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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Regular) - February, 2017

Regulation: IARE-R16

## AC TO DC CONVERTERS

(Power Electronics and Electrical Drives )

Time: 3 Hours

Max Marks: 70

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Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

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### UNIT – I

- (a) Explain the V-I characteristics of thyristor circuit. [7M]

(b) The capacitance of reverse biased junction J2 in a thyristor is  $C_{j2}=20\text{pf}$  and can be assumed to be independent of offset voltage. The limiting value of the charging current to turn on the thyristor is 16mA. Determine the critical value of  $dv/dt$ . [7M]
- (a) Discuss the process of commutation and explain the different commutation techniques used for the thyristors along with circuit diagram and waveforms. [7M]

(b) Describe the basic structure of MOS controlled thyristor and give its equivalent circuit. [7M]

### UNIT – II

- (a) Explain the operation of three phase full converters. [7M]

(b) Write a short note on shunt capacitor compensation. [7M]
- A three phase full converter is operated from a three phase star connected 208V,60HZ supply and the load resistance is  $R=10\Omega$ . If it is required to obtain an average output voltage of 50% of the maximum possible output voltage, calculate [14M]

  - the delay angle
  - the RMS and output currents.
  - the average and RMS thyristor currents.
  - the rectification efficiency
  - TUF
  - input PF

### UNIT – III

- (a) Explain the operation of AC voltage controller with resistive, inductive and EMF loads along with neat circuit diagram, input and output waveforms. [7M]

(b) Discuss about the application of single phase AC voltage controller and compare the advantages and disadvantages of single phase AC voltage controller [7M]

6. (a) A single phase unidirectional AC voltage controller is connected with a load of  $R=20\Omega$  with an input voltage of 230V, 50 HZ. If the firing angle of thyristor is  $90^\circ$ . Determine, [7M]  
i. RMS value of output voltage  
ii. Power delivered to load.
- (b) Explain the operation of cyclo-inverters in detail. [7M]

#### UNIT – IV

7. (a) Explain the operation of single phase half wave converter drives. [8M]  
(b) Write a short notes on, [6M]  
i. 3-phase half wave converter drives.  
ii. 3-phase full converter drives.
8. (a) Explain the operation of single phase series converter with neat diagrams. [7M]  
(b) Derive the expressions for performance factors of single phase fully converted bridge converter. [7M]  
i. Input displacement factor  
ii. Input power factor  
iii. Voltage ripple factor.

#### UNIT – V

9. (a) Explain about the step down DC to DC convertes with resistive and inductive loads with neat circuit diagrams and waveforms. [7M]  
(b) Explain the working of current commutated chopper with the aid of diagram & waveforms. [7M]
10. Discuss the operation following power electronics converters along with circuit and waveforms. [14M]  
i. BUCK and BOOST regulators.  
ii. CUK regulators and multi output boost. converters.