

IV B.Tech. II Semester Regular Examinations, April/May -2005
INDUSTRIAL ELECTRONICS
(Common to Electronics & Communication Engineering, Electronics & Instrumentation Engineering and Mechatronics)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the DC amplifier using cathodeemitter follower as the 1st stage and derive the expression for its gain using its equivalent circuit.
(b) Explain the cathodeemitter drift compensation technique in DC amplifiers.
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.
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?
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.
5. (a) Explain SCR as a static switch.
(b) Draw the general SCR phase control circuit and draw its waveforms.
6. Design a snubber circuit and explain its operation and give its applications.
7. List out different types of resistance welding processes and explain each one using appropriate figures and also give their applications.
8. (a) Explain the theory behind the induction heating.
(b) List and explain the applications of induction heating.

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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.
3. Explain the principle of operation of shunt voltage regulator using integrated circuit.
4. What is meant by commutation of SCR? What are different classes of forced commutation methods? Explain class A and class B methods.
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.
6. Draw and explain the operation of the time-sharing inverter circuit and give its related current and voltage waveforms.
7. (a) What is meant by electronic timer and explain it with examples.
(b) Explain the DC operated timer using its circuit.
8. (a) Explain the theory and principle of dielectric heating.
(b) List various Industrial applications of dielectric heating.

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1. (a) Explain the DC amplifier using cathodeemitter follower as the 1st stage and derive the expression for its gain using its equivalent circuit.
(b) Explain the cathodeemitter drift compensation technique in DC amplifiers.
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.
3. Explain the principle of operation of shunt voltage regulator using integrated circuit.
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.
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.
6. Explain the operation of self-commutated inverter circuit and give all the voltage and current waveforms and give its applications.
7. (a) Explain the principle and operation of SCR alarm circuit.
(b) Explain the speed control of induction motor using triac.
8. (a) What are the properties of materials used in dielectric heating?
(b) Explain various methods of coupling electrodes to RF generator in dielectric heating applications.

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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.
2. (a) Explain in detail the principle of obtaining a regulated power supply.
(b) What is a controlled series voltage regulator? Give its block diagram.
(c) Tabulate the differences between
 - i. Shunt and series regulators.
 - ii. Zener shunt regulator and transistorized shunt regulator.
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.
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.
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.
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.
7. Draw and explain the triac time delay relay circuit.
8. (a) Explain the theory and principle of dielectric heating.
(b) List various Industrial applications of dielectric heating.
