Unit 8 - Week 6

Assignment 6

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-11, 23:59 IST.

Consider the circuit shown in Figure 1, for questions 1 to 10. The cascade of a type-I compensated buck converter with an LDO is designed for the following specifications. V_{IN} = 1.8 V, V_O = 1.0 V, V_{DROP} = 200 mV, switching frequency (F_{SW}) = 5 MHz, L = 1 µH, C_O = C_D = 4 µF, R_O = 1 Ω, g_m = 100 µS. Assume that inductor R_{DCR} = 50 mΩ, R_{DS_ON} of M_P is 50 mΩ, forward voltage of diode D_N is 300 mV and peak-to-peak amplitude of V_{RAMP} is 0.5 V.

Adhere to the units mentioned in the question while filling in numerical answers. The duty cycle D always lies between 0 and 1.

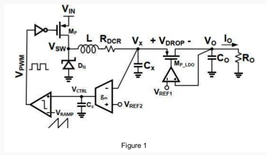


Figure 1

1) Fill in the blank with a numerical answer: The duty cycle of V_{PWM} (in respect of the circuit shown in Figure 1) is D = ____ (up to 2 decimal places).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.72,0.8

2 points

2) Fill in the blank with a numerical answer: The control voltage V_{CTRL} (in respect of the circuit shown in Figure 1) corresponding to the duty cycle of V_{PWM} found in question 1 is ____ volt (up to 2 decimal places).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.35,0.4

1 point

3) Fill in the blank with a numerical answer: The peak-to-peak inductor ripple current ΔI_L (in respect of the circuit shown in Figure 1) is ____ mA (up to 1 decimal place).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 72,92

1 point

4) Fill in the blank with a numerical answer: The average current (in respect of the circuit shown in Figure 1) drawn from the supply V_{IN} is ____ mA (up to 1 decimal place).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 700,800

1 point

5) Fill in the blank with a numerical answer: The overall conduction efficiency of the system shown in Figure 1, ignoring losses due to the inductor ripple current is η = ____ % (up to 1 decimal place).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 72,75

1 point

6) Fill in the blank with a numerical answer: Assuming that the ON resistance of diode D_N is 0 Ω, the quality factor of the inductor (in respect of the circuit shown in Figure 1) is Q = ____ (up to 1 decimal place).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.3,6

1 point

7) Fill in the blank with a numerical answer: Assuming that the ON resistance of diode D_N is 0 Ω, the minimum value of the compensation capacitor C_C (in respect of the circuit shown in Figure 1) for which the loop is stable with a gain margin of -6 dB under no-load condition is ____ nF (up to 1 decimal place).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 7.8,10

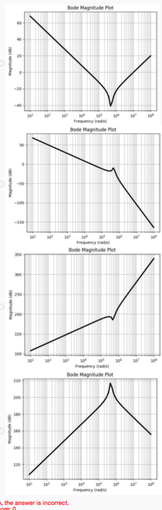
2 points

8) Fill in the blank with a numerical answer: The unity loop gain frequency of the system shown in Figure 1 is ω_{UGB} = ____ krad/s (up to 1 decimal place).

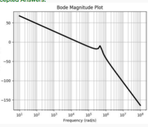
No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 41,47

1 point

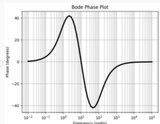
9) Identify the Bode magnitude plot of the loop gain transfer function (in respect of the circuit shown in Figure 1) amongst the choices provided below. **1 point**

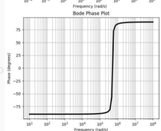


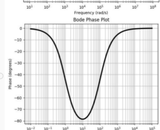
No, the answer is incorrect.
Score: 0
Accepted Answers:

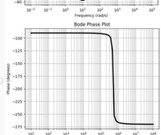


10) Identify the Bode phase plot of the loop gain transfer function (in respect of the circuit shown in Figure 1) amongst the choices provided below. **1 point**









No, the answer is incorrect.
Score: 0
Accepted Answers: