

Total No. of Printed Pages:3

**SUBJECT CODE NO: H-127**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**T.E. (EEP/EE/EEE)**  
**Power Electronics**  
**(REVISED)**

[Time: Three Hours]

[Max.Marks:80]

- N.B Please check whether you have got the right question paper.
- i) Q.No.1 & Q.No.6 are compulsory.
  - ii) Solve any two questions from remaining from each section.
  - iii) Draw appropriate waveforms if required.
  - iv) Assume suitable data if necessary.

**Section A**

- Q.1 Solve any five. 10
- a) Draw V-I characteristics of TRIAC.
  - b) Give the comparison between GTO & SCR.
  - c) What are the two control technics used in Chopper.
  - d) List the advantages of power MOSFET.
  - e) Draw the voltage-current characteristics of IGBT.
  - f) What are the different classifications of Chopper?
  - g) Compare circulating and non-circulating current mode of dual converter.
  - h) What are different SCR voltage ratings?
- Q.2 a) Draw and explain the dynamic turn-on and off characteristics of SCR. 07
- b) A 3-phase half wave converter is operated from a 3-phase Y connected 220v, 50Hz supply and Load resistance of 10 ohm, If the average output voltage is 25% of maximum possible average voltage. Calculate: Delay angle, RMS and Average output currents, Average and RMS SCR current. Input power factor. 08
- Q.3 a) Explain with neat circuit diagram and waveforms operation of single phase half wave controlled rectifier with effect of free-wheeling diode. 07
- b) For idol type A chopper circuit following conditions are given, duty cycle = 0.4, chopping frequency of 400 Hz, input dc voltage = 220 v and R = 1 ohm L = 3 mH and back emf = 25 V. Calculate the Average output current, min and max values of steady state output current, Input power, power absorbed by Load emf, power loss in R. 08
- Q.4 a) Explain in detail working principle of dual converter. 07
- b) A single quadrant Type – A chopper is operated with the following specifications; on time  $t_{on} = 1msec$ , off-time  $t_{off} = 1.5 msec$  and ideal battery of 220V. Calculate 08
- 1) Average and RMS output voltages
  - 2) Ripple and form factor

- Q.5 a) Explain PWM and FM Technics of chopper used for operation control. 07
- b) A 3-phase semi-converter is connected to a highly inductive load show that the average output voltage is given by 08
- $$V_{o_{avg}} = \frac{3\sqrt{3} V_m}{2\pi} (1 + \cos\alpha)$$
- Where,  
 $V_m$  = Peak phase voltage of star connected source.

### Section B

- Q.6 Solve any five. 10
- Explain why PWM inverter is superior to a square wave inverter.
  - Draw the circuit diagram of Buck-Boost converter.
  - What is Switching Mode Power Supplies (SMPS)
  - Compare  $180^\circ$  and  $120^\circ$  mode operation of VSI.
  - What is cycloconverter? Give its classifications.
  - What is UPS and power conditioners.
  - Draw circuit diagram of 3-phase to 3-phase cycloconverter.
  - Define Inverter and give its classifications.
- Q.7 a) Draw and explain with neat circuit diagram and wave form, operation of single phase half bridge Voltage Source Inverter (VSI) with RL Load. 07
- b) The buck – converter has an input voltage of  $V_{dc} = 14v$ . The required average output voltage  $v_o = 6v$  and peak-to-peak output ripple voltage is 15mV. The switching frequency is 30KHz. If peak to peak ripple current of Inductor is limited to 0.6 A. Determine 1) Duty cycle 08  
 2) Filter Inductance 'L'  
 3) Filter capacitance 'C'
- Q.8 a) Explain with neat diagram and waveforms operation of 1-phase to 1-phase cycloconverter with R-L Load. 07
- b) For single phase half bridge Inverter, DC input voltage is 200v with 5 ohm resistive load, Calculate 08  
 1) RMS output voltage  
 2) Output power  
 3) PIV  
 4) Total Harmonic Distortion

- Q.9 a) Explain working principle of single phase AC voltage controller. 07
- b) An AC Voltage controller has a resistive load of 10 ohm and RMS input voltage is 08  
 $V_s = 230v, 50Hz$ . The SCRs are switched on for  $n=25$  cycles and off for  $m=75$  cycles.  
 Determine  
 1) RMS Output Voltage  
 2) Input power  
 3) Average and RMS current ratings of SCR
- Q.10 a) Explain with neat diagram & waveforms working of Buck converter. 07
- b) Explain with neat diagram and waveform, of  $120^\circ$  conduction mode operation of 3-phase 08  
 bridge Inverter with R-Load.