Using the correct number of significant digits, covert the following physical quantities to the proper SI units

i. 45 lbm (1lbm = 0.4536 kg)

$45 * 0.4536 = 21$ kg

ii. 10×10^2 gal (1 gal = 0.0037854 m^3)

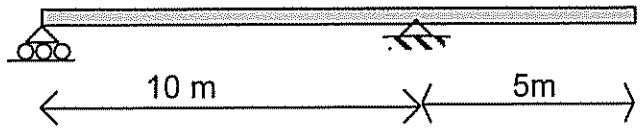
$10 \times 10^2 * 0.0037854 = 4 \times 10^2$ ~~gal~~ m^3

iii. 250 cu ft per sec (1 cu ft = 0.028317 m^3)

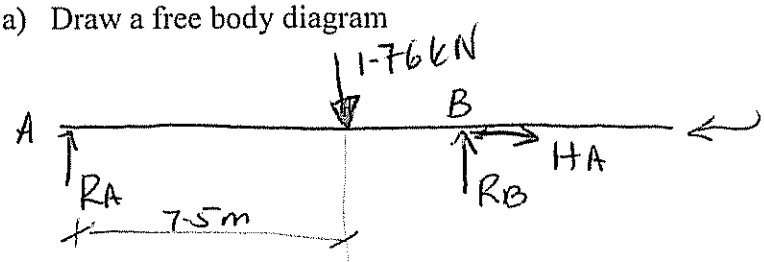
$250 * 0.028317 = 7.1$ m^3/sec.

QUESTION 2.

Consider the following uniform beam, which has a mass of 12 kg/m and is supported on a roller and a pin support.



a) Draw a free body diagram



equivalent force to uniformally distributed force = 12*9.8*15 = 1.76 kN applied 7.5m from the end of beam.

b) Write the equilibrium equations

$\Sigma H \Rightarrow \quad H_A = 0 \qquad -1)$

$\Sigma V \Rightarrow \quad R_A + R_B = 1.76\,kN \qquad -2)$

$\Sigma M_A \Rightarrow \quad 1.76 * 7.5 - R_B * 10 = 0 \qquad -3)$

c) Determine the reactions at the roller and the pin.

1) $\Rightarrow \quad H_A = 0$

3) $\Rightarrow \quad R_B = \dfrac{1.76 * 7.5}{10} = 1.32\,kN$

2) $\Rightarrow \quad R_A = 1.76 - 1.32 = 0.44\,kN.$

QUESTION 3. (Gift question)

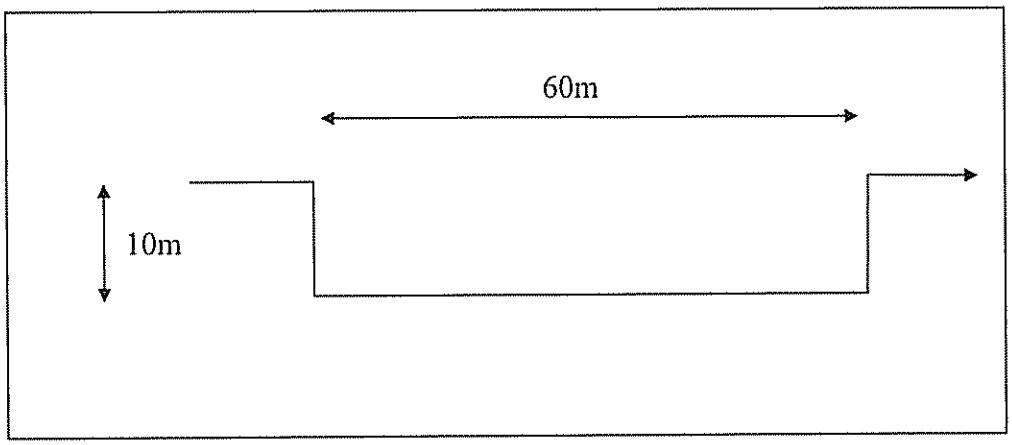
Chris, our engineer visits a construction site where a structure designed by him is being erected. Chris has not been hired to supervise the construction. Noticing some unsafe conditions (poor scaffolding, improper shoring etc.), Chris wonders whether or not to report them. On a previous job a colleague had reported some safety violations, and then on later visits had not noticed additional safety violations, which subsequently caused injury to workers. The colleague was sued for carelessness. What should Chris do? Your response should summarize the ethical issues and make a recommendation citing the relevant parts of the professional codes of ethics.

The actions of the colleague are irrelevant. Chris must "hold paramount the safety, health and welfare of the public". If Chris sees unsafe conditions he must report them.

QUESTION 4.

⇒ does not degrade.

