

**III B.Tech I Semester Regular Examinations, November 2006**

**INDUSTRIAL ELECTRONICS**

**(Instrumentation & Control Engineering)**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions  
All Questions carry equal marks**

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1. (a) Draw a two stage (identical) direct coupled amplifier and explain its principle of operation.  
(b) What is drift? Explain. [10+6]
2. Explain in detail the various protection techniques with neat diagrams for regulated power supplies. [16]
3. (a) Define the short-period and long-period accuracy of a stabilizer.  
(b) Draw the basic voltage stabilizer circuit using nonlinear voltage divider and explain it. [8+8]
4. (a) Which thyristor rating is in danger of being exceeded when a load is inductive, and what is the conventional limiting technique?  
(b) What are the different signals which can be used for turning on an SCR by gate control? Compare them. [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. Explain the operation of single-phase bridge inverter with the help of load voltage and load current waveforms. [16]
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 behind the induction heating.  
(b) List and explain the applications of induction heating. [8+8]

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1. (a) What is the need of D.C amplification?  
(b) What are the various coupling methods used in D.C amplifiers.  
Explain with neat sketch. [6+10]
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) Sketch the basic circuit of a 723 IC voltage regulator and explain its operation.  
(b) Explain the operation of LM 340 fixed voltage regulator. [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) 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. Draw and explain the operation of the time-sharing inverter circuit and give its related current and voltage waveforms. [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) Describe the role of ultrasonic waves in any two industrial applications.  
(b) Describe briefly the piezo electric effect used for ultrasonic wave generation.

Code No: RR312202

**Set No. 2**

[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) Compare series and short voltage regulator circuits in all respects.  
(b) Design a series voltage regulator with the following specifications  $V_o=20\text{volts}$ ,  
 $V_{in}=22\text{-}30\text{ volts}$ ,  $I_{load}(\text{max})=50\text{mA}$ . [10+6]
3. Explain the principle of operation of shunt voltage regulator using integrated circuit. [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 three-phase , half-wave controlled converter with inductive load. Sketch the associated waveforms and derive expressions for the average voltage output. [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 the poly-phase resistance welding circuit.  
(b) Explain a single phase resistance welding 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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1. Derive an expression for voltage gain of DC amplifier. List and explain its merits and demerits. [16]
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. (a) What are various IC Voltage Regulators? How these are advantageous than the other regulators?  
(b) Explain the operation of any IC voltage regulator?  
(c) How the short circuit current protection is provided for an IC regulator. Draw the circuit diagram. [6+5+5]
4. Explain two bidirectional triggering methods of a Triac and give the comparison between them. [16]
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. Draw and explain the simple SCR series inverter circuit employing Class A type commutation. Draw and explain the relevant waveforms. Explain its limitations. [16]
7. Explain the synchronous timer with the help of its voltage and current waveforms. [8+8]
8. (a) Explain the theory behind the induction heating.  
(b) List and explain the applications of induction heating. [8+8]

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