

III B.Tech. I Semester Regular Examinations, November -2005**POWER ELECTRONICS****(Electrical & Electronic Engineering)****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. The latching current of a thyristor with d.c. voltage source of 100V is 50mA. Calculate the value of minimum width of the gate pulse current when connected to a pure inductive load of 1H. Compute the effect, if a resistance of 10 ohms is connected in series with the load. [8+8]
2. Explain the operation of a single phase half wave converter for R-load with neat circuit diagram and necessary waveforms. Also derive the output average voltage and current for $\alpha = 30^\circ$. [12+4]
3. A six pulse thyristor converter is connected to the mains through a transformer of 6% reactance. If the rms value of the voltage at the secondary of the transformer is 415V, calculate the voltage regulation. Neglect resistance in converter. The full load dc current is 200A. What is the value of commutation angle. [16]
4. A single phase full wave ac voltage controller has a resistance load of
 - (a) 10 ohms and
 - (b) 5 ohms.The input ac voltage is 230V, 50Hz. For a delay angle of 90° , determine the rms load voltage, rms load current, rms thyristor current and input power factor for above two loads. [8+8]
5. For a single phase mid-point cyclo-converter, explain the operation of the circuit when fed to R-load with the help of neat circuit diagram and relevant output waveforms for $\alpha = 30^\circ$ and $\alpha = 120^\circ$ for $f_0 = 1/4$ fs. [4+8+4]
6. Discuss the operation of class - A and class-B commutation circuits. Also mention their application with the help of neat circuit diagram. [8+8]
7. Draw and explain the simple SCR series inverter circuit employing class A type commutation. With the help of important waveforms. State the limitations of this inverter. [8+4+4]
8. Explain the voltage control in case of single phase bridge inverter circuit, in order to get variable voltage and variable frequency output. [16]

III B.Tech. I Semester Regular Examinations, November -2005**POWER ELECTRONICS****(Electrical & Electronic Engineering)****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the necessity of series and parallel connection of SCRs.
(b) What is String efficiency in series and parallel connections.
(c) What are the problems arising in series and parallel connections. [4+4+8]
2. A single phase fully controlled bridge converter is operated from a single phase 220V, 50Hz supply. The load current is continuous and has negligible ripple. The average load current is $I_{dc} = 50\text{A}$ and commutating inductance per phase is $L_C = 0.5\text{mH}$. Determine the overlap angle if
(a) $\alpha = 30^\circ$
(b) $\alpha = 60^\circ$ [8+8]
3. A three phase, six pulse fully controlled converter is connected to three phase ac supply of 440V and 50Hz and operates with a firing angle of $\pi/5$ radians. The load current is maintained constant at 5 Amps and load voltage is 440V. Calculate load resistance, source inductance and overlap angle. [4+6+6]
4. An a.c. voltage controller supplies power to a resistive load of 20 ohms. The rms of input voltage is 220V at 50Hz. The thyristors are switched ON for 30 cycles and OFF for 70 cycles. Calculate the values of
(a) the rms output voltage
(b) input power factor
(c) the average and rms values of thyristor currents [4+4+8]
5. (a) What is a cyclo converter?
(b) What are the varieties of single phase cyclo converters.
(c) What are the salient features of cyclo converters.
(d) What are the major limitations of cyclo converters [4+4+4+4]
6. (a) A step-up chopper with a pulse width of $150\mu\text{s}$ operating on 220V, dc supply. Compute the load voltage if the blocking period of the device is $40\mu\text{s}$.
(b) What is the necessity of step-up chopper where do you use. [10+6]
7. Draw and explain the simple SCR series inverter circuit employing class A type commutation. With the help of important waveforms. State the limitations of this inverter. [8+4+4]

8. A single phase full bridge inverter uses a uniform PWM with two pulses per half cycle for voltage control. Plot the distortion factor, fundamental component, and lower order harmonics against modulation index. [5+5+6]

III B.Tech. I Semester Regular Examinations, November -2005**POWER ELECTRONICS****(Electrical & Electronic Engineering)****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What is the importance of Surge current rating of a thyristor, explain in detail.
(b) A thyristor has half-cycle surge current rating of 1000mA for a 50Hz supply. Calculate its one-cycle surge current rating and I^2t rating. [10+6]
2. (a) What are the features of Half -controlled converters over full controlled converters.
(b) Bring out the features of Free-wheeling diode used in converters. [8+8]
3. Explain the operation of three phase half-wave controlled converter with resistive load, and inductive load. Sketch the associated waveforms. [8+8]
4. A single phase full wave ac voltage controller has a resistance load of
(a) 10 ohms and
(b) 5 ohms.
The input ac voltage is 230V, 50Hz. For a delay angle of 90° , determine the rms load voltage, rms load current, rms thyristor current and input power factor for above two loads. [8+8]
5. Discuss the working of a single phase mid point cyclo converter with R-L loads and for discontinuous operation with neat circuit diagram and output rms voltage and current waveforms for $f_0=1/3$ fs. [4+7+5]
6. Explain the operation of a basic dc chopper and obtain the following as a function of E_{dc} , R and duty cycle δ .
(a) average output voltage and current
(b) rms value of the output voltage
(c) RMS and average load currents [6+4+6]
7. Explain the auxiliary impulse commutation techniques used in the bridge type single phase inverter with neat circuit diagram. [4+7+5]
8. Explain the voltage control in case of single phase bridge inverter circuit, in order to get variable voltage and variable frequency output. [16]

III B.Tech. I Semester Regular Examinations, November -2005**POWER ELECTRONICS****(Electrical & Electronic Engineering)****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. Explain the V-I Characteristics of Thyristors with elaborating the following :
 - (a) Latching current
 - (b) holding current
 - (c) on-state and off-state condition
 - (d) turn-on and turn-off times
 - (e) finger voltage[6+10]
2. Explain the operation of single phase fully-controlled bridge converter with RL loads for discontinuous and continuous current modes. Draw circuit and necessary waveforms for $\alpha = 60^\circ$.[8+8]
3. A six pulse thyristor converter is connected to the mains through a transformer of 6% reactance. If the rms value of the voltage at the secondary of the transformer is 415V, calculate the voltage regulation. Neglect resistance in converter. The full load dc current is 200A. What is the value of commutation angle.[16]
4. Explain the operation of a single phase ac voltage controller with neat circuit diagram and output waveforms with respect to source voltage waveforms at $\alpha = 60^\circ$ for Resistive load.[4+8+4]
5. For a single phase mid-point cyclo-converter, explain the operation of the circuit when fed to R-load with the help of neat circuit diagram and relevant output waveforms for $\alpha = 30^\circ$ and $\alpha = 120^\circ$ for $f_0 = 1/4$ fs.[4+8+4]
6. A current commutated chopper controls a battery powered electric car. The battery voltage is 100V, starting current is 100A, thyristor turn-off time is $20 \mu s$, chopping frequency is 400Hz. Compute the values of commutating capacitor and commutating inductor. Assume $I_{cm} / I_{om} = 3$.[16]
7. Draw and explain the simple SCR series inverter circuit employing class A type commutation. With the help of important waveforms. State the limitations of this inverter.[8+4+4]
8.
 - (a) What are the different pulse width modulation techniques used for inverters.
 - (b) Which of the schemes gives better quality of voltage and current.[10+6]
