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Question Paper Code: 31564

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Fifth Semester

Instrumentation and Control Engineering

01UIC504 – POWER ELECTRONICS AND APPLICATIONS

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Examine the circuit turn off time should be greater than the thyristor turn-off time?
2. List the different methods to turn on the thyristor?
3. Define commutation angle or overlap angle?
4. What is the effect of freewheeling diodes in semi converter circuit?
5. The boost regulator has an input of 20V and the average output voltage of 8V. Determine the duty cycle of the converter?
6. Give the applications of DC chopper?
7. Identify the reason for thyristor are not preferred for inverters?
8. Mention the advantages of PWM control?
9. What is meant by cyclo-converter and write its types?
10. What do you mean by integral cycle control method?

PART - B (5 x 16 = 80 Marks)

11. (a) Describe the basic structure of power MOSFET and explain the principle of operation with neat diagram also discuss its switching characteristics. (16)

Or

- (b) (i) Briefly explain the significance of snubber circuit also discuss the importance of driver circuit with neat sketch for SCR. (10)
- (ii) Draw and explain VI characteristics of SCR. (6)
12. (a) Analyze the working of single phase controlled bridge rectifier in the following mode (a) rectifying mode (b) inversion mode. Sketch the associated waveforms also derive the expressions for average output voltage and RMS output voltage. (16)

Or

- (b) (i) Summarize the working of dual converter. (8)
- (ii) A three phase half wave controlled rectifier has a supply of 200V/phase. Determine the average load voltage for firing angle of 0° , 30° , 60° . Assuming a thyristor voltage drop of 1.5V and continuous load current. (8)
13. (a) (i) With help of circuit diagrams, mode of operation and waveforms, explain the working of boost converter and derive expression for average, RMS value of output voltage and effective input resistance against duty cycle. (10)
- (ii) A step-up chopper with pulse width of 150ms operating on 220V DC supply. Compute the load voltage if the blocking period of device is 40ms. (6)

Or

- (b) (i) Briefly discuss the SMPS operation with neat block diagram. (10)
- (ii) Differentiate between ZCS and ZVS converter? (6)
14. (a) Explain the operation of 3 phase bridge inverter for 180° degree mode of operation with help of relevant phase and line voltage waveforms and expressions. (16)

Or

- (b) State different methods of voltage control inverters. Describe about different PWM control in inverter with the significance of harmonic control. (16)

15. (a) (i) With a neat power circuit describe the operation of single phase AC voltage controller with RL load. (10)
- (ii) A single phase AC voltage regulator with RL load has the following details. Supply voltage $230V$, frequency of $50Hz$, resistance is 4Ω and $\omega L=3\Omega$. Calculate (a) the control range of firing angle (b) the maximum value of RMS loads current (c) the maximum power. (6)

Or

- (b) (i) Mention the types of commutation used in step-up cyclo converter and explain the operation with necessary waveform. (10)
- (ii) Write short notes on significance of matrix converter with its advantage and application. (6)
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