Sheet (3)

(1) A single-phase half-wave AC controller has a resistive load of 15Ω. The input voltage is 220 V, 50 Hz. The firing delay angle is 45°. Determine:
(a) the rms output voltage,
(b) the average and rms currents of the thyristor and the diode,
(c) the average input current,
(d) the input power factor, and
(e) the maximum and minimum power factor.

(2) A single-phase full-wave controller has a resistive load of 10Ω. The input voltage is 220V 50-Hz. If the desired output power is 2.5 kW, determine:
(a) the rms output voltage,
(b) the firing angle,
(c) the input power factor, and
(d) the average and rms thyristor currents.

(3) A resistive load of 10 Ω is connected to a 220-V, 50-Hz AC source via a single-phase full-wave AC triac-voltage controller. The load power varies between the maximum value to ¼ the max. value. Calculate the following:
(a) the control range of (α),
(b) the rms value of the load current for each extreme of the firing angle,
(c) the average and rms values of triac current,
(d) the supply power factor for the smaller power value**.**

(4) A single-phase, full-wave, AC thristors-voltage controller feeds power to a resistive load of 10 Ω from a 220-V, 50-Hz AC source, at triggering angle $\alpha = \pi/6$. Determine:
(a) the rms value of the output voltage,
(b) the output power and input power factor.
(c) the value of the thyristor voltage at the instant of firing,
(d) the ratio of the third harmonic to the fundamental components of the output voltage
(e) the triggering angle at which the greatest forward or reverse voltage is applied to one of the thyristors and the magnitude of these voltages.

(5) A single-phase, resistive load is supplied from 380-V, 50-Hz source through a fully-controlled AC voltage regulator. With no phase control the load power is 9.63 kW, find:
(a) the value of (α) to reduce the average power to 3 kW,
(b) the amplitude of the fundamental current for this value of (α), and
(c) the amplitude of the third and fifth-order harmonic currents.