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Question Paper Code : 31237

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

Sixth Semester

Electrical and Electronics Engineering

080280054 – POWER ELECTRONICS

(Common to 080280050 – Power Electronics for B.E. (Part-Time) Fifth Semester Electrical and Electronics Engineering)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by holding current and latching current in SCR?

2. Compare the characteristics of power BJT and power MOSFET.

3. Why freewheeling diode is used in a 1ϕ half wave controlled rectifier?

4. In a single phase ac voltage controller which uses on-off control, the rms supply voltage is 220 V. If the duty cycle is 40%, find the rms output voltage.

5. How the output voltage is controlled in a steps down chopper?

6. What is a cycloconverter?

7. Write the differences between full bridge and half bridge single phase inverter.

8. What is meant by over modulation in simusoidal pwm? Write its advantage.

9. Draw the UJT triggering circuit for 1ϕ half controlled rectifier.

10. What are the advantages of HVDC system?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the construction and working principle of TRIAC along with its static characteristics. (10)

(ii) Describe the protection circuit for SCR against high $\frac{di}{dt}$ and $\frac{dv}{dt}$. (6)

Or

(b) (i) Explain the working principle and static characteristics of power MOSFET. (8)

(ii) Describe the series operation of SCRs and derive the expression for the resistance connected across each SCR for equalising the voltage under static condition. (8)

12. (a) (i) Explain the working principle of 1ϕ fully controlled rectifier with high inductive load along with necessary circuit and waveforms. Derive the expression for average output voltage in it. (12)

(ii) A 1ϕ fully controlled rectifier is connected to RLE load. The rms source voltage is 220V. The average load current is constant at 10A. If the value of R is 0.5 Ω and L is 2 mH, find the firing angle for E=120 V. (4)

Or

(b) (i) Describe the operation of three phase ac voltage controller assuming that the load is star connected resistive load. (10)

(ii) Explain the effect of source inductance in a 1ϕ full converter operation having resistive load. (6)

13. (a) Explain the working principle of step up chopper with necessary circuit and waveforms. Derive the expression for output voltage in it for continuous current operation. (16)

Or

(b) With necessary circuit and waveforms, explain the operation of three phase to single phase cycloconverter. (16)

14. (a) Explain the principle of operation of a 3ϕ bridge inverter operating in 120° conduction mode with necessary circuit and waveforms. Assume the load is 3ϕ delta connected resistive load. (16)

Or

(b) (i) Explain the sinusoidal pwm technique employed in inverters with necessary waveforms. (10)

(ii) Describe any one method to reduce harmonics in inverter's output voltage. (6)

15. (a) Explain the construction of triggering circuit using cosine wave crossing scheme for any one controlled rectifier circuit. (16)

Or

(b) (i) Describe the features available in a microcontroller to generate gating pulses for a power electronic converter. (8)

(ii) Explain the principle of operation of any one HVDC system. (8)

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