

III B. Tech I Semester Supplementary Examinations, July – 2023**POWER ELECTRONICS**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

UNIT-I

1. a) Explain the operation of IGBT with VI and switching characteristics. [7M]
 b) The semiconductor devices are fault prone devices in the converter; propose methods in protecting the SCR in dealing electrical parameter transients [7M]
 (OR)
2. a) Discuss in detail about the UJT triggering method of SCR [7M]
 b) Explain the two-transistor analogy of SCR. [7M]

UNIT-II

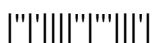
3. a) In detail how the source inductance influence on the output voltage in single phase full controlled bridge rectifier; derive the expression for output voltage [7M]
 b) Explain the operation of single-phase dual converter with necessary figures [7M]
 (OR)
4. a) Assuming the load current is ripple free, Derive the rms voltage at the output of single-phase semi-converter [7M]
 b) A single -phase full converter is delivering power to RLE load with $R=5\Omega, L=10\text{ mH}$ and $E=80\text{ V}$. The ac source voltage is $230\text{ V}, 50\text{ Hz}$. If one of the SCR is damaged and open circuited find the new value of average output current on the assumption to continuous conduction. Also sketch the output voltage and current waveforms? (Take firing angle to be 45°) [7M]

UNIT-III

5. a) Discuss how the full converter helps in bi-directional power flow using necessary waveforms [7M]
 b) Develop converter and control in varying the voltage and frequency of single-phase ac-ac converter [7M]
 (OR)
6. a) Draw the circuit diagram of ac-ac converter and find the average voltage of the load voltage with reference to firing angle and draw the source currents [7M]
 b) Derive the output voltage expression of three-phase full-converter taking RL load (assume load is continuous) [7M]

UNIT-IV

7. a) Explain the different modes of operation and derive the voltage gain of boost converter while operating continuous conduction mode [7M]
 b) Derive the voltage gain of buck-boost converter while operating in discontinuous mode of operation [7M]
 (OR)
8. a) Derive the expression for voltage ripple in buck converter [7M]
 b) Explain the different modes of operation and derive the voltage gain of boost converter while operating dis-continuous conduction mode [7M]



Code No: R2031022

R20

SET - 1

UNIT-V

9. a) How do you use PWM to inverters? Explain operation of single full bridge inverter with quasi-square wave pulse width modulation [7M]
b) Draw the pole and line voltages of three phase inverter at 120° mode of operation and derive the rms line voltage [7M]
(OR)
10. a) Draw the pole and line voltages of three phase inverter at 180° mode of operation and derive the rms of pole voltage [7M]
b) Discuss about phase displacement method in controlling the output voltage of inverter [7M]

