Homework # 5

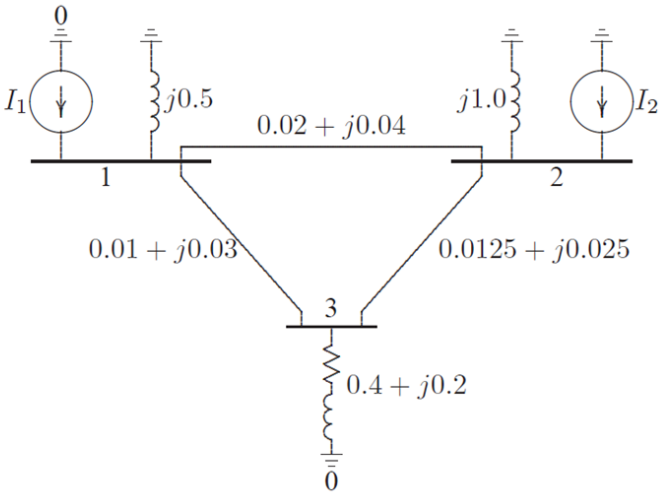
Due: Monday, July 24th

Question 1. (10 points) What are electrical bus bars in a power system?

Question 2. (10 points) Explain about the graph theory to represent power system networks.

Question 2. (10 points) Explain about the bus admittance matrix and its role in solving power system networks.

Question 3. (35point) Formulate the bus admittance matrix for the following power system.



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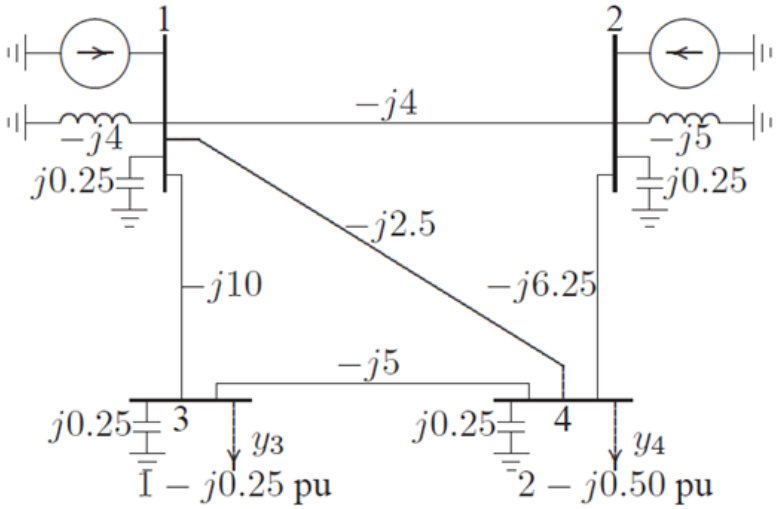
Question 4. (35point) Formulate the bus admittance matrix for the following power system.



1) Electrical bus bars are comparable to nodes in a circuit. They connect the individual phases of each connected component with theoretically zero resistance and reactance.

2) Graph theory uses bus bars as vertices and everything connecting them, such as transmission lines, motors, and generators, as edges with weights of their admittance.

2) An admittance matrix shows all the self and mutual inductances between nodes in the graph, and using I=YV, you can solve for your desired variables with matricies. This is notably useful for computers because they're very good at matrix math.

3) y=1/Z, Yii=sum all touching, Yij=-yij

	y01=-2j,	y02=-j,	y03=2-j	Y00=2-4j
y10=-2j,		y12=10-20j,	y13=10-30j	Y11=20-52j
y20=-j,	y21=10-20j		y23=16-32j	Y22=26-53j
y30=2-j,	y31=10-30j,	y32=16-32j		Y33=28-63j

[2-4j	2j	j	-2+j]
[2j	20-52j	-10+20j	-10+30j]
[j	10+20j	26-53j	-16+32j]
[-2+j	-10+30j	-16-32j	28-63j]

4) y=1/Z, Yii=sum all touching, Yij=-yij

	y01=-3.75j	y02=-3.8j	y03=-4j	y04=-4j	Y00=-15.55j
y10=-3.75j		y12=.25j	y13=.1j	y14=.4j	Y11=-3j
y20=-3.8j	y21=.25j		y23=0	y24=.16j	Y22=-3.39j
y30=-4j	y31=.1j	y32=0		y34=.2j	Y33=-3.7j
y40=-4j	y41=.4j	y42=.16j	y43=.2j		Y44=-3.24j

[-15.55j	3.75j	3.8j	4j	4j	]
[3.75j	-3j	-.25j	-.1j	-.4j	]
[3.8j	-.25j	-3.39j	0	-.16j	]
[4j	-.1j	0	-3.7j	-.2j	]
[4j	-.4j	-.16j	-.2j	-3.24j	]