

III B. Tech I Semester Supplementary Examinations, June/July-2022**POWER ELECTRONICS**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

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

All Questions Carry Equal Marks

UNIT-I

1. a) With neat diagrams explain static characteristics of a SCR. [8M]
 - b) Demonstrate the characteristics of power MOSFET. [7M]
- (OR)
2. a) What are the practical problems associated to series operation of SCR? Discuss. [8M]
 - b) Describe UJT firing circuit used for triggering SCRs. [7M]

UNIT-II

3. a) Explain the operation of Single Phase half controlled rectifier with RL-load with neat sketches in continuous current mode. [8M]
 - b) Explain the operation of Single Phase fully controlled bridge type rectifier with R-load. [7M]
- (OR)
4. a) A single phase full converter supplies a load consisting of R, L and E. The inductance is large and output current is constant. Assume the SCR to be ideal with following data: RMS supply voltage = 220 V, load resistance = 0.5 Ω , output current is 10 A. Determine (i) firing angle if $E = 135$, $E = -145$ V (ii) which source is supplying power in $E = 135$ and $E = -145$? [8M]
 - b) Explain the non-circulating current mode of operation of Single Phase dual converter with associated circuits. [7M]

UNIT-III

5. Explain the operation of three phase fully controlled six pulse bridge type rectifier with associated waveforms. Derive the expression for average output voltage. [15M]
- (OR)
6. a) With neat sketch explain Single phase AC voltage controller for R-load. Derive RMS load voltage and current. [8M]
 - b) Explain the working of a single phase cyclo-converter for RL-load of frequency $f_0 = \frac{1}{6}f_s$ with continuous conduction mode. [7M]



UNIT-IV

7. a) Explain the Control Techniques of a chopper. [8M]
b) A buck boost converter is operated from a 24V battery and supplies an average load current of 2 Amp. Its switching frequency is 50kHz. Neglecting diode and switch drop, determine: [7M]
(i) Range of duty cycle variation required to maintain the output voltage at 15V, given that the battery voltage ranges from 26V in the fully charged state to 21V in the discharged state.
(ii) The peak to peak choke ripple current for the nominal supply voltage, given that choke value is 500 μ H.
(iii) Average supply current drawn from the battery under nominal condition.

(OR)

8. Explain the operation of a boost converter. Derive the expressions for peak to peak ripple current and ripple voltage in terms of circuit components, frequency, supply voltage and duty ratio. [15M]

UNIT-V

9. a) Explain the operation of single-phase half bridge inverter for R-load with aid of relevant waveforms. [8M]
b) Explain sinusoidal pulse width modulation technique in detail. [7M]
(OR)
10. Explain the principle of operation of three-phase inverter with 180 $^\circ$ conduction mode with necessary wave forms and circuit. [15M]

