# Exercise 5

Power systems

Question 1

- A symmetrical three-phase short circuit occurs on the 22kV busbars of the circuit shown as a one-line diagram in the figure below. Calculate the fault current and the fault apparent power.
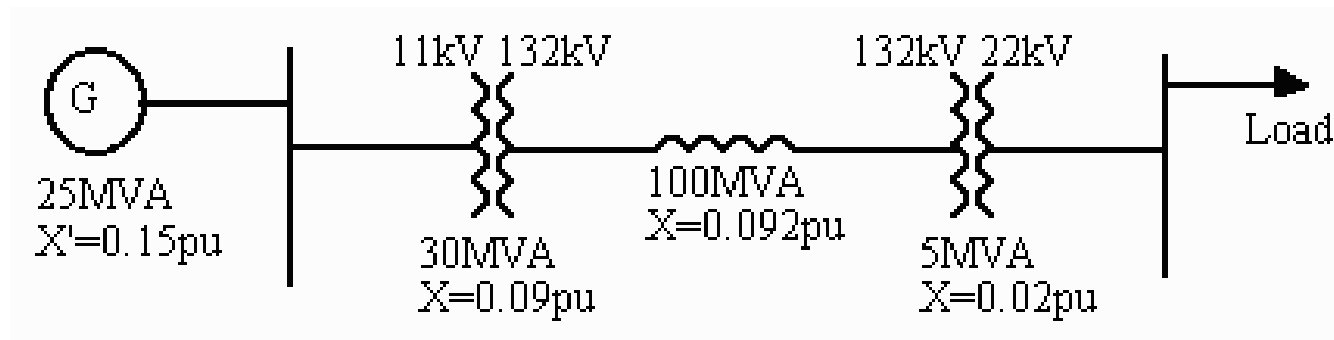
Question 2

- Two 100-MVA, 20-kV turbo generators (each of transient reactance 0.2 pu) are connected, each through its own 100-MVA, 0.1 pu reactance transformer, to a common 132-kV busbar. From this busbar, a 132-kV feeder, 40 km in length, supplies an 11-kV load through a 132/11-kV transformer of 200 MVA rating and reactance 0.1 pu. If a balanced three-phase short circuit occurs on the low voltage terminals of the load transformer, determine, using a 100-MVA base, the fault current in the feeder and the rating of a suitable circuit breaker at the load end of the feeder. The feeder impedance per phase is $(0.035+j0.14)\,\Omega/\mathrm{km}$.

Question 2
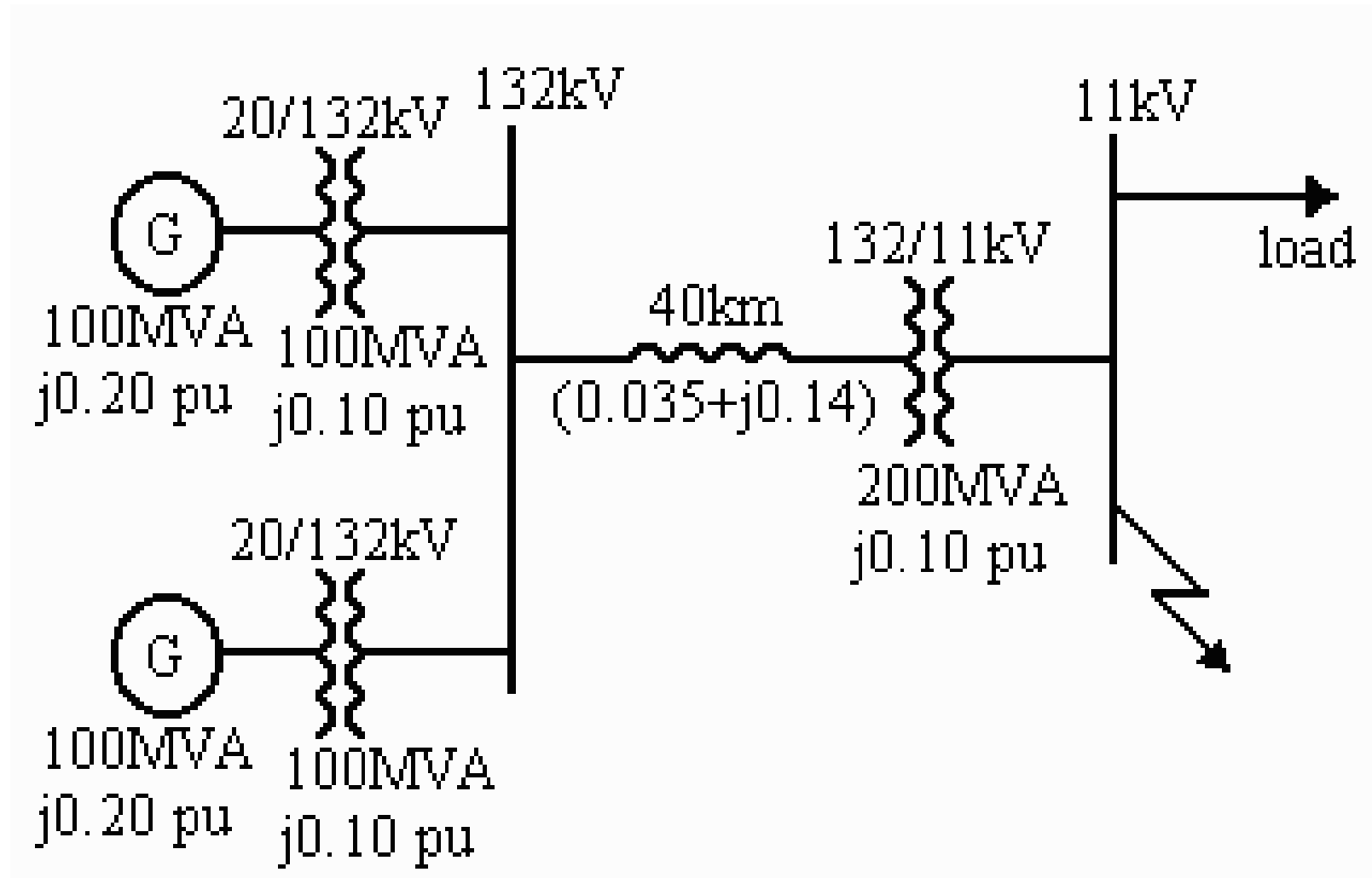
Question 3

- A single line-to-earth fault occurs in a radial transmission system. The following sequences exist between the source of supply (an infinite busbar) of voltage 1 pu to the point of the fault: $Z_1 = (0.3+j0.6)$pu, $Z_2 = (0.3+j0.55)$pu, $Z_0 = (1+j0.78)$pu. The fault path to earth has a resistance of 0.66 pu. Determine the fault current and the voltage at the point of the fault.