

B.E. DEGREE EXAMINATIONS: APRIL/MAY 2012

Fourth Semester

MECHATRONICS ENGINEERING

MCT106: Industrial Electronics

Time: Three Hours

Maximum Marks: 100

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. An IGBT has three terminals called
 - a) Collector, emitter and base
 - b) Drain, source and base
 - c) Drain, source and gate
 - d) Collector, emitter and gate
2. High frequency operation of a circuit is limited by
 - a) On-state loss in the device
 - b) Off- state loss in the device
 - c) Switching losses in the device
 - d) Both On state and off state loss in the device
3. When a thyristor is reverse biased, the number of blocked p-n junctions is
 - a) 1
 - b) 2
 - c) 3
 - d) 4
4. Overlap in a phase controlled converter, under continuous conduction , does not depend on
 - a) Frequency
 - b) Applied voltage.
 - c) Load current
 - d) Load inductance.
5. A chopper can be used on
 - a) Pulse-width modulation only
 - b) Frequency modulation only.
 - c) Amplitude modulation only
 - d) Both PWM and FM
6. In a single pulse modulation of PWM inverters, fifth harmonic can be eliminated if pulse width equal to
 - a) 30°
 - b) 60°
 - c) 120°
 - d) 150°
7. Two identical SCRs are connected back to back, feed a load R. If SCR is fired at 90° , a MI voltmeter across the load would read
 - a) $\frac{1}{2}$ x peak voltage
 - b) peak voltage
 - c) $\frac{1}{\pi}$ x peak voltage
 - d) zero
8. The cycloconverter require natural or forced commutation under
 - a) Natural commutation in both step- up and step-down cycloconverter
 - b) Forced commutation in both step- up and step-down cycloconverter
 - c) Forced commutation in step- up cycloconverter
 - d) Forced commutation in step-down cycloconverter

9. A separately excited d.c motor which have to be controlled from a 3-phase source, operates in the first quadrant only. The most preferred converter would be
- Fully- controlled converter
 - fully -controlled converter with freewheeling diode
 - Half controlled converter
 - Sequential control of two series connected fully-controlled converters
10. SMPSs are superior to linear power supplies in respect of
- Size and efficiency
 - Efficiency and regulation
 - Regulation and noise
 - Noise and cost

PART B (10 x 2 = 20 Marks)

- Mention the differences between power diode and signal diode.
- What are the advantages of GTO over SCR?
- What is the function of freewheeling diodes in controlled rectifier?
- List advantages of six pulse converter.
- What is meant by step-up and step-down chopper?
- Why thyristors are not preferred for inverters?
- What type of gate signal is used in single phase ac voltage controller with RL load?
- Mention the applications of cyclo-converter.
- List out various typical industrial applications of relays.
- List some of the special equipment used in industrial electronics.

PART C (5 x 14 = 70 Marks)

21. a) Discuss the different modes of operation of TRIAC with the help of VI characteristics.

(OR)

- b) Draw the basic structure of an IGBT and explain the operation.

22. a) Derive the expressions for average output voltage and rms output voltage of single phase full converter.

(OR)

- b) Describe the working of 3 phase fully controlled bridge converter in the Rectifying mode and inversion mode. And derive the expressions for average output voltage and rms output voltage.

23. a) State different methods of voltage control inverters. Describe about PWM control in inverter.

(OR)

b) Explain the working of current commutated chopper with aid of circuit diagram and necessary waveforms. Derive an expression for its output voltage.

24. a) Explain the operation of multistage control of AC voltage controllers with neat diagram.

(OR)

b) With neat diagram explain cycloconverters.

25. a) Discuss in detail about Dielectric heating and induction heating.

(OR)

b) Write short notes on

(i) Electronic regulators. (5)

(ii) Power electronics application to industrial process control. (5)

(iii) Drives in industries (4)
