

**IV B.Tech. I Semester Regular Examinations, November -2005****INDUSTRIAL ELECTRONICS  
(Electronics & Control Engineering)****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions  
All Questions carry equal marks**

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1. (a) What is drift? Describe any one drift compensation technique.  
(b) Compare various commonly used drift compensation techniques. [8+8]
2. (a) Compare series and shunt voltage regulator circuits in all respects.  
(b) Design a series voltage regulator with the following specifications  $V_o=20\text{volts}$ ,  
 $V_{in}=22-30\text{ volts}$ ,  $I_{load}(\text{max})=50\text{mA}$ . [10+6]
3. An LM 237 IC voltage regulator, is to produce an output of  $-12\text{V}$  with  $I_L(\text{max}) = 80\text{mA}$ . Calculate the suitable resistances for the output and select an appropriate supply voltage and also determine the device power dissipation. [16]
4. (a) Explain the use of pulse transformer in triggering circuit.  
(b) Explain the construction, operation and V-I characteristics of a diac. [8+8]
5. Explain the fully controlled single phase bridge type phase controlled rectifier circuit and give the expression for the average dc output voltage. [16]
6. (a) Explain the design aspects of series inverter.  
(b) Explain how the output frequency is higher than the resonant frequency in the above circuit. [8+8]
7. (a) Explain how the SCR control circuit measures the moisture level of the clothes in the application of automatic clothes-drier.  
(b) List of the other industrial applications of SCR. [10+6]
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) Draw the circuit for series voltage regulator using two transistors and explain its working.  
(b) Define and explain the following:
  - i. Input Regulation factor
  - ii. Output resistance
  - iii. Temperature Co-efficient. [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) 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 importance of the freewheeling diodes in single-phase full-wave controlled rectifier circuit. And also justify the statement "Freewheeling diode improves the power factor of the system". [16]
6. Explain the operation of self-commutated inverter circuit and give all the voltage and current waveforms and give its applications. [16]
7. (a) Explain a simple SCR battery charger.  
(b) Explain the operation of an SCR universal motor speed control circuit. [8+8]
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) Why drift compensation is needed in the amplifier circuit ? What are different techniques?  
(b) Explain any one compensation technique with neat ckt. diagram and relevant calculations. [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 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) 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. (a) Draw the SCR protection circuit and explain how over current protection is possible from that circuit.  
(b) A circuit having a prospective fault current 1 kA is protected by a fuse with  $I^2t$  rating of 100  $A^2$  sec on a 50-Hz basis. The faulted circuit is opened in 5 msec. Calculate the peak value of the fault current. [8+8]
6. Design a snubber circuit and explain its operation and give its applications. [16]
7. Design a simple and inexpensive burglar alarm to give an audio and visual indication of a door opening. Design for battery operation and low standby power. [16]
8. (a) Describe the role of ultrasonic waves in any two industrial applications.  
(b) Describe briefly the piezo electric effect used for ultrasonic wave generation.

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1. (a) What are Non-linear bias circuits? Why do we need this circuit?  
(b) Explain any one Non-linear biasing circuit. [8+8]
2. (a) Explain the operation of a Shunt type Voltage Regulator with neat sketch.  
(b) Derive the expressions for series Resistance of above Voltage Regulator.  
(c) Design a Shunt Regulator for  
output voltage 9.1v  
 $I_L (\text{max}) = 100\text{mA}$   
 $I_L (\text{min}) = 10\text{mA}$   
 $I_{z(\text{knee})} = 20\text{mA}$   
 $V_{in} = 20\text{v}$  [6+4+6]
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) Design an LC RF interference filter using SCR with a 3-dB cutoff frequency at 50kHz with a 10 Ohm load.  
(b) What is the main advantage of low-voltage triggering devices as compared to high-voltage devices. [8+8]
5. (a) Draw and explain the Static AC circuit breaker using SCR and explain its operation.  
(b) Explain the over voltage protection circuit and explain its operation. [8+8]
6. Design a snubber circuit and explain its operation and give its applications. [16]
7. (a) Explain a simple SCR battery charger.  
(b) Explain the operation of an SCR universal motor speed control circuit. [8+8]
8. (a) List the merits of Induction Heating.  
(b) Explain the main principle behind induction heating. [8+8]

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