

Total No. of Printed Pages:3

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

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

1. Q.No.1 & Q.No.6 are compulsory.
2. Solve any two questions from remaining each sections.
3. Draw appropriate waveforms if required.
4. Assume suitable data if necessary.

**Section A**

- Q.1 Solve any five. 10
- a) Define holding current and Latching current as applicable to an SCR.
  - b) What do you mean by commutation of SCR? Give the different methods of commutations.
  - c) Compare TRIAC with SCR.
  - d) List the advantages of power MOSFET.
  - e) Draw the circuit diagram of 3 phase full converter.
  - f) What are the different classifications of Chopper?
  - g) Give the merits and demerits of GTO as compared to conventional SCR.
  - h) What are the operation control techniques used in chopper.
- Q.2 a) Draw and explain V-I characteristics of SCR. 07
- b) A single phase fully controlled bridge converter supplies an Inductive Load. Assume output current is virtually constant and equal to  $I_d$ . Calculate the following if supply voltage is 230v and firing angle  $\pi/6$  radian. 08
- 1) Average output voltage
  - 2) Supply RMS current
  - 3) Supply fundamental RMS current
- Q.3 a) Explain with neat circuit and waveform, operation of single phase fully controlled bridge rectifier with R-L Load. 07
- b) A single quadrant type A chopper is operated with following specifications, on time  $t_{on} = 1msec$ , off time  $t_{off} = 1.5msec$  and ideal battery of 220V. 08  
 Calculate
- 1) Average and RMS output voltages
  - 2) Ripple factor and form factor
- Q.4 a) Explain in detail working Principle of Dual converter. 07
- b) Explain principle of step-up chopper and derive expression for average output voltage. 08

- Q.5 a) Explain PWM and FM Techniques of Chopper used for operation control. 07
- b) A 3phase half wave converter is operated from a 3-phase Y connected 220 v, 50 Hz, Supply 08  
and Load resistance of 10 ohm. If the average output voltage is 25% of maximum possible  
average voltage. Determine:
- 1) Delay angle
  - 2) RMS and average output currents
  - 3) Average and RMS SCR current
  - 4) Input power factor

### Section B

- Q.6 Solve any five 10
- a) Define Inverter and give its applications.
  - b) Draw circuit diagram of 3 $\phi$  to 1 $\phi$  cycloconverter.
  - c) Compare 180<sup>0</sup> and 120<sup>0</sup> mode operation of VSI.
  - d) What is UPS and power conditioner?
  - e) Draw circuit diagram of Buck-boost converter.
  - f) List different voltage control and PWM techniques used in single phase Inverter.
  - g) What is Switching Mode Power Supplies (SMPS)?
  - h) What is cycloconverter? Give its classifications.
- Q.7 a) Draw and explain with neat circuit diagram and waveforms, operation of single phase half 07  
bridge Voltage Source Inverter (VSI), with R-L Load.
- b) A single phase full bridge inverter is operated from a 48V battery and is supplying power to a 08  
pure resistive load of 15 ohm. Calculate
- 1) Fundamental output voltage and first five harmonics
  - 2) RMS value of output voltage
  - 3) Output RMS power and fundamnet power
- Q.8 a) Explain with neat diagram and waveforms operation of single phase to single phase 07  
cycloconverter with R-L Load.
- b) The buck converter has an input voltage of 14v. The required average output voltage is 6v, 08  
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
  - 2) Filter Inductance 'L'
  - 3) Filter capacitor 'C'
- Q.9 a) Explain working principle of single phase AC voltage controller. 07
- b) Explain with neat diagram and waveform of 180<sup>0</sup> mode of operation of 3-phase Inverter with 08  
R-Load.

- Q.10 a) Explain with neat diagram and waveform operation of Buck converter. 07
- b) An Ac voltage controller has resistive load of 20 ohm and RMS input voltage is 230v, 50Hz. 08  
The SCRs are switched on for  $n=30$  cycles and off for  $m=70$  cycles.  
Determine :
- 1) RMS output voltage
  - 2) Input power
  - 3) Average and RMS current rating of SCR