

FACULTY OF ENGINEERING

BE 3/4 (E& EE/Inst.) I-Sem (Old) Examinations, November / December 2012

Subject: Power Electronics**Time: 3 Hours****Max. Marks:75****Note:** Answer All questions from Part-A and any Five questions From Part-B**Part-A (25 Marks)**

1. What is the purpose of di/dt protection for SCR? (3)
2. What are the advantages and disadvantages of IGBTs? (3)
3. Why is it necessary to use fast-recovery diodes for high-speed switching? (2)
4. Briefly discuss the gate-drive design considerations of the MOSFET. (2)
5. Give a brief comparison between non-circulating current mode and circulating current mode in dual converters? (3)
6. Justify the statement "Freewheeling diode in phase controlled rectifiers improves the power factor of the system". (2)
7. What is the effect of load inductance on the performance of AC voltage Controller? (3)
8. Draw the circuit diagram of a single-phase AC regulator using two SCRs and explain why it must have its trigger sources isolated from each other? (2)
9. What are the performance parameters of inverters? (3)
10. What are the methods for voltage control within inverters? (2)

Part-B (50 Marks)

11. Draw the basic structure of IGCT, characteristics and explain its working (10)
12. Discuss about class-C commutation clearly with the help of a neat schematic and necessary waveforms (10)
13. a) Explain the operation of single – phase, half-controlled bridge converter feeding an inductive load with the associated wave forms for continuous conduction. Derive the expression for average load voltage, average load current. (5)
b) A single phase fully controlled bridge rectifier is given 230 V, 50 HZ supply. The firing angle is 45° and the load is highly inductive. Determine. (5)
i) Average output voltage ii) Voltage ripple factor
iii) Power factor iv) Form factor
14. Discuss the basic principle of working of a single-phase to single-phase bridge type step-down cycloconverter with continuous & discontinuous conduction mode. Draw the necessary voltage and current waveforms. (10)
15. For type-A chopper circuit, source voltage is 220 V , chopping period $T=2000 \mu s$, On-period $=600 \mu s$, Load circuit parameters: $R=1 \Omega$, $L=5 \text{ mH}$ and $E=24 \text{ V}$. (10)
(i) Find whether load current is continuous or not
(ii) Calculate the value of average output current
(iii) Compute maximum and minimum values of output current
(iv) Compute average value of supply current
16. Explain the working of 3-phase bridge inverter in 180° mode feeding a resistive load. (10)
17. a) Explain sinusoidal pulse modulation as used in PWM inverters. (5)
b) With the help of a neat schematic, explain the working of a BJT. (5)
