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Total Number of Pages : 2

M.TECH

M.TECH 2ND SEMESTER (AR 18) REGULAR EXAMINATIONS, APRIL/MAY 2019

POWER ELECTRONIC CONVERTERS

Branch: PE, Subject Code:MPEPC2010

Time: 3 Hours

Max Marks : 70

PART-A

(10 X 2=20 MARKS)

1. Answer the following questions.

- What are the two types of control strategies?
- What is the power factor of a single phase full converter with highly inductive load for a firing angle of 45° ?
- What is meant by unidirectional or half-wave ac voltage controller?
- What is meant by step-up cyclo-converters?
- What are the various types of voltage source inverters?
- What is line commutated inverter?
- Outline the advantages of Current Source Inverter (CSI) over Voltage Source Inverter
- Give the advantages of Space Vector PWM over Sine PWM as applied to 3 phase Voltage Source Inverter.
- What is the output voltage ripple in a step up chopper?
- How cyclo-converter differs from rectifier–inverter for converting static ac frequency to variable ac frequency.

PART-B

(5 X 10=50 MARKS)

Answer any five questions from the following.

Q.2

- Derive an expression for harmonic factor, displacement factor and power factor of a single phase semi converter from the fundamental principle [5]
- With suitable diagram & waveform, explain the operation of a single-phase fully controlled rectifier with R-L load and derive the expression for average output voltage. [5]

Q.3

- Explain details the working operation of buck-boost converter with neat diagram and trace the output voltage, current through and voltage across the inductor in converter element. [5]
- The Buck-Boost Regulator has an input voltage of $V_s=12V$. The duty cycle $k=0.25$ and the switching frequency is 25 KHz. The inductance $L=150 \mu H$ and filter capacitance $C=220 \mu F$. The average load current $I_a=1.25A$ Determine (a) Average output voltage V_a (b) Output voltage ripple ΔV_0 (c) inductor ripple current ΔI [5]

Q.4.

- Explain the different methods of voltage control adopted in an inverter with suitable waveforms [5]
- Explain the 180° conduction mode operation of a 3- \emptyset VSI. Draw the waveforms of (a) gate pulses (b) phase voltages (c) line voltages. [5]

Q.5.

- (a) Describe the operation of Type-D chopper with suitable circuit & waveform and find the output performance. [5]
- (b). A 3 phase cycloconverter feeds 1 phase load of 190 Volts, 45 Amps, at a power factor of 0.7 (lagging). [5]
Determine:
i. The required supply voltage
ii. Thyristor rating
iii. Power factor of supply current.

Q.6.

- (a) Draw and explain the operation of a three-phase Semi converter with R-L-E load under continuous conduction with appropriate waveforms of (a) Output Voltage (b) Load current (c) phase-A supply current for a firing angle of 90° . [5]
- (b) Differentiate natural commutation and forced commutation [5]

Q.7.

- (a). Discuss the working of a single phase AC voltage controller with RL load when its firing angle is more than the load power factor angle. Illustrate with waveforms [5]
- (b). Explain the principle of working of single phase to single phase step up cycloconverter. List the factors that affect the performance of cycloconverter [5]

Q.8. Write Short notes on:

- (a) Four quadrant chopper [5]
- (b) effect of source inductance [5]

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