

Code: EE5T4

**III B.Tech - I Semester – Regular Examinations - December 2016**

**POWER ELECTRONICS  
(ELECTRICAL & ELECTRONICS ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

**PART – A**

Answer *all* the questions. All questions carry equal marks

11 x 2 = 22 M

- 1 a) Define Power Electronics.
- b) What is the purpose of snubber circuit? Draw the snubber circuit diagram.
- c) Classify the Rectifiers.
- d) List out the advantages of 3-ph rectifier over 1-ph rectifier.
- e) Discuss various PWM techniques.
- f) Show the basic parallel inverter diagram.
- g) Compare between constant frequency and variable frequency control methods.
- h) Write the step up chopper advantages.
- i) Can you list two applications of cyclo converter?
- j) Develop ac voltage controller using four diodes and one SCR.
- k) Explain the draw backs of Solid state devices.

## PART – B

Answer any *THREE* questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) Explain in detail the turn off mechanism of an SCR? 8 M

b) What is the necessity of connecting of SCRs in series?  
What are the problems associated with series connection of SCRs? How are they eliminated? 8 M

3. a) Discuss the operation of 3-ph semi converter with R and RL load and draw the voltage wave form for discontinuous and continuous mode of operation? Derive the load voltage expression. 8 M

b) A single phase full converter supplies a load consisting of R, L and E. The inductance is large and output current is constant. Assume the SCR to be ideal with following data:

RMS supply voltage = 220 V, load resistance = 0.5 ohm, output current is 10 A 8 M

Determine i) firing angle if  $E = 135$ ,  $E = -145$  V

ii) which source is supplying power in  $E = 135$  and  $E = -145$

iii) draw the load voltage waveform for both cases.

4. a) Describe the modes of operation of Jones chopper with neat waveforms. 8 M
- b) A RLE type load is operating in a chopper circuit from a 400 V d.c source, for the load  $L=0.05$  H and  $R=0.3\Omega$ . For a duty cycle of 0.3, find the chopping frequency to limit the amplitude of load current excursion to 8 A. 8 M
5. a) Explain the 3-ph inverter 120 degree mode of operation with neat wave forms for both phase and line voltages. 8 M
- b) A single phase full bridge inverter is operated from a 48 V battery and is supplying power to a pure resistive load of 10 ohm. 8 M  
Determine: i) the fundamental output voltage and the first five harmonics.  
ii) RMS value by direct integration method and harmonic summation method.  
iii) Output rms power and output fundamental power.
- 6 a) Describe the principle operation of single phase mid point cyclo converter with R and RL load for continuous and discontinuous mode with neat wave forms. 8 M

b) List out merits and demerits of cyclo converter 4 M

c) A single phase a.c regulator feeds power to a resistive load of 4 ohm from 230 V, 50 Hz source. Determine

4 M

i) the peak values of average and RMS thyristor currents for any firing angle.

ii) the minimum circuit turn off time for any firing angle.