

S.E. Sem - IV (ELEC) (NEP 2020) May/2026

16/05/2026

Time: 3 hours

Max.Marks:60

Q1) Answer any three of the following (entire syllabus)

- Describe dv/dt and di/dt protection circuits for an SCR. (05)
- Compare Power MOSFET and IGBT based on their applications and symbols. (05)
- Compare mid-point and bridge configurations of single-phase full-wave rectifiers. (05)
- Compare Voltage Source Inverters (VSI) and Current Source Inverters (CSI). (05)
- Explain the role of heat sinks in thermal management of power devices. (05)

Q2)

- Describe the different modes of operation of an SCR with junction diagrams. (08)
- Explain the advantages of Wide Band Gap devices (SiC and GaN) over traditional Silicon devices. (07)

Q3)

- Describe the operation of a single-phase full-wave mid-point controlled rectifier with R load and draw the relevant waveforms. (08)
- Describe the various gate triggering methods. Why is pulse triggering used in practical applications? (07)

Q4)

- Describe the switching characteristics of an IGBT during Turn-ON and Turn-OFF with neat waveforms and relevant time intervals (t_{dn} , t_r , t_{df} , t_{fr}). (08)
- A single-phase fully controlled bridge rectifier is fed from 230V, 50Hz supply. For firing angle $\alpha = 45^\circ$ and R load, calculate the average and RMS output voltage. (07)

Q5)

- Derive the expression for output voltage of a Buck converter operating in Continuous Conduction Mode (CCM). (08)
- Discuss various isolated gate driver techniques, including Opto-couplers and Pulse Transformers. (07)

Q6)

- Describe the Sinusoidal Pulse Width Modulation (SPWM) technique for voltage control in inverters. (08)
- Compare Buck, Boost, and Buck-Boost converters (07)