King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE520-171
Power World Case and Analysis

The Nine Bus utility power network depicted in Power world simulator file (TS9Bus.PWB) base case is the subject of analysis.

Power Flow analysis (10 points):

A)   It is required to complete **all displayed variables and attributes** of the system in (TS9Bus.PWB) in a similar way displayed in (B7FLAT.PWB). Each transmission line of the system has 120 MVA as thermal limit. Each transformer has a thermal limit of 280 MVA. The generators limitations and power variation cost are depicted in the table below.

Generator	P_{max} (MW)	P_{min} (MW)	Q_{max} (MVAR)	Q_{min} (MVAR)	Cost of P MSR/MW
G_1	200	50	100	-50	1.1
G_2	300	50	100	-20	1
G_3	250	50	50	-50	1.2

The transformers tap changers could be varied within (+/- 5 %) of its nominal ratio. A switchable capacitor bank can be added when required at a cost is 0.1 million SR for each 0.1 pu capacity. The power utility must maintain the bus voltages within (+/- 5 %) of the nominal value and line or transformer flow below **85 % (plus your two digit serial number) of their thermal limits**.

Conduct Load-Flow study and submit a report about the system base-case operation.

B)   The loads of case A have been increased by **40% (plus your two digit serial number)** at every load bus keeping the same power factor of the base case. Run the Load-Flow of this case and report abnormality in the power utility system due to this increase in the loads.

If corrective actions are necessary then use the power-flow control tools and/or switching elements to restore the system to a normal operation. The objective is to bring the system operation under normal conditions with minimum cost. Report in details any abnormality faced due to the loads increase, and the approach considered to bring the system back to its normal operation.

Short Circuit Analysis (5-points):

The objective is to reach the MVA short circuit capacity of each Breaker in the network for any transient short circuit scenario outer of the generating units for both above cases.

Transient Stability Analysis (5-points):

In order to design of the clearing speed of the circuit breaker used to clear any fault in the system, It is required to find the critical clearing time of the protection elements used to restore the generating unit oscillation due to faults. Report about your finding for the conducted Transient stability investigated cases.

Notice:

Use power world simulator ver. 19 (free online download trial).

Use software typical values for short-circuit & transient-stability analysis.

Due date Dec. 13th, 2017.

Individual exam on the project items Dec. 18th , 2017.