Carbon monoxide is assumed to be a conservative pollutant. On a depressed 4 km long section of urban highway, the carbon monoxide emissions during peak hour are estimated to be 2,180 kg/ hour. Assume the highway right of way is 60 meters wide and the morning peak hour lasts for 2 hours. The highway is depressed 10m below the grade level of the area, there is negligible or no air movement outside the depressed trench, and that the area is initially free of pollutant.



a) What is the carbon monoxide concentration for this section at the end of the morning peak period?

$$CO\text{concentration} = \frac{2180 \times 2 \times 10^6}{4 \times 10^3 \times 60 \times 10} \quad \frac{kg}{hr} \cdot \frac{hr}{m \cdot m \cdot m} \quad \frac{kg}{mg}$$

$$= 1816 \quad \frac{mg}{m^3}$$

(NAAQS)

b) The National Ambient Air-Quality Standards define the maximum level of carbon monoxide to protect public health to be 40,000 mg/m^3. Are these levels of carbon monoxide in the trench of concern for drivers, passengers and highway workers? Why or why not?

$1816 < 40{,}000\ mg/m^3$

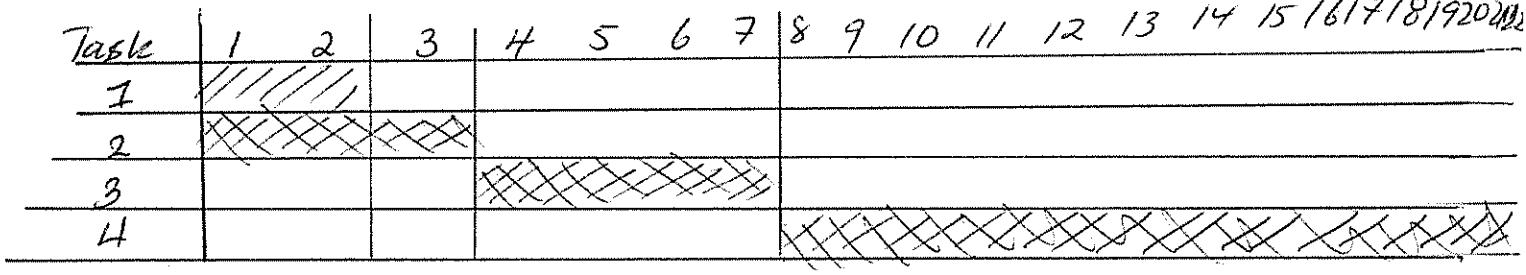
The concentration is significant less than the NAAQS. Therefore this concentration is not of concern to drivers, passengers and highway workers as the standard represents a maximum acceptable level.

QUESTION 5.

Pink Floyd Properties has another construction project. You will again bid as a subcontractor. The subcontract is for earthworks in preparation to construction. One of your employees has developed a WBS for the project and a set of precedences as shown below.

Task Number	Task Name and Description	Duration (days)	Predecessors
1.	Site set up	2	
2	Fence area	3	
3	Clear vegetation and topsoil	4	1,2
4	Excavation and hauling	15	3

a) Draw a Gantt Chart for the project



b) Identify the critical path

Critical path is Task 2, Task 3, Task 4 - ### on Gantt Chart

c) What is the minimum duration for the project?

22 days.

QUESTION 6.

Develop explanations of the following terms suitable for inclusion in a glossary:

a) Transportation Mode

- refers to a means of travel such as automobile passenger, bus or walking.

b) Sprawl

Expansion of urban/suburban areas into farmland adjacent to a metropolitan area.

c) Trip - travel between an origin and destination.

d) Land use

Activity on a specific parcel of land ~~that~~ that characterizes travel patterns, environment impact and economic activity.

e) Construction manager

Construction manager supports the construction process by ensuring timely supply of materials, labor & equipment, cost control and schedule site management and overall oversight.

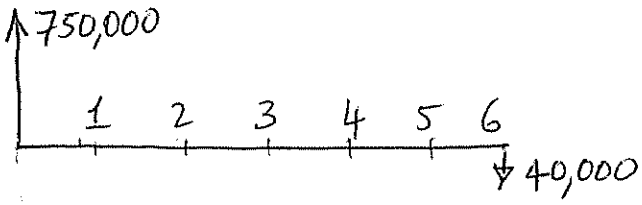
f) Coffer dam

-a structure to create a dry area so construction can proceed. Commonly used for foundations, especially piers for bridges.

QUESTION 7.

A mechanical robot is part of the welding operation for structural steel assembly. The robot costs $750,000 and because of the specialized function is expected to have a useful life of only six years with an estimated salvage value at retirement of $40,000. Operating and maintenance costs are expected to be negligible.

a) Sketch the cash flow diagram



b) If the annual interest rate is 8%, at the end of the robot's life what are the total labor savings that must be realized to justify the expenditure of the purchase price?

$i = 0.08$.

$$F = \frac{750{,}000}{(1+i)^6} - 40{,}000$$

$= \$433{,}000$

Need to save $433,000 in labor to justify to decision to purchase the robot.

QUESTION 8.

a) What are the advantages of team based projects?

Team based projects
- provide more resources
- generate more ideas
- identifies more opportunities
- take greater risk
- produce solutions that are more widely accepted
- provide opportunities for leadership & growth.

b) What are the disadvantages of team based projects?

Team based projects also:
- require greater effort
- can be inefficient
- generate conflict & hostility that may be counterproductive
- create "group think"!

c) Assess how your team (or teams) functioned for the presentations and projects 2 and 3.

My observation is that some of your teams worked very well, and others were dysfunctional. The functional teams were productive and organized and all members contributed.