Matlab Group Assignment #1

Section #:_____

Names: UINs:

_____ _____

_____ _____

_____ _____

_____ _____

1. Write the system of equations below in matrix form, then solve using matrix division in Matlab:

$$\begin{aligned} x - y + 3z - 2w &= 10 \\ -2x + 4y - 3z + w &= 5 \\ 3x - y + 10z - 4w &= 29 \\ 4x - 3y + 8z - 2w &= 6 \end{aligned}$$

2. Repeat for the following system of equations. In the space below, explain Matlab's warning and what is actually happening (if you are not sure, try using the **solve** command as well).

$$\begin{aligned} 3x + 6y - 9z &= 15 \\ 2x + 4y - 6z &= 10 \\ -2x - 3y + 4z &= -6 \end{aligned}$$

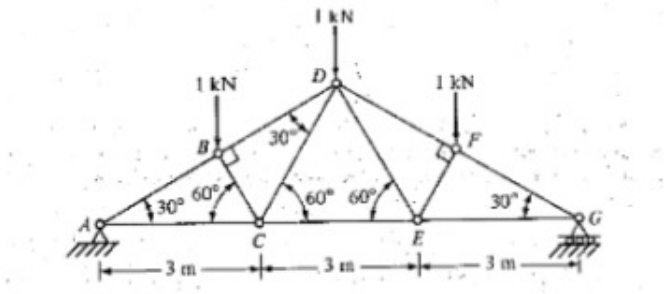
3. Repeat for the following system of equations. In the space below, explain Matlab's warning and what is actually happening.

$$\begin{aligned} 2x - 4y + z &= -4 \\ 4x - 8y + 7z &= 2 \\ -2x + 4y - 3z &= 5 \end{aligned}$$

For the remainder of this lab, we will be applying matrices and systems of equations to Engineering applications. **CHOOSE ONE OF THE FOLLOWING APPLICATIONS TO SOLVE.** Use the principles stated to set up a system of equations and solve in Matlab.

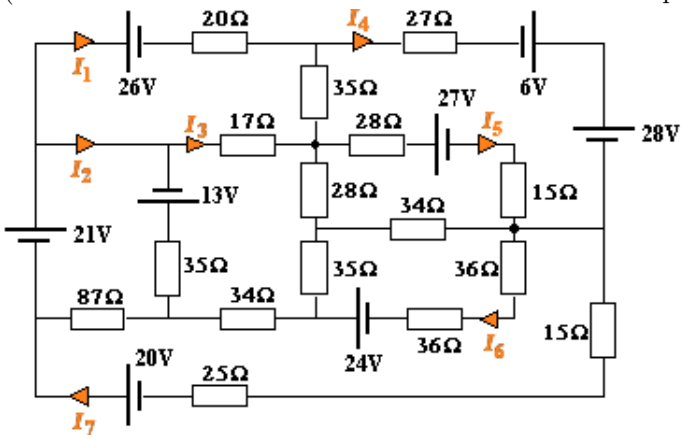
Truss Problem (for MEEN, CVEN, AERO, PETE majors especially)
Basis for this type of problem: Newton's Law $\sum F_x = 0$, $\sum F_y = 0$

The triangular truss is subject to three vertical loads as shown in the figure below. Find the forces in each of the bars, plus the (vertical) reaction forces at A and G.
(HINT: For an example of how to set up the equations, see Gilat, p130 #22-23)



Resistive Circuit Problem (for ECEN, CPSC majors especially)
Basis for this type of problem: Kirchhoff's Law $\sum V = 0$, $V = IR$

The electrical circuit shown consists of resistors and voltage sources. Determine the current in each resistor.
(HINT: The mesh current method is illustrated in Gilat p83)



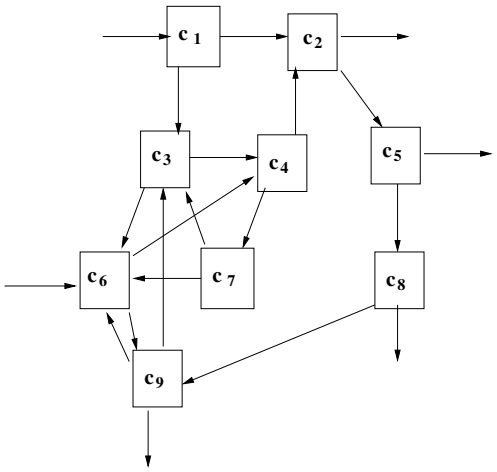
(**Problem choices continue on next page**)

Mass-Balance Reactor Problem (for CHEN, BIEN, BICH majors especially)

Basis for this type of problem: Given a conservative material passing through a solution in a reactor, $\sum input = \sum output$ and $m = Qc$ (mass = flow rate times concentration). For further explanation, see http://www.math.tamu.edu/~dmanuel/math151/ChemReactorFlow.pdf.

The reactor below consists of 9 interconnected reactors. The flow rate (in m^3/min) and concentrations (in g/m^3) are shown below (F_{ab} =flow rate from reactor a to reactor b):

If the concentration and flow into reactor 1 are each 10 and the concentration and flow into reactor 6 are each 8, find the concentration of solutions in each of the reactors.



F_{12}=2
F_{13}=8
F_{22}=7
F_{25}=9
F_{34}=10
F_{36}=5
F_{42}=14
F_{47}=8
F_{55}=4
F_{58}=5
F_{64}=12
F_{69}=6
F_{75}=5
F_{76}=3
F_{88}=2
F_{89}=3
F_{93}=2
F_{86}=2
F_{99}=5