

LIB
5/6/13 AN

Reg. No. :

| | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

Question Paper Code : 21400

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fifth Semester

Electrical and Electronics Engineering

EE 2301/EE 51/10133 EE 504/10144 EE 504 — POWER ELECTRONICS

(Common to Instrumentation and Control Engineering)

(Regulation 2008/2010)

(Common to PT EE 2301 Power Electronics for B.E.(Part -Time) Fourth Semester —
Electrical and Electronics Engineering — Regulation 2009)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the limitation of high frequency operation of a power electronic device?
2. What is the use of snubber circuit?
3. What is displacement factor for two pulse converter?
4. What is circuit turn-off time for single phase full converter?
5. What are the control strategies for chopper circuit?
6. What is the need for resonant converter?
7. In a CSI, if frequency of output voltage is 'f' Hz, what is the frequency of voltage input to CSI?
8. What is space vector?
9. What are the types of ac voltage controllers?
10. What is matrix converter?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Snubber circuit for an SCR should primarily consists of capacitor only. But in practice a resistor is used in series with the capacitor. Why? -Discuss. (8)
- (ii) Sketch the dynamic characteristics of a thyristor during its turn-ON and turn-OFF process. Discuss briefly the nature of these curves. (8)

Or

- (b) Explain various types of commutation circuits for SCR. (16)

12. (a) (i) A single phase bridge converter is utilized to produce regulated DC output voltage. The input voltage is 230V and the load current is 8A for a firing angle of 30°
- (1) Calculate the dc output voltage (4)
- (2) Calculate the dc output voltage and current if a freewheeling diode is used at the output for the same firing angle as in (1). (4)
- (ii) Explain single phase half wave rectifier circuit with RL Load and freewheeling diode. (8)

Or

- (b) (i) Discuss the effect of series inductance on the performance of single phase full converter indicating clearly the conduction of various thyristors during one cycle. (8)
- (ii) Describe the working of 1ϕ dual converter in two modes. (8)
13. (a) (i) A type - 'A' Chopper has supply voltage V_s and duty cycle of (A) 0.4 and (B) 0.6 For these duty cycles, calculate
- (1) average and rms values of output voltage (3)
- (2) output power for R load (3)
- (3) ripple factor (2)
- (ii) Explain the operation of step-up chopper and derive an expression for its output voltage. (8)

Or

- (b) (i) Draw and explain the block schematic of SMPS and mention its advantages over linear power supply. (8)
- (ii) Draw the power circuit diagram of a buck regulator and explain its operation with equivalent circuit for different modes and waveforms. (8)
14. (a) With neat diagram and waveforms explain 3ϕ VSI using transistors operating in 120° conduction mode. Also obtain the expression for rms value of output voltage. (16)

Or

- (b) (i) Explain Multiple Pulse Width Modulation. (8)
- (ii) Explain Sinusoidal Pulse Width Modulation. (8)

15. (a) (i) Explain about multi-stage sequence control of voltage controllers. (8)
(ii) Explain Multiple Pulse Width Modulation. (8)

Or

- (b) (i) Explain the principle of integral cycle control. (8)
(ii) A single phase voltage controller has input voltage of 230V, 50 Hz and a load of $R = 15\Omega$. For 6 cycles ON and 4 cycles OFF, determine.
- (1) rms output voltage (3)
 - (2) input pf and (3)
 - (3) average and rms thyristor currents. (2)
-