

GANPAT UNIVERSITY
B.TECH SEM.5th ELECTRICAL ENGINEERING
REGULAR EXAMINATION NOV-DEC 2014
2EE503 - POWER ELECTRONICS DEVICES & CIRCUITS

TIME:-3 HOURS

TOTAL MARKS-70

- INSTRUCTION:-
1. Attempt all questions.
 2. Make suitable assumptions wherever necessary.
 3. Figures to the right indicate full marks.

Section-I

Que-1

- (a) Explain the operating principle of a thyristor in terms of the "two transistor analogy". (06)
- (b) Derive the expression for the average output voltage of single phase full converter. Assume the load to be highly inductive. Draw the variation of average output voltage with α . Also draw the output voltage waveforms. (06)

OR

Que-1

- (a) Draw the output i-v characteristics of an IGBT and explain it in terms of the operating principle of the device. (06)
- (b) With the help of neat circuit diagram explain the Morgan's chopper. (06)

Que-2

- (a) A single-phase one-pulse SCR controlled converter feeds an R-L load with a freewheeling diode across the load. Discuss how freewheeling diode comes into play when supply voltage is passing through zero, and becoming negative. Sketch waveforms for supply and load voltages, load current, supply current, freewheeling diode current and voltage across the SCR. Derive expression for average load current. (06)
- (b) Derive the expression for the output voltage of a step down chopper in terms of duty cycle and input voltage. (05)

OR

Que-2

- (a) Explain commutation techniques of SCR in detail. (06)
- (b) Explain 3-phase half -wave controlled converter with R-L load and Freewheeling Diode. (05)

Que-3

Attempt any three. (12)

- (a) Differentiate between Type A and Type B chopper.
- (b) Explain turn ON switching Characteristics of SCR.
- (c) Differentiate between SCR and TRIAC.
- (d) Define following terms with their usual meanings with respect to an SCR:
 (i) V_{BO} , (ii) V_{DWM} , (iii) I_L , (iv) t_d

Section-II

Que-4

- (a) Compare the control techniques used in choppers. (06)
(b) Derive the expression for the average output voltage of single phase semiconverter. (06)
Assume the load to be highly inductive. Draw the variation of average output voltage with α . Also draw the output voltage waveforms.

OR

Que-4

- (a) Explain the single pulse-width-modulation technique of inverter voltage control. (06)
(b) A three-phase bridge inverter is fed from a 600 V DC source. The inverter is operated in 180° conduction mode and is supplying a purely resistive star connected load. Determine: a) RMS value of the output line & phase voltages. (06)
b) RMS value of load current and power delivered to the load if the load resistance is $15 \Omega/\text{phase}$

Que-5

- (a) Explain the operation of single phase full bridge inverter with R-L load. (05)
(b) What are the advantages of Switched Mode Power Supply (SMPS) over a linear supply system? Take any configuration of SMPS and explain its working. (06)

OR

Que-5

- (a) Explain the working of a single phase AC voltage regulator with R-L load (phase-control). (05)
(b) Explain the operating principle of a 120° mode three-phase inverter with the help of circuit diagram and some basic waveforms. (06)

Que-6

- (a) Discuss the different types of UPS with schematic diagrams. (06)
(b) Explain the working of mid-point configuration of cycloconverter with circuit diagram and waveform. (06)

-----END OF PAPER-----