

2056
B.E. (Electrical and Electronics Engineering)
Sixth Semester
PC-EE-602: Power Electronics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.

x-x-x

1. (i) How is light triggering different from temperature triggering for an SCR? (2)
(ii) Define firing angle, extinction angle and overlap angle as associated with phase-controlled rectifier. (2)
(iii) Draw a well-labelled circuit of a voltage-commutated Chopper. (2)
(iv) What are the essential conditions for working of Phase Controlled Rectifier as Line commutated inverter. (2)
(v) What is the effect on output voltage of a three-phase controlled rectifier due to source inductance and resistance? (2)

PART-A

2. (i) A single-phase transformer with secondary voltage of 230V, 50 Hz, delivers power to load $R=10\ \Omega$ through a half-wave controlled rectifier circuit. For a firing angle of 60 degrees, compute the average output voltage, rms value of output current, ac input and dc output power. (5)
(ii) Explain how UJT can be used as relaxation oscillator for triggering SCR with help of circuit diagram and waveforms. (5)
3. (i) Draw the circuit of a single-phase 1-Pulse mid-point converter feeding a RL load. Explain its working and support your answer with input voltage, output voltage waveform and voltage across the thyristors for $\beta=\pi+\alpha$. (5)
(ii) Draw a three-phase dual converter, its equivalent circuit. What is need of a dual converter and derive the condition of firing angles for its operation in circulating current mode. (5)
4. (i) Draw and explain the working of a type-B two quadrant chopper with relevant waveforms. Does it work as step-up or step-down Chopper? (5)
(ii) A type-A chopper operating at 2 kHz from a 100 V dc source has a load time constant of 6 ms and load resistance of 10 ohms. Calculate t_{on} and t_{off} times for average output voltage of 50 V. (3)
(iii) Explain constant frequency method to control the output voltage of a chopper. (2)

P.T.O.

(2)

PART-B

5. (i) What is load Commutation. Draw the circuit and explain how it works. (5)
 (ii) For any three-phase 3-Pulse(half-wave) phase converter, draw its circuit, explain its working, table of conduction and waveforms for output voltage for firing angle =60 degrees. (5)
6. (i) What is the need of Static equalizing circuit for series connection of SCRs, derive the expression for connecting Static Equalizing circuit. (5)
 (ii) Draw a well-labelled three-phase full converter feeding a RLE load and sketch the input line voltage and output voltage waveform for firing angle =90 degree. Write the expression and the value for average output voltage for input voltage of 415 V(rms). (5)
7. (i) State the various schemes used to protect the thyristor, draw the suitable diagram and explain. (6)
 (ii) Draw and explain the static V-I characteristics of SCR. Explain latching current and holding current. (4)

x-x-x