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Continuing Education Course #062
Switchmode Buck Power Converter
Using Voltage-Mode Control

1. Reasons for using a Buck power converter include:
- ○ a. the output voltage is lower than the supply voltage,
- ○ b. high conversion efficiency is required,
- ○ c. a switch-mode solution is acceptable,
- ○ d. all of the above.

2. Average input and output currents to a Buck converter are nearly equal:
- ○ a. True,
- ○ b. False.

3. The inductor current in a Buck converter is:
- ○ a. constant,
- ○ b. rectangular waveshape,
- ○ c. DC plus a triangular waveshape,
- ○ d. DC plus a rectangular waveshape.

4. The inductor voltage in a Buck converter is:
- ○ a. constant,
- ○ b. rectangular waveshape,
- ○ c. DC plus a triangular waveshape,
- ○ d. DC plus a rectangular waveshape.

5. DC resistance of the inductor in a Buck converter contributes to power loss:
- ○ a. True,
- ○ b. False.

6. Output capacitor ripple voltage in a Buck converter depends on inductor ripple current:
- ○ a. True,
- ○ b. False.

7. Line regulation relates the output voltage changes due to supply changes:
- ○ a. True,
- ○ b. False.

8. Load regulation relates the output voltage changes due to supply changes:
- ○ a. True,
- ○ b. False.

9. The feedforward control in a Buck converter is primarily employed to improve:

○ a. line regulation,
○ b. load regulation,
○ c. both of the above,
○ d. none of the above.

10. The inductor/capacitor combination in a Buck converter can introduce an underdamped resonance in the control loop of a Buck converter:
○ a. True,
○ b. False.

11. The load on a Buck converter can alter the damping of a resonance in the control loop of the Buck converter:
○ a. True,
○ b. False.

12. The Pole-Zero (PZ) compensator for voltage-mode control uses an integrator pole for:
○ a. higher DC gain,
○ b. cancellation of resonance induced phase,
○ c. PZ compensator bandwidth limitation,
○ d. none of the above.

13. The Pole-Zero (PZ) compensator for voltage-mode control uses two zeroes for:
○ a. higher DC gain,
○ b. cancellation of resonance induced phase,
○ c. PZ compensator bandwidth limitation,
○ d. none of the above.

14. The Pole-Zero (PZ) compensator for voltage-mode control uses two poles for:
○ a. higher DC gain,
○ b. cancellation of resonance induced phase,
○ c. PZ compensator bandwidth limitation,
○ d. none of the above.

15. Switchmode sampling introduces a Zero-Order Hold delay in the feedback loop:
○ a. True,
○ b. False.

16. Switchmode sampling introduces a Nyquist “notch” in the feedback loop:
○ a. True,
○ b. False.

17. The pulse-reset sawtooth Pulse-Width Modulator (PWM) can support:
○ a. feedforward control,
○ b. feedback control,
○ c. both feedforward and feedback control,
○ d. none of the above.

18. A soft-start reference ramp can be used to:
○ a. limit starting current from the supply,
○ b. avoid control saturation at startup,
○ c. both of the above,
○ d. none of the above.

19. A Buck converter with voltage-mode control cannot start with the load applied:

○ a. True,

○ b. False.

20. An otherwise stable Buck converter with voltage-mode control can momentarily encounter 100% duty cycle requirements when a transient load is applied suddenly:

○ a. True,

○ b. False.

21. An otherwise stable Buck converter with voltage-mode control can momentarily encounter 0% duty cycle requirements when a transient load is removed suddenly:

○ a. True,

○ b. False.

22. Required average inductor current changes in a voltage-mode controlled Buck converter are associated with non-zero feedback error voltages:

○ a. True,

○ b. False.

23. Sampling a Buck converter with a longer period generally requires larger inductor and capacitor values:

○ a. True,

○ b. False.

24. For a synchronously switched Buck converter with a maximum 3.12 sec (1-D) switching period, a 3.3V output voltage, and a maximum 200 milli-Ampere peak-to-peak ripple current, the inductor must be:

○ a. less than 103 H,

○ b. more than 103 H,

○ c. none of the above.

25. For a synchronously switched Buck converter with a maximum 312 nsec (1-D) switching period, a 5 milli-Volt ripple voltage, and a maximum 200 milli-Ampere peak-to-peak ripple current, the output capacitor must be,

○ a. less than 6.24 F,

○ b. more than 6.24 F,

○ c. none of the above.