

# Unit 7 - Week 5

## Course outline

How does an NPTEL online course work?

Week 0

Week 1

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Week 4

Week 5

- Hard Switching Loss in DC DC Converters
- Magnetic Loss in DC-DC Converters, Relative Significance of Losses as a Function of the Load Current
- Output Voltage Ripple of a Buck Converter
- Choosing the Inductor and Capacitor for a Buck Converter
- CCM Vs DCM Operation in DC DC Converters
- CCM DCM Boundary Condition, Voltage Conversion Ratio in DCM
- Concept of Pulse Frequency Modulation PFM
- Classification of Pulse Width Modulators
- DC - DC Converter Control Techniques, Stability Analysis of Voltage Mode Buck Converter Part 1
- Stability Analysis of Voltage Mode Buck Converter Part 2
- Stability Analysis of Voltage Mode Buck Converter Part 3

Quiz : Assignment 5

Week 5 Feedback

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Assignment solutions

## Assignment 5

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

**Due on 2020-03-04, 23:59 IST.**

1) State whether the following statement is true or false. "For a fixed output voltage, the output ripple of a switching buck converter (ignoring all losses) increases with an increase in the input voltage." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
True

2) State whether the following statement is true or false. "For a buck converter operating with fixed input and output voltages, doubling the switching frequency will halve the ripple in the output voltage." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
False

3) State whether the following statement is true or false. "The transient response of a switching DC-DC converter can be improved by increasing the inductance and output capacitance by the same factor, when the transient response is limited by the loop bandwidth." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
True

4) State whether the following statement is true or false. "Ignoring all losses, a switching buck converter operating in the continuous conduction mode at  $V_{IN} = 1.8\text{ V}$  has a higher output ripple at  $V_O = 1.2\text{ V}$  compared to  $V_O = 0.6\text{ V}$ ." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
False

5) State whether the following statement is true or false. "For a buck DC-DC converter operating in the discontinuous conduction mode, the output voltage can be regulated by increasing the switching frequency when the load current is decreasing." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
False

6) State whether the following statement is true or false. "For the same resonance frequency in a buck converter, a choice of  $L = 1\text{ }\mu\text{H}$  and  $C = 10\text{ }\mu\text{F}$  will have a better transient response compared to a choice of  $L = 0.5\text{ }\mu\text{H}$  and  $C = 20\text{ }\mu\text{F}$ ." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
False

7) State whether the following statement is true or false. "Every kind of switching loss (gate driver, dead-time and hard-switching) increases with an increase in the switching frequency." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
True

8) State whether the following statement is true or false. "Quiescent current losses constitute a significant portion of the total power loss at full-load." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
False

9) State whether the following statement is true or false. "For the same resonance frequency in a buck converter, a choice of an inductor with a smaller inductance and a capacitor with a larger capacitance will require the inductor to have a smaller saturation current." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
False

10) State whether the following statement is true or false. "For a buck converter operating in the discontinuous-conduction mode with fixed input and output voltages, a reduction in the load current would cause the duty cycle to increase." **1 point**

- True  
 False

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
False

11) Which of the following statements is/are correct? **1 point**

- Resistive losses in the inductor (modelled using  $R_{DCR}$ ) occur due to losses in the inductor core and due to the skin effect.  
 Magnetic losses in the inductor (modelled using  $R_{ACR}$ ) occur due to losses in the winding resistance of the inductor.  
 None of the above

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
None of the above

12) Which of the following statements is/are incorrect? **1 point**

- For fixed input and output voltages, the PWM duty cycle of a DC-DC converter increases with an increase in the load current.  
 For fixed input and output voltages, the PWM duty cycle of a DC-DC converter increases with an increase in the gate capacitance of the power FETs.  
 Reducing the switching frequency at light load yields a significantly higher efficiency.  
 Reducing the switching frequency at heavy load yields a significantly higher efficiency.

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
For fixed input and output voltages, the PWM duty cycle of a DC-DC converter increases with an increase in the gate capacitance of the power FETs.  
Reducing the switching frequency at heavy load yields a significantly higher efficiency.

13) Fill in the blank with one of the given choices. "A DC-DC converter with  $V_{IN} = 2.5\text{ V}$  and  $V_O = 1.5\text{ V}$  has an undershoot of 50 mV during a load transient. If the output voltage is changed to 1 V, then assuming that the transient response is limited by the slew rate of the inductor current, the transient response would have \_\_\_\_." **1 point**

- Less than 50 mV of undershoot  
 More than 50 mV of undershoot  
 No change in the undershoot

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Less than 50 mV of undershoot

14) Which of the following statements is true for a DC-DC converter? **1 point**

- Trailing-edge PWM has a better transient response for  $D > 50\%$  compared to leading-edge PWM.  
 Trailing-edge PWM has a better transient response for  $D < 50\%$  compared to leading-edge PWM.  
 Both trailing-edge and leading-edge PWM offer the best transient response at  $D = 50\%$ .  
 The transient response does not depend upon the type of modulation used.

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Trailing-edge PWM has a better transient response for  $D > 50\%$  compared to leading-edge PWM.