

(b) With the help of a neat circuit diagram and waveforms, explain the operation of 3-phase bridge inverter with R load. (7)

7. (a) Single phase half bridge inverter has a resistive load of  $R = 3 \Omega$  and DC input voltage of 50 V. Calculate :  
(i) RMS output voltage at fundamental frequency,  
(ii) output power, (iii) Average and peak current of each thyristors. (8)
- (b) Write a short on unipolar and bipolar sinusoidal modulation. (7)
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Total Pages : 4

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May 2023

**B. Tech. (EL) IV SEMESTER  
Power Electronics (ELPC-403)**

Time : 3 Hours

Max. Marks : 75

*Instructions :*

- 1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
- 2. Answer any four questions from Part -B in detail.*
- 3. Different sub-parts of a question are to be attempted adjacent to each other.*

**PART-A**

- (a) Draw the 1-phase fully controlled rectifier circuit with freewheeling diode. (1.5)


(b) List the advantages and disadvantages of Boost converter. (1.5)

(c) Compare VSI and CSI. (1.5)

(d) Discuss the time ratio control in a dc chopper. (1.5)

(e) Draw a 3-phase half wave controlled converter circuit diagram and output voltage wave form for R load. (1.5)

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- (f) Compare continuous and discontinuous modes of operation of converters. (1.5)
- (g) Define modulation index. (1.5)
- (h) Define the ripple current. (1.5)
- (i) Explain briefly the load commutation. (1.5)
- (j) What is meaning of the 120-degree mode of inverter operation? (1.5)

### PART-B

2. (a) Define holding current and latching current of SCR. Show these currents on the static IV characteristics of SCR. (8)
- (b) For a step up chopper, de source voltage is 230 V, load resistance  $10 \Omega$ , drop across the switch is 2V and duty cycle 0.4. Calculate average and RMS value of output voltage and chopper efficiency. (7)
3. (a) Explain the operating principle of dc chopper with a suitable diagram. Draw the voltage and current waveforms of chopper. Derive expressions for average output voltage and rms output voltage. (6)
- (b) Explain the design procedure of filter circuit for a boost converter with continuous current mode. (9)

4. (a) A single phase 220 V, 1 kW heater is connected to a half-wave controlled rectifier and fed from a 220 V, 50 Hz ac supply, Determine the power absorbed by the heater when the firing angle is : (8)
- (i)  $\alpha = 30^\circ$  and
- (ii)  $\alpha = 90^\circ$ .
- (b) What are the different turning - ON methods of a thyristor? Explain each method. (7)
5. (a) With the help of circuit diagram explain the working of single phase fully controlled converter with RL load. Draw the waveform of output voltage with and without freewheeling diode and output current. (8)
- (b) With help of neat circuit diagram and associated waveforms discuss the operation of a Buck converter in continuous conduction mode. (7)
6. (a) The buck regulator has an input voltage of  $V_s = 15$  V. The required average output voltage is  $V_a = 5$  V at  $R = 400 \Omega$  and the peak-to-peak output ripple voltage is 10 mV. The switching frequency is 20 kHz. If the peak-to-peak ripple current of inductor is limited to 0.6 A, determine : (8)
- (i) the duty cycle
- (ii) the filter inductance L,
- (iii) the filter capacitor C.