

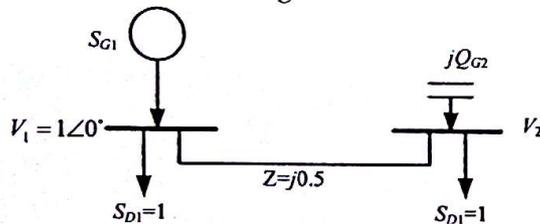
One A-4 size "cheat-sheet" is allowed in the exam, with anything written on it. No one is allowed to share anything, including calculators. Anybody found using unfair means will be expelled from the exam.

Ignore the effect of Earth unless otherwise mentioned. Assume all lines are completely transposed unless otherwise mentioned.

1. With $|V|=100$ V, the instantaneous power into a network N has a maximum value of 1707 W and minimum value of -293 W. Find a possible single phase RL circuit equivalent of the network N. 4

2. Draw the phasor diagram of an open circuit medium length transmission line using the receiving end voltage as reference. In this phasor diagram, indicate the sending end current and the sending end voltage. 3+3
 What is the effect on this phasor diagram (draw a new one!) when a shunt reactor is switched on at the receiving end.

3. In the power network shown below, if the capacitor (Q_{G2}) is replaced by a generator SG2, such that each generator is able to support the local load. Then $V_2 =$ 2



- a. $1\angle 0^\circ$
 b. $\angle V_2 < 0^\circ, |V_2| > 1$
 c. $\angle V_2 < 0^\circ, |V_2| < 1$
 d. $1\angle \delta, \delta > 0$
 e. $1\angle \delta, \delta < 0$

4. Consider a medium length transmission line, at the ends of which a load is to be connected. Before switching on the load, the impedance measured from the sending end of the line was $800 \angle -89^\circ$ ohms. While switching on the load, a three phase short-circuit occurred at the receiving end. At that instant, the impedance measured at the sending end of the line was $200 \angle -77^\circ$ ohms. Find the characteristic impedance Z_C and γl for the line. 5

5. A 200 mile, 220 kV, 60 Hz, single circuit three-phase transmission line, composed of 'Merlin' conductors located vertically, with adjacent phases 20 feet apart. 4+4

What is the surge impedance loading, in MW, for this line?

The line is loaded with 200 MW at 0.8 pf lagging. Calculate the sending end voltage required to support this load at 220 kV.

Extra Credit (no partial credit)

6. Which of the following distribution companies does not operate in Delhi? 2
- a) Delhi Electric Supply Undertaking
 - b) Bombay Suburban Electric Supply ✓
 - c) Military Engineering Services ✓
 - d) New Delhi Municipal Corporation ✓