Hall Ticket No | | | | | | | | | | | Question Paper Code: BPE002

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE–R16

AC TO DC CONVERTERS

(Power Electronics and Electric Drives)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Write a short note on MOS controlled Thyristor(MCT). **[7M]**
   (b) What are the specifications of Thyristor switch? **[7M]**
2. (a) Write a short note on Integrated Gate Commutated Thyristors (IGCT)? **[7M]**
   (b) Explain the various power losses in Thyristor switches. **[7M]**

UNIT – II

3. (a) Explain continuous mode of operation in 3ϕ semi converter with R load. **[7M]**
   (b) A three phase semi converter is used to charge 200V battery from 220V, 50Hz AC supply. Assume internal resistance of the battery is 0.5 ohm and an inductance is connected in series with a battery so that 10A constant charging current flows. Determine the firing angle of the converter, conduction period of each thyristor and input power factor? **[7M]**
4. (a) Explain discontinuous mode of operation in 3ϕ full converter with R load. **[7M]**
   (b) What is the use of freewheeling diode in converter circuits? **[7M]**

UNIT – III

5. (a) Explain the operation of 3ϕ AC voltage controller with delta connected R load. **[7M]**
   (b) A single phase electronic tap changer is feeding from 230V, 50Hz AC supply and is connected with a load of R = 10 ohm and the turns ratio from primary to secondary is unity. If the firing angle of the upper group thyristors is 45° then determine **[7M]**
      i. RMS value of the output voltage
      ii. RMS value of the upper group thyristors current
      iii. VA rating of the transformer
      iv. Power factor
6. (a) Explain the operation of 3ϕ bridge type cycloconverter. **[7M]**
   (b) A 6 pulse cycloconverter is supplied from 440V, 50Hz AC supply and it is delivering 50A to single phase resistive load. The source inductance is 1.5mH. Determine the output voltage at firing angles 0° and 45°. **[7M]**

UNIT – IV

7. (a) Explain the operation of 1ϕ half converter for RL load in discontinuous mode of operation. **[7M]**

   (b) Explain in detail about the single phase Dual Converter? Sketch the various waveforms of dual converter? **[7M]**

8. (a) Explain the operation of 1ϕ full converter for RLE load in discontinuous mode of operation? **[7M]**

   (b) A single phase full controlled converter is connected to 220V, 50Hz AC supply. A load of R = 10 ohm is connected in series with large inductance and the load current is ripple free. If the firing angle is 60°. Determine different parameter of the converter. **[7M]**

UNIT – V

9. (a) Explain the operation of buck boost converter with a neat sketch. **[7M]**

   (b) A buck boost regulator has input voltage of V_s = 12V. The duty cycle, k=0.25 and the switching frequency is 25kHz. The inductance L = 150μH and the filter capacitance C = 220μF. The average load current is 1.25A. Determine **[7M]**

   i. Average output voltage
   ii. Peak to peak output voltage ripple in capacitor
   iii. Peak to peak ripple current in inductor
   iv. Critical values of L and C

10. (a) Explain the buck converter in detail with a neat sketch? **[7M]**

    (b) A boost regulator has input voltage of V_s = 5V. The output voltage is 15V, the load current is 0.5A and the switching frequency is 25kHz. The inductance L = 150μH nd the filter capacitance C = 220μF. Determine **[7M]**

    i. Duty cycle
    ii. Ripple current of inductor
    iii. Peak current of the inductor
    iv. Ripple voltage of the capacitor
    v. Critical values of L and C