전력전자 선택 : Area of Power Electronics (Total 50 points)

1. Assume that there is a boost DC-to-DC converter. Its input and output voltages are defined as V_o and V_d, respectively. In addition, the duty ratio and switching period are represented using the variables of D and T_s.

A) Derive the relationship between the input and output voltages for the converter operating in the continuous conduction mode. (10 points)

B) What is the critical inductance value for the critical conduction mode? (10 points)

2. Consider the space vector modulation technique for a voltage source inverter with the DC-link voltage V_d.

A) Determine the possible maximum RMS value of the sinusoidal output voltage obtained by the space vector modulation. (10 points)

B) Express the duty ratios of two nonzero space vectors and a zero vector. (10 points)

C) Explain the advantages of the space vector modulation, compared to the sinusoidal PWM (SPWM). (10 points)