6E3112

6E3112

B. Tech. VI Sem. (Main & Back) Exam. May/June 2013
Electrical Engg.
6EE 4Advanced Power Electronics

Time: 3 Hours   Maximum Marks:80
                                                       Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

*Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

1._____   2._____

UNIT – I

Q.1 (a) What are the steps involved in determining the output voltage waveforms of three-phase bidirectional controllers? [8]

(b) An ac Voltage controller in figure has a resistive load of R=10Ω the root-mean-square (rms) input voltage is V_s =120V, 60H_z. The thyristors switch is on for n= 25 cycles and is off for m=75 cycles. Determine (a) the rms output Voltage V_o, (b) the input power factor (PF), and(C) the average and rms current of thyristors.

[8]
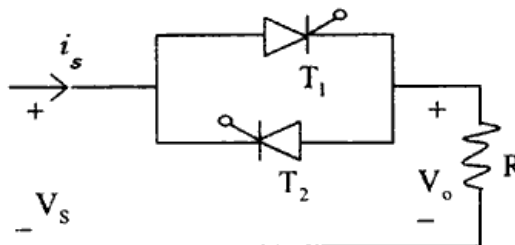
OR

Q.1 (a) What is the Control range of the delay angle for single-phase unidirectional controller? [8]

(b) The load of an ac voltage controller is resistive with R = 1.5Ω. The input voltage is V_s = 120V(rms), 60H_z. Plot the PF against the delay angle for single-phase half wave and full wave controllers. [8]

UNIT – II

Q.2 (a) With the help of neat circuit diagram & waveforms, explain briefly the operation of transistorized three-phase bridge inverter with resistive load in 120° conduction mode. [10]

(b) Explain why a PWM inverter is superior to a square- wave inverter. [6]

OR

Q.2 (a) State the need for reduction of harmonics in inverters. Outline the various methods for reduction of harmonics or the improvement in waveshape. [8]

(b) Design a self-commutated inverter circuit to operate at a frequency of 3KHz with an optimum distortion. The load Specifications are as follow: R = 5Ω, L=5mH,

E_{dc}= 100V. Also compute the output power. [8]

UNIT – III

Q.3 (a) Draw and explain the control circuit block diagram for a cycloconverter with non-circulating current mode. rtuonline.com [8]

(b) What is a loadcommutated cycloconverter? How does it differ from line commutated cycloconverter? [8]

OR

Q.3 (a) Describe the control scheme for a cycloconverter using voltage sensing principle of converter group selection. [8]

(b) A three pulse cycloconverter feeds a single phase load of 190V, 45A at a power factor of 0.7 lagging. Determine:

    (i)   The required supply voltage   (ii)   Thyristor rating

    (iii)   Power factor of the supply current.   [8]

UNIT – IV

Q.4. (a) Explain the operation of Bi- directional power supplies. [8]

    (b) With a neat sketch, explain the operation of flyback converter &derive the equation for its output Voltage. [8]

OR

Q.4. (a) Explain the operation of Resonant- DC power supply.

    (b) Write a short note on:

    (i)   Full bridge converter.

    (ii)   Switch mode DC power supplies.

UNIT – V

Q.5. (a) Explain Resonant AC power supply.

    (b) With a neat sketch, explain multistage conversions. [8]

OR

Q.5. (a) Write a short note on:

    (i)   Voltage mode control

    (ii)   Bi-directional AC power supplies. [8]

(b) The load resistance of the ac power supply in figure is R=2.5Ω. The dc input voltage is V_s =100V. The input inverter operates at a frequency of 20KHz with one pulse per half cycle. The on-state voltage drops of transistor switchesand diodes are negligible. The turns ratio of the transformer is a =N_s/N_p=0.5. The output inverter operates with a uniform PWM of four pulses per half cycle. The width of each pulse is δ=18°. Determine the rms load current. The ripple voltage on the output of the rectifier is negligible. Neglect the losses in the transformer, and the effect of the load the losses in the transformer, and the effect of the load on the resonant frequency is negligible. [8]

DC-ac Stage   AC-ac Stage

CycloGenuerter