



WEEK 2: ASSIGNMENT

1. A boost PFC converter fed from 230V, 50Hz input is supply the 3300W load. The converter is operated with the switching frequency of 70 kHz and regulates the output voltage at 400V. The converter is operating in continuous conduction mode, then calculate the inductance value in μH , if the allowable peak to peak current ripple is 1.5A. Note: The answer should be rounded up to 2 decimal places.

Ans. 951.00 to 954.00

2. A single phase full-bridge diode rectifier with capacitive filter is fed from 230V, 50Hz mains supply. A 1000W load is connected to the output cannot take a voltage ripple of more than 10% of the peak value of the input. Calculate the smallest value of capacitance (in μF) that should be used in order to meet the requirement. (Note: The answer should be rounded up to 2 decimal places; use $\pi = 3.14$; $1 \text{ radian} = 57.3 \text{ degrees}$).

Ans. 851.00 to 853.00

3. What will be the peak repetitive reverse voltage of diode in case of single-phase full-bridge rectifier with capacitive filter. Note: $V_{s,pk}$ is the peak value of input AC voltage

- A. $V_{s,pk}$
- B. $\frac{V_{s,pk}}{2}$
- C. $\frac{V_{s,pk}}{\sqrt{2}}$
- D. $2 * V_{s,pk}$

Answer: A

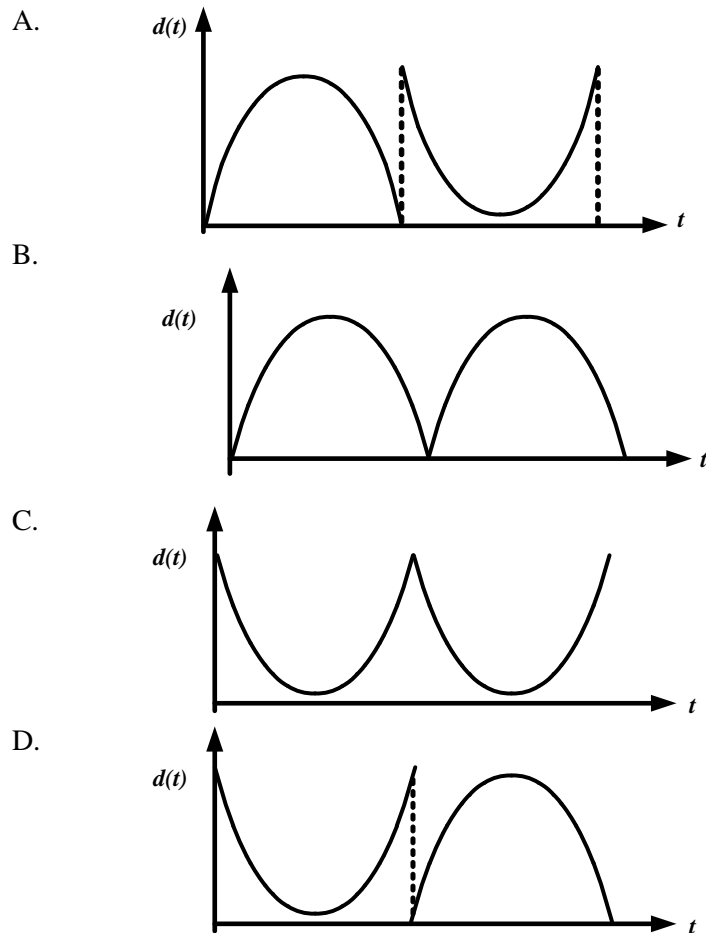
4. For the single-phase full-bridge rectifier without the capacitive filter. Match the following quantities correctly. Note: Symbols have obvious meanings.

Quantity	Expression
I. I_{rms} of diodes	a. $\frac{V_{s,pk}}{\sqrt{2}R_L}$
	b. $\frac{V_{s,pk}}{2R_L}$
II. I_{avg} of diodes	c. $\frac{V_{s,pk}}{\pi R_L}$
	b. $\frac{V_{s,pk}}{2\pi R_L}$

- A. I-a, II-c
- B. I-b, II-c
- C. I-a, II-d
- D. I-b, II-d

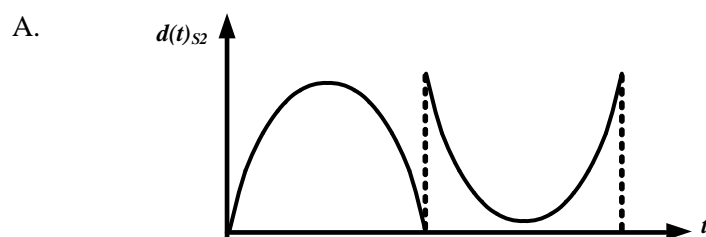
Answer: B

5. For the single-phase boost PFC converter, what will be the variation of the duty ratio ($d(t)$) for switch S_1 . Note: Symbols have obvious meanings.

