

**IV B.Tech II Semester Regular Examinations, Apr/May 2006**  
**INDUSTRIAL ELECTRONICS**  
( Common to Electronics & Instrumentation Engineering and Mechatronics)  
Time: 3 hours Max Marks: 80

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Explain about Residual drift in D.C amplifiers.  
(b) Explain how it can be compensated. [8+8]
2. (a) Tabulate the differences between linear mode power supply and SMPS.  
(b) Explain the different types of SMPS.  
(c) What is a switching regulator? Why it is called so? Enumerate and explain its advantages. [5+5+6]
3. (a) Draw the basic electronic voltage stabilizer circuit and explain it.  
(b) Define the terms regulation factor and stabilization ratio of a voltage regulator. [8+8]
4. (a) Explain the thermal and power ratings of SCR.  
(b) Explain the methods of measurement of the following SCR parameters.
  - i. Holding and latching current
  - ii. Turn-off time
  - iii.  $dV/dt$  and  $di/dt$  [9+7]
5. Explain the operation of three-phase , half-wave controlled converter with resistive load. Sketch the associated waveforms and derive expressions for the average voltage output. [16]
6. Draw and explain the operation of the time-sharing inverter circuit and give its related current and voltage waveforms. [16]
7. Draw and explain the operation of a speed control of a dc series motor by a single-phase semiconverter for the continuous motor current. Draw the associated voltage and current waveforms. [16]
8. (a) Explain the coagulating action of Ultrasonics.  
(b) Explain the chemical ,thermal and biological effects of Ultrasonics. [8+8]

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1. Derive an expression for voltage gain of DC amplifier. List and explain its merits and demerits. [16]
2. (a) Explain the need for protection techniques in Regulated Power Supplies? Explain any two techniques in detail.  
(b) Draw a circuit diagram of an electronic regulator and derive an expression for its regulation sensitivity. [8+8]
3. (a) Draw the circuit and explain the working of short-circuit and overload protection given for voltage regulator circuits.  
(b) What is the importance of RF filter in the Thyristor protection circuits and give reasons? [8+8]
4. (a) Define
  - i. Latching current
  - ii. holding current of SCR.  
(b) A thyristor whose latching current is 25mA is connected in series with a resistor of 20 ohms , an inductor of 0.5H and a DC power supply of 100V. The duration of the firing pulse is 40 microsec. Will the thyristor get fired?  
(c) Why is a gate-to-cathode resistance required for sensitive gate SCRs. [4+8+4]
5. (a) A single phase fully controlled bridge converter supplies an inductive load. Assuming that the output current is virtually constant and is equal to  $I_d = 3A$ , determine the following performance measures, if the supply voltage is 230V and if the firing angle is maintained at  $(\pi/6)$  radians. i) Average output voltage ii) Supply fundamental current iii) Fundamental power factor iv) supply harmonic factor v) voltage ripple factor  
(b) Explain the effect of freewheeling diodes in converter circuits. [10+6]
6. Design a snubber circuit and explain its operation and give its applications. [16]
7. (a) Explain the resistance welding process.  
(b) Draw the basic circuit of ac resistance welding and explain it. [8+8]
8. (a) Briefly explain the chemical, physio chemical, thermal and biological effects of ultrasonic waves.  
(b) List various industrial applications of ultrasonic waves. [8+8]

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1. (a) Explain the DC amplifier using cathodeemitter follower as the 1<sup>st</sup> stage and derive the expression for its gain using its equivalent circuit.  
(b) Explain the cathodeemitter drift compensation technique in DC amplifiers. [8+8]
2. (a) What is the disadvantage of single transistor SMPS and how it can be eliminated using bridge type of configuration?  
(b) A single transistor, fly back SMPS operating at 16 kHz is supplying a mean load power of 120W at a mean voltage of 80 V from a dc source of 110 V. Estimate the mark/ space ratio of the output voltage and the value of inductance required in the circuit. [8+8]
3. (a) Draw the circuit of monolithic regulator connected as a current regulator and explain it. Also obtain the expression for its load current.  
(b) Differentiate between the monolithic and hybrid integrated circuits. [8+8]
4. (a) List the advantages and disadvantages of Triac as compared to SCR  
(b) Explain in detail the following current ratings of SCR.
  - i. Average ON state current
  - ii. Surge current rating
  - iii. RMS ON state current
  - iv. di/dt rating. [8+8]
5. (a) Explain the half-waving effect in a single-phase symmetrical half-controlled converters.  
(b) Draw and compare the waveforms of a half-wave controlled rectifier (RL load) with and without freewheeling diodes. [8+8]
6. Explain the operation of self-commutated inverter circuit and give all the voltage and current waveforms and give its applications. [16]
7. Draw and explain the operation of a speed control of a dc series motor by a single-phase semiconverter for the continuous motor current. Draw the associated voltage and current waveforms. [16]
8. (a) Explain the theory and principle of dielectric heating.  
(b) List various Industrial applications of dielectric heating. [8+8]

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1. (a) Explain about Residual drift in D.C amplifiers.  
(b) Explain how it can be compensated. [8+8]
2. (a) Explain the methods of decreasing input regulation factor ( $S_v$ ) for a series Voltage Regulator.  
(b) Define
  - i. input regulation factor
  - ii. output resistance
  - iii. temperature coefficient of a Voltage Regulator. And derive an expression to relate them. [8+8]
3. (a) Draw the circuit of monolithic regulator connected as a current regulator and explain it. Also obtain the expression for its load current.  
(b) Differentiate between the monolithic and hybrid integrated circuits. [8+8]
4. (a) List the advantages of thyristor as compared to BJT for switching applications.  
(b) An SCR has a  $V_g - I_g$  characteristics given as  $V_g = 1.5 + 8 I_g$ . In a certain application, the gate voltage consists of rectangular pulses of 12 V and of duration 50microsec with the duty cycle 0.2. Find the value of  $R_g$  series resistor in gate circuit to limit the peak power dissipation in the gate to 5 watts. And also calculate average power dissipation in the gate.  
(c) Define the Nonrepetitive and Repetitive peak reverse and forward voltage ratings of SCR. [6+6+4]
5. Explain the operation of a single-phase , half-controlled bridge converter with resistive load with the associated waveforms and also derive the expressions for average load voltage , average load current and RMS load voltage. [16]
6. Design a snubber circuit and explain its operation and give its applications. [16]
7. Explain the SCR sequential flasher used for automobile turn signals. [16]
8. (a) Explain the coagulating action of Ultrasonics.  
(b) Explain the chemical ,thermal and biological effects of Ultrasonics. [8+8]

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