

B. Tech.
Year: II Semester: IV
Even Semester 2025-2026
Subject Name: Fundamentals of Power Electronics

Time: 2 Hr.

Max Marks: 30

Note: Attempt All questions.

Q1	Attempt any three parts of the following.	Marks
a)	Explain the Turn- ON methods of SCR with proper justification.	4
b)	With a neat diagram, explain the operation of a Gate Turn-Off Thyristor (GTO). Discuss its advantages, limitations, and applications in modern power electronics.	4
c)	Explain the operation of single-phase angle-controlled full wave rectifier. Derive the expression for average dc output voltage. Draw the relevant waveforms.	4
d)	A single-phase full converter fed from 220 Volt; 50 Hz gives an output voltage of 180 Volt at no load. When loaded with constant output current of 10 A, the overlap angle is found to be 6 degrees. Compute the value of source inductance in henneries.	4
Q2	Attempt any three parts of the following.	
a)	Explain the construction and working principle of SCR. Also draw the V-I characteristics of SCR.	3
b)	The thyristor controlling the power in a load resistance R_L . The Supply Voltage is 240 V Dc and the specified limits for di/dt and dv/dt for the SCR are $50 \text{ A}/\mu \text{ sec}$ and $300 \text{ V}/\mu \text{ sec}$ respectively. Determine the values of the di/dt inductance and the snubber circuit parameters R_s and C_s .	3
c)	Compare the MOSFET, IGBT, and BJT as power switching devices. Justify their selection for low-power high-frequency converters, medium-power drives, and high-power industrial applications.	3
d)	With a neat diagram, explain the operation of power semiconductor device MOSFET.	3
Q3.	Attempt any three parts of the following.	
a)	Explain the effect of a freewheeling diode in power converters with the help of a suitable example. Also justify the statement: 'A freewheeling diode improves the power factor of the system.'	3
b)	Explain the single phase Half wave circuit with RL load and freewheeling diode with the help of circuit diagram and corresponding waveforms.	3
c)	Single-phase transformer, with secondary voltage of 230 V, 50 Hz. delivers power to load $R = 10 \Omega$ through a half-wave controlled rectifier circuit. For a firing-angle delay of 60 degree, Determine i. The rectification efficiency ii. Voltage ripple factor iii. PIV of thyristor	3
d)	Explain the effect of source inductance in a single-phase full converter. Draw the circuit diagram and the relevant voltage and current waveforms showing its impact on converter operation.	3
