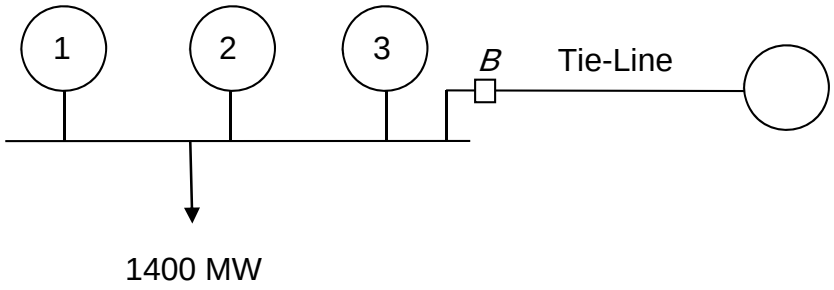
King Saud University
Department of Electrical Engineering
EE 585 Power System Operation and Control

Miterm Exam#1 (26/10/2013) Time Allowed: 1.0 H

Question 1 (10 points)

A power plant consists of three units whose MVA, output power, and per-unit speed regulations are given in Table 1 were feeding a common load of 1400 MW at 60 Hz when breaker *B* is opened.



	Rated MVA	Output Power (MW)	Speed Regulation (p.u)
Unit 1	600	500	0.04
Unit 2	500	400	0.06
Unit 3	400	300	0.05

Determine the new frequency and the new power output of each unit.

Question 2 (10 points)

A power system consists of 4 plants having the following fuel-costs:

$$FC_1 = 18P_1 + 0.035P_1^2$$

$$FC_2 = 22P_2 + 0.025P_2^2$$

$$FC_3 = 26P_3 + 0.020P_3^2$$

$$FC_4 = 32P_4 + 0.015P_4^2$$

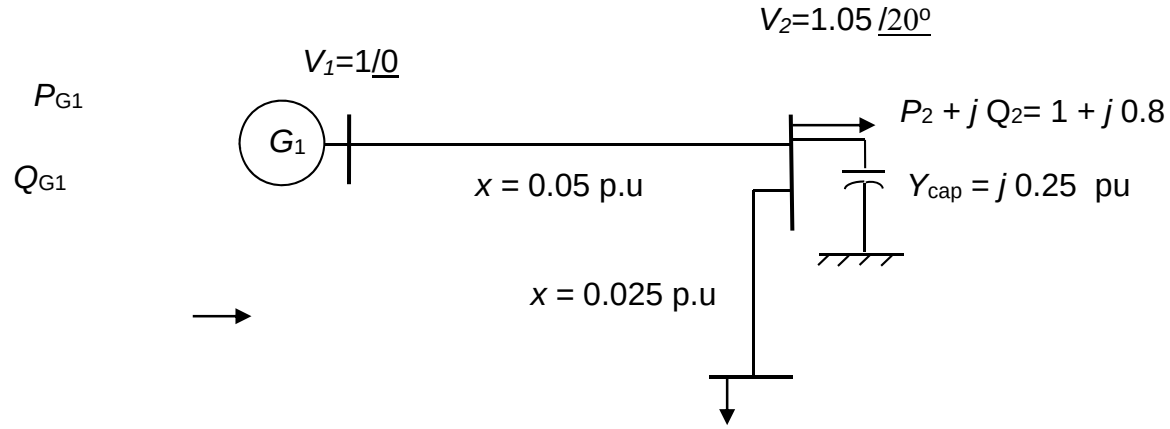
where P_1, P_2, P_3, and P_4 are output power (MW) of each plant respectively. The total system power transmission losses is given by

$$P_L = 0.0004P_1^2 + 0.0005P_2^2 + 0.0006P_3^2 + 0.0007P_4^2$$

For a total demand of 1000 MW determine the output (MW) of each plant for economic operation.

Question 3 (10 points)

For the system shown below, the transmission line shunt admittance is neglected, but there is a capacitor connected to the load bus with admittance $Y_{cap} = j\ 0.25$ pu.



i) Determine the admittance matrix Y_{bus} in rectangular form.

ii) Write the load flow equations at bus1in terms of V_2, $\sin\delta_2$ and $\cos\delta_2$

iii) Write the load flow equations at bus 2 in terms of V_2, $\sin\delta_2$ and $\cos\delta_2$.