2 Points

Problem 9 (a) A buck converter is to be designed to deliver power from a DC input with voltage ranging between 30 V and 60 V to a 5 V output at a switching frequency of 100 kHz. The load power is expected to vary between 10 W and 200 W.

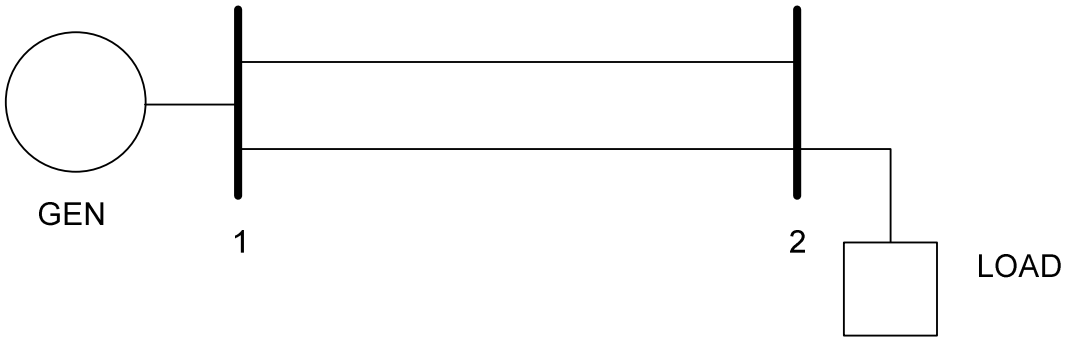
1 Point (i) What choice of inductance will *ensure* operation in discontinuous conduction mode under *all* operating conditions (i.e., all possible values of input voltage and load power)?

1 Point (ii) What choice of inductance will *avoid* operation in discontinuous conduction mode under *all* operating conditions?

2 Points

Part b) Power Systems

Given the generator on bus 1 connected to a load bus, bus 2, through a pair of identical transmission lines as shown below:



The load at bus 2 draws 5.0 pu MW and 0 pu MVAR from bus 2

The equivalent impedance of the transmission system from bus 1 to bus 2 with both lines in is 0.025j per unit

The Bus 1 voltage is 1.0 per unit volts at zero degrees phase angle, and bus 1 is the reference bus.

With both transmission lines connected the voltage magnitude and phase angle at bus 2 are:

$V_2 = 0.992$ pu volts and $\theta_2 = -7.24$ degrees

Operators now remove one of the transmission lines. The bus voltage at bus 1 remains at 1.0 pu, and the load at bus 2 stays at 5.0 + 0j

1.5 Points

A1) Solve for the voltage magnitude and phase angle at bus 2,(phase angle may be expressed in radians or degrees). You may use any method of solution that is appropriate.

0.5 Points

A2) Should the voltage at bus 2 go to a higher value or lower value with one line? Why? Does your solution verify this?