

Code: 9A02504

**R9**

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

**POWER ELECTRONICS**

(Common to EEE and E.Con.E)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions  
All questions carry equal marks

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- 1 (a) Give the construction details of an SCR with the help of schematic diagram and the circuit symbol.  
(b) Explain the importance of gate signal in SCR.
- 2 Draw the R-triggering circuit and explain with proper waveforms.
- 3 (a) Describe the operation of a single phase two pulse midpoint converter with relevant waveforms. Derive an expression for average output voltage.  
(b) A single phase half controlled bridge converter is supplied at 230 V, 50 Hz, with source inductance of 2 mH. Neglecting resistance voltage drop, when the converter is operating at a firing angle of  $45^\circ$ , and the load current is constant at 10 A. Determine the load voltage.
- 4 (a) Show that the effect of source inductance on the performance of single phase fully converter is present an equivalent resistance of  $\omega L_s/\pi$  ohms in series with the internal rectifier voltage.  
(b) Mention the advantages and disadvantages of source inductance.
- 5 (a) Describe the operation of three pulse converter with R-load and draw associate waveforms.  
(b) Derive the voltage and RMS current relationships for three pulse converter with R-load.
- 6 (a) Derive the expression output current in terms of source voltage, load impedance and firing angle for a single-phase ac voltage regulator with RL load.  
(b) A single-phase voltage controller feeds power to resistive load of  $4 \Omega$  from 230 V, 50Hz source. Determine: (i) The peak values of average and rms thyristors currents for any firing angle  $\alpha$ .  
(ii) The minimum circuit turn-off time for any firing angle  $\alpha$ .  
(iii) The ratio of third harmonic voltage to fundamental voltage for  $\alpha = \pi/3$ .
- 7 (a) For type-A chopper connected to RLE load. Write the basic voltage equations and derive the expressions for the maximum and minimum values of load current in terms of source voltage  $V_s$ , R and E.  
(b) For the ideal type-A chopper circuit,  $E_{dc} = 220$  V, chopping frequency = 500 Hz; duty cycle  $\alpha = 0.3$  and  $R = 1 \Omega$ ;  $L = 3$  mH; and  $E_b = 23$  V. Compute  
(i) The input power. (ii) Power absorbed by the back e.m.f  $E_b$ . (iii) Power loss in the resistor.
- 8 A 1-phase bridge inverter is used to supply a load of  $10 \Omega$  resistance, 24 mH inductance from a 360 V dc source. If the inverter is operating at 60 Hz, determine the steady state power delivered to the load for:  
(i) Square wave operation. (ii) Quasi square wave operation with an on-period of 0.6 of a cycle.

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