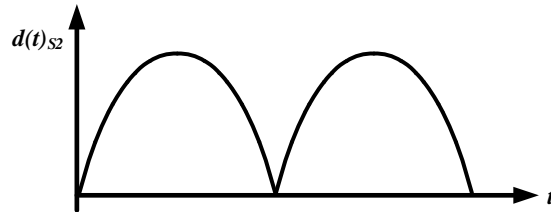


Answer: C

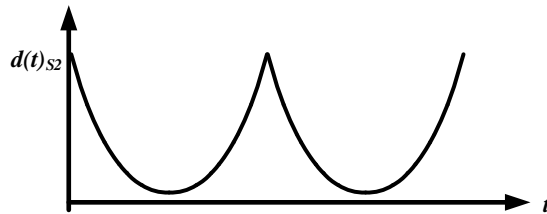
6. For the single-phase boost PFC converter, what will be the variation of the duty ratio ($d(t)_{S2}$) for switch S_2 . Note: the S_1 and S_2 switches are complementary to each other in single phase boost PFC converter. Symbols have obvious meanings.



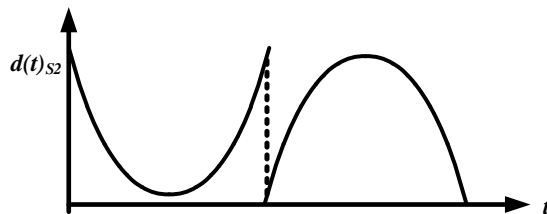
B.



C.



D.



Answer: B

7. In a full bridge rectifier circuit with capacitive filter, increasing the value of filter capacitor (without changing other things like operation, input voltage)

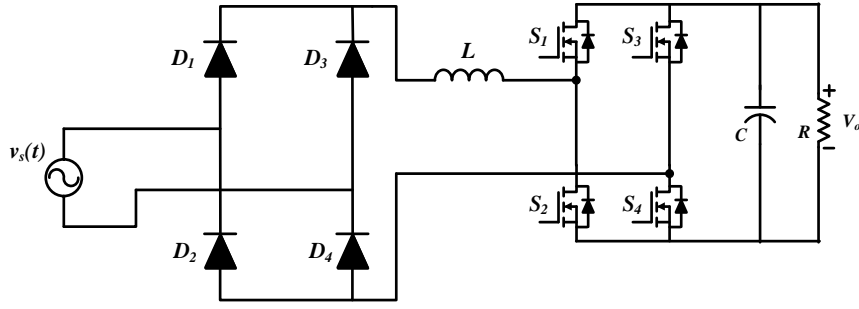
- A. decrease the peak current through the diodes
- B. diode currents will not change
- C. increases the peak current through the diodes
- D. changes the shape of diode currents but will not change the peak value

Answer: C

8. For the single-phase boost PFC converter fed from 50 Hz AC source having varying voltage 200 V-250 V. What will be the minimum value of duty ratio ($d(t)$) reached if the output voltage is kept at 400V. (Note: round the result to 2 decimal points)

Answer: 0.11 to 0.13

9. For the circuit shown below



The switches S_1 and S_4 are turned-on at the same time for $d(t)T_s$, while S_2 and S_3 are turned-on at the same time for $(1 - d(t))T_s$. S_1 and S_2 are switched in complementary manner; S_3 and S_4 are switched in complementary manner; the conduction time of S_1 and S_4 is always greater than the conduction time of S_2 and S_3 .

What will be the expression of duty ratio ($d(t)$). Symbols have obvious meanings.

A. $1 - \frac{|v_s(t)|}{V_o}$

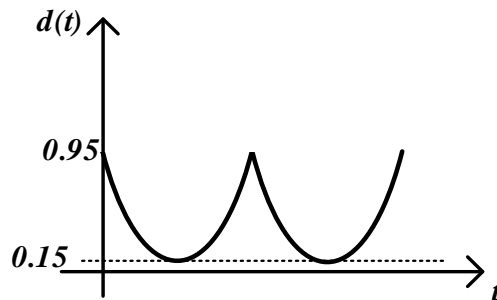
B. $1 + \frac{|v_s(t)|}{V_o}$

C. $\frac{\left(1 - \frac{|v_s(t)|}{V_o}\right)}{2}$

D. $\frac{\left(1 + \frac{|v_s(t)|}{V_o}\right)}{2}$

Answer: D

10. For the single-phase boost PFC converter fed from 220V, 50Hz mains, if the duty ratio ($d(t)$) of switch S_1 varies as shown below, then what will be the output voltage (V_o) (round it to two decimal points)



Answer: 365.00 to 367.00

Answer Key:

1. 951.00 to 954.00	2. 851.00 to 853.00
3. A	4. B
5. C	6. B
7. C	8. 0.11 to 0.13
9. D	10. 365.00 to 367.00

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