Unit 4 - Week 3

Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

- Fourier series: Part 1
- Fourier series: Part 2
- Analysis of 6 pulse LCC neglecting inductance: DC side voltage harmonics
- Analysis of 6 pulse LCC neglecting inductance: Fundamental and harmonic components of AC side current
- Definitions: Delay angle, angle of advance, commutation margin angle
- Commutation margin angle in a 6 pulse LCC neglecting inductance: Part 1
- Commutation margin angle in a 6 pulse LCC neglecting inductance: Part 2
- Quiz : Assignment 3
- Week 3 Feedback

Week 4

Week 5

Week 6

Week 7

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Week 11

Week 12

Assignment Solution

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Assignment 3

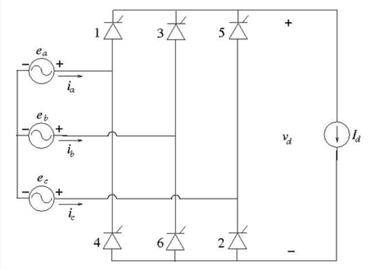
The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-02-19, 23:59 IST.

All questions are with reference to the figure below which shows the circuit of a 6 pulse Line Commutated Converter along with a balanced three phase voltage source on the AC side and a constant current source on the DC side.

$$e_a = \sqrt{\frac{2}{3}}V\ \sin(\omega_o t + 150^o), \quad e_b = \sqrt{\frac{2}{3}}V\ \sin(\omega_o t + 30^o) \text{ and } e_c = \sqrt{\frac{2}{3}}V\ \sin(\omega_o t - 90^o).$$

The thyristor valves are turned on in the sequence 1, 2, 3, 4, 5 and 6; the duration between any two consecutive instants of turn on is 60 degrees.



The following notations, in addition to those in the figure, are used:
α : Delay angle
β : Angle of advance
ξ : Commutation margin angle
V_h : RMS value of hth order harmonic component of v_d
V_d : Average value of v_d
V_{do} : Maximum average value of v_d

1) If $\alpha = 30^o$, then $\frac{V_6}{V_d} =$ _____. (Give the answer after rounding off to 4 significant figures.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.144,0.147

1 point

2) If $\alpha = 23^o$, then $\frac{V_h}{V_{do}} = 0.1018$ for a certain value of h. If α is changed to 40° , for the same h, $\frac{V_h}{V_{do}} =$ _____.
(Give the answer after rounding off to 4 significant figures.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.158,0.160

2 points

3) Which of the following sentences is/are correct? *1 point*

- The AC side current is an odd function of $\omega_o t$ for all values of α.
- The AC side current is an even function of $\omega_o t$ for all values of α.
- The AC side current as a function of $\omega_o t$ has half wave symmetry.
- The AC side current as a function of $\omega_o t$ has quarter wave symmetry.
- The AC side current as a function of $\omega_o t$ has half wave symmetry but not quarter wave symmetry.
- The AC side current as a function of $\omega_o t$ has quarter wave symmetry but not half wave symmetry.

No, the answer is incorrect.
Score: 0
Accepted Answers:
The AC side current as a function of $\omega_o t$ has half wave symmetry.
The AC side current as a function of $\omega_o t$ has quarter wave symmetry.

4) The RMS value of the fundamental component of the AC side current is 1.8 kA. What is the RMS value, in kA, of the 9th order harmonic component of the AC side current?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0

1 point

5) The RMS value of the 5th order harmonic component of the AC side current is 0.3119 kA. What is the value of I_d in kA? (Give the answer after rounding off to 3 significant figures.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.99,2.01

1 point

6) $I_d = 2$kA. What is the RMS value, in kA, of the AC side current? (Give the answer after rounding off to 4 significant figures.)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1.63,1.64

1 point

7) $\alpha = 150^o$. What is the value of ξ in degree?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 30

1 point

8) $\alpha = 55^o$. What is the value of ξ in degree?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 185

1 point

9) Which of the following sentences is/are correct? *1 point*

- For inverter operation, $\xi = 180^o - \alpha$.
- For inverter operation, $\xi = \beta$.
- For inverter operation, $\xi = 240^o - \alpha$.
- For inverter operation, $\xi = 180^o - \beta$.
- For inverter operation, $\xi < 90^o$
- For inverter operation, $\xi > 90^o$

No, the answer is incorrect.
Score: 0
Accepted Answers:
For inverter operation, $\xi = 180^o - \alpha$.
For inverter operation, $\xi = \beta$.
For inverter operation, $\xi < 90^o$